1883. 1884.

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OTTAWA

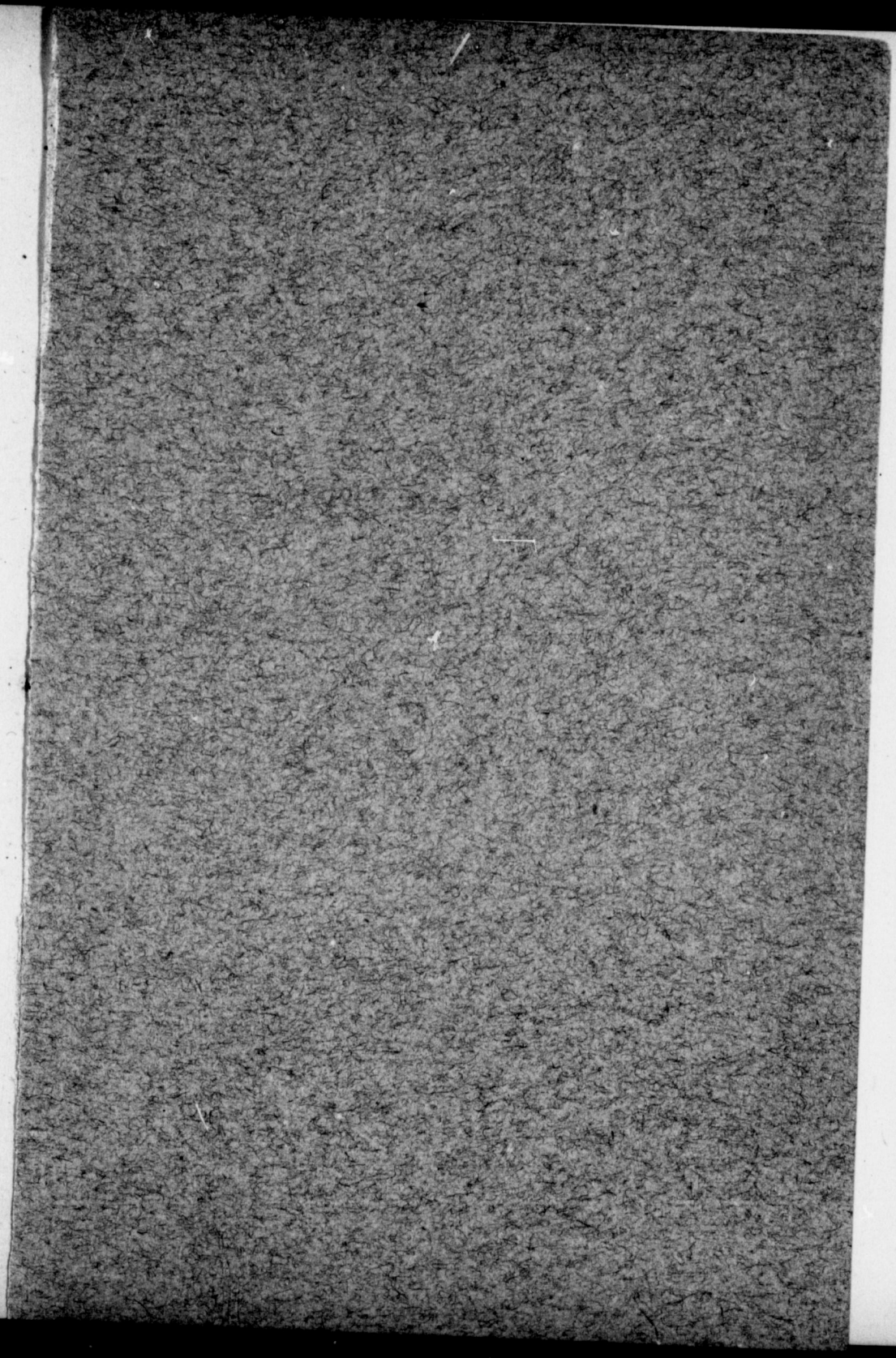
FIELD-NATURALISTS'

CLUB

Transactions No. 5

VOLUME II, NO. 1.

OTTAWA, CANADA.
Citizen Printing and Publishing Company, Metcalfe St.
1884



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CONTENTS.

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1884

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Whyte, R. B.
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Wright Geo. C. (Hull).
Wright, W. R.

Young, James.

ANNUAL REPORT OF THE COUNCIL.

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

In presenting a report on the work of the Club during the year just closed, the Council can claim that a large amount of valuable work has been accomplished. Through an oversight in last year's report no mention was made of the Botanical Class which had been conducted during the winter (1882-83) by the President, Mr. James Fletcher. The class was continued in the field during the past collecting season with great success, and has added much botanical strength to the Club. Four regular excursions of the Club were held during the summer. The first was on the 26th May to Kingsmere, a favourite resort of the members. The second was to Casselman on 23rd June, and was perhaps the best excursion yet held by the Club. The third was a very pleasant trip to Buckingham on 2nd August, while the fourth, through the kindness of Capt. Goulet, of Aylmer, who placed a steamboat at the disposal of the Club, was to the beautiful Chats Falls on 12th September. In addition, many sub-excursions were held by the different branches on Saturday afternoons, which aided largely in investigating the natural history of the localities visited. Seven soirées were held during the winter, at which valuable papers and reports were presented, and at which the attendance was very satisfactory. A synopsis of the discussions has been prepared with a view to publication in the Transactions. Classes have been conducted by Prof. Macoun and Mr. Fletcher, in Ornithology and Botany respectively, which will undoubtedly add to the future working strength of the Club. For the prizes announced by the Council for the best collection made during the year in each branch there were no competitors except in Botany, for which the prize—a copy of Gray's manual—has been awarded to Miss Isabel L. Grant, as recommended in the report of the leaders of the branch. For the prize offered by the President, Dr. Small, there were no competitors. The Librarian reports that a large number of

exchanges have been received, and that 71 copies of Transactions have been distributed to various societies and correspondents of the Club. Owing to a series of unavoidable delays, the Transactions (No. 4) for 1882-83 were not published as early as would have been desirable, but arrangements have been made with a view to prevent a repetition of such delays in publication. To improve the standing of the Club and to enable it to apply to the Ontario Government for a grant to assist it in carrying on its work, it was found necessary to have it incorporated, and the requisite papers were accordingly prepared and registered by Messrs. Scott, MacTavish & MacCraken, who very generously declined to accept any fee from the Club therefor. A petition for a grant was also prepared and forwarded to the Minister of Education. Under the conditions of incorporation, it becomes necessary to make an amendment to one of the rules, and it is proposed at the same time to make such other amendments as may be deemed advisable in order to secure the most satisfactory management of the Club. Thirty-nine new members were elected during the year, and the present membership is 128, as compared with 108 reported last year. The Rev. Duncan Anderson, M.A., of Spruce Cliff, Levis, Que., a prominent Ornithologist, was elected a corresponding member. The Treasurer's balance sheet shows that there are no claims outstanding against the Club. The reduction in the balance reported is due partly to an increase in several items of expenditure, and partly to a decrease in the amount of back fees received, and in the sale of Transactions. Nineteen meetings of the Council were held during the year, at which there was an average two-thirds attendance of the members, notwithstanding the absence of several of them from the city during the summer. In conclusion, the Council has much pleasure in informing you that His Excellency the Marquis of Lansdowne has graciously consented to become Patron of the Club in the place of our late Governor General the Marquis of Lorne.

W. H. HARRINGTON,

Secretary.

OTTAWA, 18th March, 1884.

TREASURER'S STATEMENT

Of Receipts and Expenditure for 1883-84.

RECEIPTS.		EXPENDITURE.	
Balance from 1882-83...	$ 40 31	Stationery, Printing, etc.	$ 25 76
Membership Fees.....	109 00	Excursion Expenses.....	23 58
Excursion Receipts.....	24 20	Soirée do	11 95
Soirée do	6 10	Cost of Transactions No.4	116 25
Sales of Transactions...	10 25	Balance on hand	12 32
	$189 86		$189 86

18th March, 1884.

WM. P. ANDERSON,
Treasurer.

LIBRARIAN'S LIST OF DONATIONS AND EXCHANGES.

New Brunswick Natural History Society:—"Bulletin." No. 2.

Massachusetts Horticultural Society:—"Transactions," 1883. Part I. "Schedule of Prizes," 1884.

Montreal Natural History Society:—"Canadian Naturalist." Vol. X, Nos. 7 and 8. "Canadian Record." Vol. I, No. 1.

Buffalo Naturalists' Field Club:—"Bulletin." Nos. 3, 4 and 5.

Boston Zoölogical Society:—"Quarterly Journal." Vol. II, Nos. 2, 3 and 4. Vol. III, No. 1.

Cambridge Entomological Club:—"Psyche." Vol. III, Nos. 101-2. Vol. IV, Nos. 105-116.

Joseph M. Wade:—"Ornithologist and Oölogist." Vol. VII, Nos. 13-24. Vol. VIII, Nos. 1-12.

John B. Smith:—"N. A. Heliothinæ."

American Museum of Natural History:—"14th Annual Report." "Bulletin." No. 4.

Henry Edwards:—"Papilio." Vol. III, Nos. 3-10.

Canadian Institute:—"Proceedings." Vol. I, No. 4, 5.

College of Ottawa:—"Prospectus and Course of Studies, 1883-4."

Joseph F. James:—"Revision of the Genus Clematis of the U.S."

Epping Forest and County of Essex Naturalists' Field Club:—"Transactions." Vol. III. Part 7.

Physikalisch-Ökonomischen Gessellschaft, Königsberg. Schriften der—1882.

Prof. J. Macoun:—"Catalogue ot Canadian Plants." Part I.

Academy of Natural Sciences, California:—"Constitution and By-laws." "Proceedings." Vols. V, VI, and Part 1 of Vol. VII.

George Dimock:—"Minutes of Meetings of Cambridge Entomological Club, 1883." "Microscopy and Histology."

G. E. Davenport:—"Catalogue of the Davenport Herbarium." "Supplement to ditto." "Distribution of Ferns in U.S.A."

R. H. Ward:—"Report on Micrometry."

Toronto Natural History Society:—"Check and Label Lists of Insects of Canada."

United States Geological Survey:—"Second Annual Report," 1880-81. "Hayden's Geographical and Geological Surveys of the Territories." Parts 1 and 2 (1878). "Maps for ditto." "Monograph, No. 2, Tertiary History of the Grand Canyon District, Dutton." "Atlas for ditto." "Bulletin." No. 1.

Lambeth Field Club:—"Report," 1882.

American Association for the Advancement of Science:—"Proceedings Montreal Meeting," 1882.

James Fletcher:—"Reports of Ontario Fruitgrowers' Association," 1881 and 1882.

Torrey Botanical Club:—"Bulletin." Vol. XI, Nos. 1 and 2.

J. A. Lintner:—"First Annual Report of the State Entomologist of New York State."

CONSTITUTION.

(Adopted at a Special General Meeting held 28th March, 1884.)

1. *Name and Object.*—This Club shall be called the Ottawa Field Naturalists' Club, and its object shall be the study of the Natural History of this Locality.

2. *Officers.*—The Officers of the Club shall consist of a President, first and second Vice-Presidents, a Secretary, a Treasurer, and a Librarian, who, together with three other members of the Club, shall form a Council, all of whom shall be elected annually, and shall be eligible for re-election, and who shall have the management of all the business of the Club. In the event of any vacancy occurring in the Council during the year the same may be filled by the election of a successor at any of its regular meetings.

3. *Auditors.*—There shall be two Auditors, elected annually, to examine the Treasurer's accounts for the following year and report thereon at the next annual meeting.

4. *President and Vice-Presidents.*—The President shall direct all the business of the Club, and preside at all meetings of the Club and Council; his duties, in the event of his absence, devolving on the Vice-Presidents in their order.

5. *Secretary.*—The Secretary shall give previous notice to each member of the Club of every meeting of the Club, and to each member of the Council of every meeting of the Council; shall make and keep a true record of the Proceedings of all Meetings of the Club and of the Council; have custody of the Constitution, By-laws, and Records of the Club, and conduct its general correspondence.

6. *Treasurer.*—The Treasurer shall be charged with the collection and custody of the funds of the Club, and keep a regular account thereof, which shall always be open to the inspection of the Council. He shall also submit at each annual meeting a statement showing the financial condition of the Club.

7. *Librarian.*—The Librarian shall have charge of all publications of the Club, and shall distribute the same under the direction of the Council. He shall also have the custody of all books and papers belonging to the Club, and shall supervise their circulation among the members.

8. *Council.*—The Council shall, as business may require, meet from time to time at the call of the President, or of any two officers; shall control all matters affecting the welfare of the Club, subject to this Constitution; shall have full control of the funds of the Club, and shall report its proceedings to the members at the Annual Meeting.

9. *Annual Meeting.*—The Annual Meeting of the Club shall be held on the Third Tuesday in March, at which, in addition to other business, the Annual Report of the Council shall be read, and the Council and Auditors for the following year elected, by ballot after nomination, by a majority of the members present.

10. *Special Meetings.*—A Special General Meeting of the Club may be called by the Council; and shall be called on requisition of not less than ten members, specifying the business they wish brought before the meeting. The Council shall call the meeting within fourteen days from the receipt of the requisition, giving one week's notice. No other business shall be transacted than that mentioned in the notice.

11. *Conduct of Meetings.*—The presence of ten members shall be required to constitute any general meeting of the Club, and of three members to constitute a meeting of the Council. All meetings shall be conducted under such by-laws and rules of procedure as may from time to time be adopted.

12. *Proceedings.*—Excursions in summer, and Evening Meetings and Classes of Instruction in winter, shall be held, and the Transactions of the Club shall be periodically published; all arrangements for which shall be made by the Council.

13. *Members.*—Any lady or gentleman desiring to join the Club shall send a written application, signed by the applicant and endorsed by the recommendation of two members, to the Secretary, and if approved shall be elected at the next meeting of the Council. Members desiring to leave the Club must previously settle all dues and signify their intention in writing to the Secretary.

14. *Corresponding Members.*—The Council shall have the power of electing Corresponding Members, who shall be persons not residing in Ottawa or its immediate vicinity, but who may be desirous of promoting the objects of the Club. Corresponding Members shall not be required to pay membership fees.

15. *Annual Fee.*—The annual membership fee shall be one dollar, payable in advance, due on the third Tuesday in March, and no member in arrears shall be entitled to any of the privileges of the Club. New members to pay the fee for the current year upon election. The payment of the annual fee to entitle a member to receive a copy of the Transactions, as published, and to admission to the Club Soirées, without further charge.

16. *Amendments.*—This Constitution may not be changed or amended except by a special meeting of the Club called for that purpose, and by a two-third vote of the members present.

REPORT TO THE ROYAL SOCIETY OF CANADA.

(Read at the Second General Meeting, May, 1883.)

In the rules adopted at the organization of the Club which I have the honour to represent, its object is thus briefly stated: "to study the Natural History of this locality." During the four years of its existence, a strictly local character has been maintained, and to this we ascribe whatever success the Club has attained. The general management is under the control of the usual officers, elected annually, but the scientific work is directed by "Leaders" selected by the Council. The duties of these "Leaders" are:—To render any assistance in their power to members engaged in collecting and studying in their respective branches; to bring together for mutual aid and encouragement the members interested in the same subject; to organize and direct working parties; to keep notes of work done, and to report to the Council at the close of the season.

We are divided into six sections:—Geology—including Palæontology; Mineralogy and Lithology; Botany; Entomology; Conchology; Ornithology; General Zoölogy.

During the summer our work is entirely in the field. Once a month an excursion is held to some point ten or twelve miles distant, which is well attended, not only by members, but also by their friends. On the first and third Saturdays of each month, afternoon expeditions are taken by members of each branch, under the direction of the Leaders. In addition, throughout the whole season individual work is prosecuted with much zeal and assiduity.

In the winter, evening meetings are held once a month. Papers, bearing on the work done during the summer, are read and discussed; collections and specimens are exhibited, and the reports of the Leaders are received. Classes have been conducted for beginners in Botany and Entomology, and it is intended to form others as they may be found requisite in any branch. Prizes are given by the Club for the best collection in each branch. The President also offers a prize for the best record of original work.

That the advantages of the Club may not be confined to the members, nor the results of our labours be lost to the future, Transactions are published annually. They contain the President's address; the Secretary's report; reports of progress in the sections; lists of objects collected and the papers read at the winter meetings. Perhaps the most valuable are the lists. Those of plants, insects, birds, fishes and shells are already very complete. Each year they are added to and new ones commenced. The papers are altogether upon local subjects, and partake both of scientific and economic interest. A few titles will convey an idea of their character:—Geology of the Ottawa Palæozoic Basin, by Dr. Selwyn; Cystidean Life, by Dr. Grant; Laurentian Rocks, by Mr. Adams; Asbestos, by Mr. Anderson; and Coleoptera, injurious to our Pines, by Mr. Harrington.

The Museum which we aid our sister society, the Literary and Scientific, in maintaining, also partakes of our exclusive character, consisting entirely of collections made in this vicinity. In a few years we hope to have a museum in which the whole natural resources of this district may be easily studied.

Our steady growth and extending influence are very gratifying. Our Club is under the distinguished patronage of His Excellency the Governor-General, and the roll shows some 120 members; among them being the names of no less than eight Fellows of your Honourable Society. Letters seeking information are continually received, not only from residents of this neighbourhood, but also from more distant towns. Our "Transactions" and our system have been most favourably commented upon by the leading scientific journals of America, England and Europe; and the continued energy of our members leads us to hope that the vigour of our future will be as marked as that of our past.

H BEAUMONT SMALL, M.D.,

Delegate.

PRESIDENT'S INAUGURAL ADDRESS.

H. Beaumont Small, M.D.

(delivered 6th december, 1883.)

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

It is with feelings of pleasure mingled with fear that I find myself in the position to welcome you upon this the fifth year of our Club's history. To feel that I have been considered worthy of occupying the position of President is an undoubted pleasure; yet there is ever the fear that the honour entrusted to me is greater than I have the power to maintain. Your confidence, I can assure you, has been appreciated; and, in addition to what my actions may imply, I will simply ask you to accept my most hearty thanks for placing me in this honourable position. From its beginning the Club has ever had my co-operation and good wishes; its welfare I have ever striven to promote. The incursions into the realms of Dame Nature, and the friendly intercourse with fellow members have always proved a source of pleasure and relaxation from other more serious duties of everyday life.

The acceptance of the office was not without deep consideration on my part. I felt its importance—was aware of the duties it would require—knew that much time would have to be devoted to its work—and weighing all these things carefully, I accepted it, trusting to your forbearance, determining to fulfil all its obligations to the utmost of my ability. Perhaps that which lent greatest weight to my decision was the friendly relations existing with all my *confrères* in the Council, upon whom I felt I could rely for every aid to make my term easy and successful.

Of the many difficulties that must of necessity be met, one in particular will ever overshadow all my efforts. I refer to the brilliant career of my predecessor in office, for a more untiring, energetic officer, or a more successful period in the history of any club, could not be wished for. Previous to 1879 Natural History in Ottawa ran at

random. Such societies as had been formed were devoted to science in general; very little work of any local value had been handed down to us; no effort had been made to study the resources of this neighbourhood; there had been no practical working parties, no co-operation of forces; each student followed his own bent, and in many cases trod an unencouraged and unsympathetic path. Seeing what a field there was to work, and knowing how much could be accomplished by united efforts, our worthy ex-President conceived the idea of the Club; his energy carried it into effect, and his contagious zeal and activity have maintained its successful career. During one year as Vice-President, and three successive years as President, the bulk of the labour fell on his shoulders, not only the arduous duties of managing, but also the more valuable work of directing the various branches of natural history, for there is hardly a branch in which there is not some student who can trace a fondness for nature to his assistance and enthusiasm. The result of his efforts is such as he can look at with pride, and were nothing further accomplished he has done enough to have his name for ever associated with the development of our local natural resources. To those who remember the condition of the study of natural science before the formation of this Club, its present popularity and progress tell of a very material change. Workers are now united and their efforts systematized. Numbers have been induced to enter upon the study, some of whom form our most active members. Branches hitherto unnoticed now possess energetic searchers.

Our Transactions are very creditable. They place on record much local information, valuable not only to us as residents, but to all others, more especially those who may reside here in the future. The geology and stratigraphy are very clearly explained, many minerals of economic value are described, the lists of plants, birds, fishes and shells are of incalculable value; each year they are added to and perfected, new ones commenced, and before another four years shall have passed, the resources of this district will be so thoroughly known that we shall be sighing for fresh fields to explore and conquer. Already longing eyes are being cast upon surrounding regions. Our limits will soon become a question requiring deep consideration, but I can see that our domain will eventually comprise all that natural basin drained by the Ottawa

River; our chief care being not to extend it too rapidly, but only as each foot of ground is worked. Our published lists must continue to comprise only such objects as may be obtained in a day's outing; or when they are from any greater distance the locality must be specially named.

With such a record for the Club, what wonder that I fear the difficulty of maintaining its good name and aiding in its bright future. The vista presented to our view is unlimited, for not only is the perfecting of our neighbourhood before us, but a national work has been begun—could our example but start similar clubs in other districts, their work when added to ours would complete a system unequalled for simplicity and completeness. The scheme is quite feasible. Already several clubs have written for our rules and have commenced a system of field-work. There are naturalists in every district, to start whose energies some central force only is required. Could our national centre of Natural History but see its way clear to assume this duty, the most favourable results would inevitably follow.

During the period that has elapsed since I entered into office much work has been accomplished. The summer has come and gone, during which season the Club has exhibited great activity. This is really the most important period of our year, and the field-work that by which we must hope to maintain our reputation. To its attractions we owe the favour in which the Club is held, and the popularity it has gained, and by it we must strive to retain the interest of the members. During the present year the Council has given special attention to such work. In the intervals between the regular excursions—in addition to the frequent afternoon and early morning outings—sub-excursions were held every second Saturday afternoon. The leaders received the names of those who wished to accompany the parties and notified each one of the spot to be visited. When the locality was favourable two or more divisions would unite. The progress in some branches has been very pleasing, encouraging the leaders to continue such outings another season, with hopes of still greater success. The regular excursions were also as numerous as in previous years. It was feared that the sub-excursions would detract from the success of these larger gatherings, but the results show that our fears were not realized. The opening of

the Canada Atlantic Railway has brought new districts within our limits. All who visited Casselman must have been charmed with it as a favourable locality for all departments of natural history. The vast expanse of primeval forest, too soon to be invaded by the lumberman's axe, affords an opportunity of studying nature that must be seized by our botanists. Late in the season Capt. Goulet, of Aylmer, conveyed the Club in one of his steamers to the "Chats" rapids, affording a most enjoyable excursion, and the members who took advantage of his kindness, have, I am happy to announce, presented him with a valuable binocular glass as a mark of their appreciation.

In the month of May the meeting of the Royal Society brought many eminent naturalists to our city. It is to be regretted that the Club did not in some way publicly receive them, so as to enable the members to become acquainted with its savants. Another year it is hoped steps will be taken to remedy this oversight. As you are aware the Council of that Society, in order to inform themselves upon the condition of science and literature in the country, invited representatives of leading societies to be present at their meeting, and report upon their individual work. The courteous manner in which the representatives of societies were received and the privileges extended to us made the meeting one continuous source of pleasure. When the reports were read I felt proud of the Club I represented, as no other showed such practical work and usefulness as our own, while the many complimentary remarks received afterwards gave evidence that our system had attracted attention. The papers read were of no interest to us as a local Club, they dwelt upon science in general. Several papers were read by members of our Club, but as they were also Fellows of the Society we received no credit for them. Should any other members at future meetings wish to present papers, they may do so through their representative, and they will certainly be received with the attention they deserve.

The removal of the Ottawa Literary and Scientific Society to their new and more suitable quarters was seized upon as an opportunity to secure a permanent place of meeting. As that Society had decided to remodel their museum, continuing one of a local character only, and as it was necessary for us to possess a permanent collection of specimens,

rather than form a second and what would have been a rival one, we offered to supply theirs, in consideration of permanent rooms. The conditions are the same as formerly, but as more attention is now to be devoted to the museum, our members will be expected to contribute more freely. The curator will inform us what the museum possesses, donations may then be sent to the Council, who will see that the gift is properly credited. Let us be free and liberal, keeping the Society in our debt; they have always acted in a friendly manner; let all our endeavours be to continue the amicable relations that should ever exist.

Our winter soirées will continue as in the past. The programme prepared presents many features which must prove attractive. The papers of Dr. Dawson and Professor Macoun upon subjects regarding which they are so eminent authorities, will be highly instructive. The paper by Mr. Odlum, one of our new members, residing in Pembroke, is a new feature. This talented gentleman has kindly consented to visit us for the purpose of reading his paper and being present at one of our meetings. I would remind you that in addition to the published subjects there will always be room for notes and communications from the members. It is not necessary that they should be of marked scientific value; some uncommon visit of a bird or insect, or an unusual growth of a plant will prove of interest, and anything that causes discussion will be of value. Should information be required on any point, queries will not be out of order. The result of the summer's collecting may be exhibited that we may learn what others are doing or what the Club possesses. Each one should feel that the success of the evening in part depends on himself. The aim of all should be to make it as interesting and as profitable as possible, so that we may have, not one long formal lecture, but short papers followed by discussions of an informal character, becoming even conversational. This year we intend to take notes of the discussion, and embody in the Transactions such remarks as are of a local character bearing upon the subject.

The usual prizes are offered to the members for competition. The Club prize remains unchanged; that given by the President embraces a wider field than hitherto, for confining it to additions to published lists was not productive of such good results as was expected, and it is

now open to papers on original work in any department. This, it is hoped, will cause some to exercise their power of observation and impel them to advance in the domain of original research—that only true means of making science progressive.

There is one point I would ask you to think over before the annual meeting, that is the name of the Club, which, I think, should be changed, so that it will read the Ottawa Naturalists' Field Club, instead of the Ottawa Field-Naturalists' Club. The change of a name is a serious matter always. Here it can hardly be called a change, rather an alteration, and in my opinion a correction.

It affords me much pleasure to be able to announce that His Excellency the Marquess of Lansdowne has graciously consented to become the patron of the Club, and I can only hope that our work may prove as interesting to him as it did to his predecessor, the Marquess of Lorne, who always spoke in the kindest manner of our efforts.

To a person following the study of natural history, nothing is more essential than a knowledge of the system by which the members of that vast kingdom are classified. Without this a very important purpose of a name is lost. A name is not simply for the purpose of saving a description when we wish to indicate an object, but it is also intended to intimate the group to which it belongs, and its position or rank in the natural series. The former is of course of primary importance, but the latter is the deeper and more scientific meaning, the inability to apply which constitutes the difference between the ordinary observer or collector and the naturalist.

A person about to travel to a strange country looks on the map to find the position of the spot he is about to visit, notes what other places there are in the neighbourhood and their relative distances. So upon entering the domain of nature should one glance over the map of that country. He should search for his special province and compare it with others, that he may learn its relative position and extent. He should make himself acquainted with its boundaries, and should become familiar with the bordering districts. Should this information be wanting, one of the greatest sources of gratification is lost. In an ordinary ramble innumerable interesting objects are passed by and not

noticed. The characters which rank one object above another are not known. Relations and analogies of the greatest importance fail to attract attention, nor does he recognize a part in its many modifications. Upon entering a museum such knowledge is again requisite to appreciate what is gathered there. We can only pity the person who wonders why bats are not with birds, or why snakes, eels and worms are in different cases.

Throughout nature there are certain principles or relations which, when searched for, furnish the only true guides, and very few observations of these show that nature has undoubtedly followed a certain plan in producing organized beings. As these beings are scattered all over the globe, inhabiting different elements, this plan is considerably altered and disfigured by modifying influences. The aim is to discover this plan, to trace it through intricate paths, to recognize it in various disguises, and when fully worked out, to draw the lines of demarcation which serve to divide and sub-divide such groups as may be formed. To accomplish this end, the affinities which one object bears towards another must be closely studied. In the animal kingdom those of real importance are found in the internal vital structures, where we must search for the resemblances of a permanent character. A single organ or set of organs may be selected and followed through its many stages, but the greatest precision is obtained when the organism is considered in the totality of its parts. The external markings though not to be depended upon for permanent characters are found to be of value in determining the minor differences and forming the lesser divisions. However, as the same influences that modify externally affect the internal arrangement to some extent, these more crude characters serve to point out the path we wish to follow.

Such principles may be discovered in all systems having any claim to be natural, their correctness depending on the closeness with which the guide has been followed. In the system of Aristotle, formed more than two thousand years ago, we find the first evidences of a natural classification. He studied closely the circulation, and separated all animal life into two groups, corresponding to our vertebrates and invertebrates. One he formed of all those animals possessing red blood, in the other he placed all with a colourless fluid. His further divisions

were into those living on the earth, in the water, and in the air. A fourth group comprised all lower forms under the name of *vermes*. With no previous researches to guide him, and but limited material to study from, he produced this accurate division which all subsequent investigations have only confirmed. For two thousand years this system was accepted. Up to the time of Linnæus, no other successful attempt was made, naturalists devoting their energies to discovering and naming species. Linnæus seeing the correctnesss of the principle adopted, did not form a new scheme, but extended his researches and made a further division into classes. (*Addendum A.*)

It is not for the system that we are indebted to Linnæus, but for the firm foundation upon which he placed the science of natural history. He it was who permanently formed the divisions of class, order, family, genus, species, and perhaps his most valuable legacy was the method of giving double names, based on the generic and specific characters—a boon few properly realize. His system was published in 1759, and for the next sixty years naturalists devoted themselves to correcting and improving upon it. The beginning of our century saw a marked advance. The Linnæan system was then discarded and that which forms the foundation of all present systems was adopted. In 1819 Cuvier gave to the world the result of his labours, which has continued with slight modification to the present day. I place with it that taught by Principal Dawson, he being our leading Canadian authority, and his system being a fair example of the many in vogue at the present day. (*Addenda B. & C.*)

Cuvier has selected the nervous structures as the means of determining his groups, at the same time giving due weight to the changes in the other vital organs. At one end he separates all possessing a brain and spinal cord extending throughout the body, and an internal skeleton, from which they derive the name vertebrata. At the other end he makes a group of all not formed on the bilateral plan, the parts radiating from a common centre, hence their name radiata. The remainder is divided into mollusca and articulata. In the former the nerve centres are scattered irregularly throughout their structure, all being connected with two chief centres situated over the throat. In the other group the nerve centres are arranged as a double chain extending the length of the

body, a set being placed in each articulation or ring. The nervous system is not wholly considered. In the vertebrates a perfect system of respiration and circulation, the complicated digestive process, together with the number of special senses, are all distinctive characters which leave no doubt about placing this group at the head of the list. Of the relative position of the next two groups Cuvier was uncertain. They were not placed one after another, but side by side, the mollusks having a slight precedence. This he allowed, as in them he considered the circulation in closed vessels was more perfectly performed, respiration approached nearer the higher type, and the digestive organs were nearly as complex as in the vertebrates. The articulates he thought lower, as modifications in the vital processes became evident, respiration was not performed by a single organ, but by a series of chambers scattered throughout the body, and circulation and digestion were also performed on a more simple plan. Modern observers however have altered this, placing the articulates decidedly in front. Their external skeletons—the bilateral symmetry of all parts—the distinct members for locomotion, and the superior power of directing their movements, place them in a higher scale. The mollusks, on the other hand, although having greater developments of some structures, are otherwise more lowly constituted, their irregularity of structure and want of symmetry causing them to approach the radiates. The last group was easily placed at the foot of the link. Their want of special sense, their simplicity of structure and function, make it difficult to distinguish many of them from the vegetable kingdom. In the formation of classes the same general characters rule, whilst in addition certain characteristics of the group are considered. With the vertebrates, although the various functions are studied, the classes are really formed on the same plan as in the Linnæan system. The articulate classes depend on external characters chiefly. The arachnids are highest as they have pulmonary respiration; and are furnished with eight legs. Insects have head, thorax and abdomen, legs six in number. Crustaceans have their bodies divided into thorax and abdomen, and legs more numerous. Annulata are composed of numerous rings, legs rudimentary and no proper division into head, thorax or abdomen. The cephalopods are the highest of their group, having many resemblances not only to the

articulates but also to the vertebrates. The next two classes are according to their shells. The last class consists of those constructed internally on the plan of the mollusks, but externally resembling the lower group. The radiate classes extend from the well known star fishes to the simple celled infusoria.

In deciding the scale of the natural series a certain method has always presented itself, that is, to select a certain point as a standard, compare the objects we wish to rank, and when compared, that which most nearly approaches the standard has precedence. In selecting the standard, that end of the scale is most naturally chosen which is the perfection of all types. Thus, throughout the whole animal kingdom, when we speak of a thing being highly or lowly developed, we refer to it as approaching near to or departing from the likeness of man in the construction of its parts.

Up to the time of Cuvier the idea was to form one continuous line from the highest to the lowest form of animal life. Cuvier renounced this plan, placing many of his sub-kingdoms and classes on almost equal footing. He, however, failed to explain the discrepancies or elucidate the plan of his series. This want of regularity has always perplexed classifiers who have followed the Cuvierian school. Macleay, a Scotch naturalist, attempted to arrange all in groups represented by circles, the series being continuous where the circles came in contact. The whole difficulty is due to their observation not being based upon proper theories. These systems have been formed on certain characters, without first discovering why these characters were present or ascertaining by what theory they could be explained. They failed to recognize the import of their facts and continued their investigations in the wrong direction.

At the same time that Cuvier was constructing his animal kingdom, and probably from the same influences that caused him to look deeper than his predecessors, others also commenced to investigate the subject, and although no system was evolved, the principles upon which we must build a system purely natural were discovered. All other systems were formed by studying the characteristics of the natural groups, and then bringing together all to which they could be applied. This method studies nature as a whole, from the most lowly

formed to its highest type, and then draws the lines of demarcation, separating group from group. Adult forms are not alone considered. It follows the development of each object from its earliest condition, also enlists into its service many extinct forms, and by this means a purely natural system is created, the series being traced from the lowest to the highest creation. I have made a rough outline of the system of Haeckel, based on this method, which is given that you may obtain an insight. In these methods many points require to be proven, many obscurities to be cleared up. There is much work to be done, work which must advance slowly, but as the greater number of leading naturalists are following this plan, we can look forward to possessing, in due time, a perfect system.

Of the further division into orders, families, genera and species, the two latter are the most important, as from them the name of the object is derived. The species is the one of real value, as it is the unit of our systems. When among several individuals we find a peculiarity of form or external marking—tangible and constant—we recognize it as a specific difference, and give it a name according to some peculiar marking it possesses. When among several with such specific differences there is a general resemblance in internal structure, and often to a great extent in external characters, we recognize a natural group and name it a genus. The families and orders are very unsatisfactory, the terms giving no idea of their value. Their distinctions are some general external character which indicates a peculiarity of internal structure. Mammal orders are according to the hoof and teeth, birds according as they are made for swimming, wading, perching, etc.; insects according to the character and number of their wings. It is in these lesser divisions that we find the great differences of the many systems. Each specialist generally works independently of those in other branches; one gives a value to his divisions that another does not recognize, reducing orders and making families more numerous or increasing the number of orders and lessening the families. This constructing upon individual authority is very detrimental to the progress of science, as is also the custom of giving names by the same primitive plan. There is hardly an object that has not two or more names, and in indicating it, it is not enough to give a single authority, but it is becoming necessary to give

he authority for both the generic and specific names. Another difficulty that is increasing to an alarming extent is that of the numerous varieties that are being recognized; so plentiful are they, that a triple name is now becoming as common as a double one.

However, as every evil works its own cure, so from this state we may hope to derive a more simple science, where one name only will be recognized and no authority required—a custom now being advocated by many American naturalists.

Hitherto the feeble state of natural history has compelled Canadian naturalists to cling to the skirts of our friends in the United States, depending solely on them as our authorities. But now with our rapid advance we require a national authority upon such matters, and it is pleasing to know that in the Geological and Natural History Survey, we have our wants supplied. During the past year, under its authority, has been issued the first part of a catalogue of Canadian plants prepared by Prof. Macoun, which must become our recognized authority. No doubt the energetic director, Doctor Selwyn, will, as researches under his direction are extended, use all endeavours to continue the publication of such aids to enquirers in all other branches of natural history.

In offering you these few remarks, my object has been to point out how very important, and what a source of gratification must be a knowledge of this nature. If I have impressed you with its value, a little study on your part will soon familiarize you with the subject. Could more of our beginners see it in this light, we should have fewer back-sliders and a host of earnest and energetic workers. In this age it is becoming fashionable to be versed in science, and numbers rush wildly after nature and think they understand what is seen. But they soon tire and wonder where the attraction lies. Others energetically learn names and make collections, but they also tire and gradually lose interest. Would they but master these principles and learn to read the book of nature, its illustrations would afford them unthought-of attractions, and ever present something new.

I would advise all who begin the study to learn the principles of nature, and I promise as their reward a rich treat—a life-long pleasure.

Nothing is so requisite to the busy mind as relaxation, and how can it be better obtained than by retiring to her solitudes and making comparison of all the grand and beautiful things that nature has given us.

Mr. W. P. Anderson asked whether any analogy could be traced between the classifications of the animal and vegetable kingdoms.

The President said he thought not, as the classifications were formed quite independently of one another.

Prof. John Macoun was of opinion that there might be, for in plants, as in animals, there were four principal types: the thallophytes corresponding to the radiates; the acrogens and endogens to the mollusca and articulata, and the exogens to the vertebrata. To make the analogy still more marked he compared the gymnosperms, the lowest form of exogens, with the marsupials and monotremes, the lowest forms of mammalia.

ADDENDA.

A.—Linnæus.

Division A.—Heart of 4 cavities,—2 ventricles, 2 auricles,—blood warm and red.		
Viviparous—*Mammalia.*	Class	I
Oviparous—*Aves*	"	II
Division B.—Heart of 2 cavities,—blood red and cold.		
Having lungs—*Amphibia.*	"	III
Having gills—*Pisces.*	"	IV
Division C.—Heart of 1 cavity,—blood white and cold.		
Having antennæ, Undergoing transformation,—*Insecta.*	"	V
Having tentacula, No transformation,—*Vermes.*	"	VI

B.—Dawson.

Vertebrata.

Mammalia—Mammals.
Aves—Birds.
Reptilia—Reptiles.
Pisces—Fishes.

Articulata.

Arachnida—Spiders and Mites.
Insecta—Insects.
Crustacea—Lobsters, etc.
Annulata—Worms.

Mollusca.

Cephalopoda—Cuttle-fish.
Gasteropoda—Univalve Shells.
Lamellibranchiata—Bivalves.
Heterobranchiata—Tunicates.

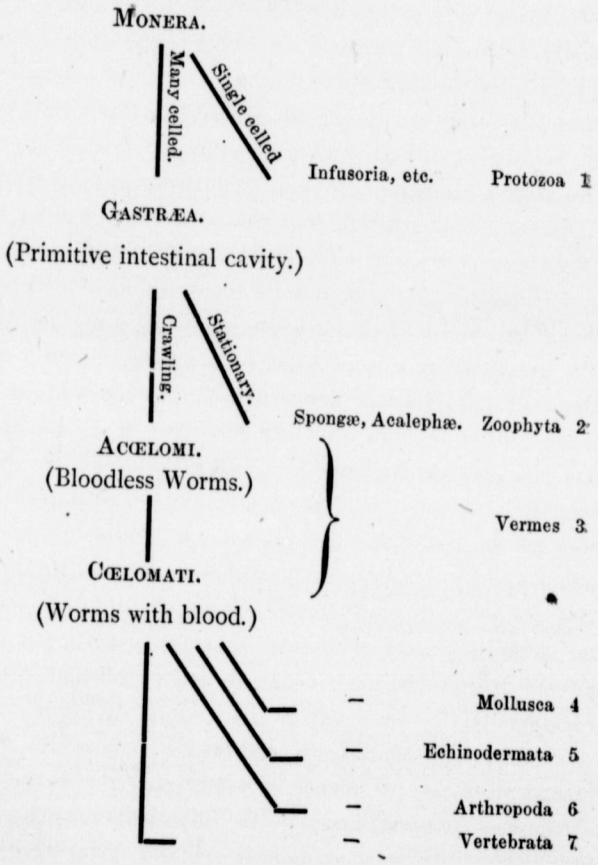
Radiata.

Echinodermata—Star-fishes.
Anthozoa—Coral animals.
Acalephæ—Jelly-fish.
Protozoa—Animalculæ, Sponges.

C.—Cuvier.

Vertebrata.	Articulata.
Mammalia.	Annelida.
Aves.	Crustacea.
Reptilia.	Arachnida.
Pisces.	Insecta.
Mollusca.	**Radiata.**
Cephalopoda.	Echinodermata.
Pteropoda.	Entozoa.
Gasteropoda.	Acalephæ.
Acephala.	Polypi.
Brachiopoda.	Infusoria.
Cirrhopoda.	

D.—After Haeckel.



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NOTES ON THE *FLORA OTTAWAENSIS*, WITH SPECIAL REFERENCE TO THE INTRODUCED PLANTS.

JAMES FLETCHER.

Read 20th December, 1883.

My object in preparing these notes for the Club is chiefly to explain certain points in the *Flora Ottawaensis* which might possibly be misleading to non-resident botanists.

In the drawing up of this list which was published in the first part of the Transactions there were one or two important omissions. The first of these was that there was no mention made of the limits of the locality in which the plants were collected. There is, no doubt, much room for difference of opinion as to what the limits of "this locality" should be, and it is possible that for useful work it would be better not to tie down all the branches to the same area; for instance, the extent of country which it is necessary for the Geologist to examine is far greater than that required by the Botanist, in forming a general idea of the Geology or Botany of a district, and the same may be said of the Ornithologist and Entomologist. It is not for me to make any suggestions here as to what should be the limits of any branch; nor is this a convenient time to discuss such a subject; but I will merely state that "this locality," as far as the compilation of the list of plants was concerned, has up to this time been understood to mean a distance of about 12 miles in any direction from the city, that is, about the distance a collector could travel on foot, when collecting, and return in one day. The extreme limits in different directions have included the country lying between Meech's Lake, in the Chelsea Mountains, on one side and the Mer Bleue on the other. Down the Ottawa river, East Templeton and Green's Creek have been included, and, up the river, Britannia and the islands above Aylmer. There is still a large amount of work to be done in working up the country comprised within these limits. Several districts have not been worked at all and others only visited occasionally.

Now, with regard to the list itself. A bare list of names gives no idea at all of the prevalence of any species in a locality, and this is one of the most important points the Botanist wants to know. Certain plants which are very common in some localities may be very rare here

and *vice versa*. Then again plants natives of this country, but not indigenous in this locality, occasionally get introduced either by accident or are originally brought here as ornamental plants. These should in some way be indicated as such, or students examining the lists will be deceived. We have now published four parts of Transactions, in all of which there are lists of plants; but only in the last has any of the above necessary information been given. I hope at some future day the Club may publish a full synoptical list of the plants of this locality, giving a short account of each in the same manner that Prof. Fowler did of the plants of New Brunswick; but in the meantime it has appeared to me that by clearing up the ground as far as we have gone, and drawing attention to some of the most interesting species mentioned in the list, useful work might be done, and that is my excuse for reading to you to-night what may be to many an uninteresting and dry paper.

First of all, I regret to say there are one or two names which have been placed on the list by mistake, of these mention must be made of *Amelanchier alnifolia*, *Aster longifolius*, *A novæ-angliæ*, *Vaccinium vacillans*, *Sporobolus heterolepis*, and also *Lychnis diurna*—for *Lychnis vespertina*.

There are also one or two concerning which some doubt exists. *Anemone multifida*, D.C. A single specimen of this plant was given to me by Dr. Small, in 1877, without any data. He told me afterwards that he believed it had been found near the Rifle Range; but as it has never been re-discovered since, the record is not certain. *Trifolium agrarium*, L. This name is considered by European botanists to be a synonym of *T. procumbens*, L. *var.* My reason for saying there is some doubt about this species is that, although Prof. Macoun only mentions two forms in his new catalogue, we have in Canada apparently three distinct forms, one like each of the European varieties, and this much more robust, erect and conspicuous species, of which I have found specimens two feet in height. It is not common, but has been found several times. However, it always has the appearance of an introduced plant, and it is just possible that the change in habit may be due to climate and soil.

Polygonum dumetorum, L'Her. From a very careful examination of the descriptions of *P. dumetorum* as well as of a large series of

specimens from different localities, I cannot satisfy myself that we have the type here, or even in Canada, at all. The variety *scandens*, Gray, has twice been found in this locality and is a much handsomer plant.

Œnothera chrysantha, Mx. I notice that Professor Macoun has included both this and *Œ. pumila*, L. in his catalogue. I have always been under the impression that these two were only varietal forms of one species dependent on the locality where they grew; *pumila* is found in wet spots by the sides of rivers or in low fields, *chrysantha* on gravelly banks and in drier places. During the past summer I havehad in flower in my garden a few specimens which varied so much in appearance although grown from seed taken from the same plant but which were placed under different circumstances, that I have not yet altered my opinion. If they really be distinct *chrysantha* must be added to the Flora Ottawaensis.

The study of the introduced plants of any locality has many very attractive features; there are so many fields for speculation, and yet, at the same time, with a little study, such a large proportion of the theories can be tested. "Introduced plants" as understood in the compilation of the Flora Ottawaensis, meant those plants which, when accidentally introduced, were able to survive and mature their seeds sufficiently for these seeds to again grow and complete their cycle of existence. Of course all conspicuous and showy garden flowers which are commonly cultivated for ornament, but which occasionally occur as garden escapes, were omitted. It is not always easy to determine when a plant should be included in such a list and when not, for it must be borne in mind that by far the larger number of garden flowers are not wild flowers improved by cultivation and so changed in appearance, but wild flowers from other parts of the world only slightly, if at all, altered by climate or the habitat they are placed in. There are a great many of our common wild flowers which are grown with the greatest care in Europe, as for instance the lovely little *Anemone Hepatica* which is the first to remind us of the return of spring, or the deliciously scented May-flower (*Epigœa repens*) which under the name of Trailing Arbutus is a favourite green-house plant, also the gorgeous Ladies' Slippers (Cypripedium) with many others of the curious orchid family; and even here,

we ourselves grow in our gardens plants from other parts of the Dominion, as the beautiful British Columbian shrubs, the flowering currant (*Ribes Sanguinea*) and Syringa, (*Philadelphus Lewisii*). These lovely shrubs, which are among the most conspicuous objects of our gardens, are found on every hillside west of the Cascades in British Columbia. From the same province, but considerably rarer, are two or three species of Rhododendron. These conspicuous plants, however, do not give the Botanist trouble, because their very beauty draws sufficient attention to them for their whole history to be known—the difficulty is with the inconspicuous plants, such as creep in uninvited and unawares among other seeds; in fact what we call weeds. But what is a weed? "The dictionaries tell us," says Dr. Gray (Am. Jl. Sc. 3 S. xviii, p. 161), "any useless or troublesome plant." "Every plant which grows in a field, other than that of which the seed has been (intentionally) sown," says the Penny Cyclopedia. The Treasury of Botany defines it "any plant which obtrusively occupies cultivated or dressed ground to the exclusion or injury of some particular crop intended to be grown. Thus even the most useful plants may become weeds if they appear out of their proper place. The term is sometimes applied to any insignificant-looking or unprofitable plants which grow profusely in a state of nature and also to any noxious or useless plant." Dr. Gray's own definition is "plants which tend to take prevalent possession of soil used for man's purposes irrespective of his will." Of course in our list of introduced plants those species are omitted which occupy ground in a state of nature, but which also as weeds conspicuously intrude into cultivated fields, as *Erigeron Canadense and Ambrosia artemisiæfolia* perhaps the most *weedy* looking plants we have. Some plants as *Trifolium repens* the white or Dutch clover, are truly useful when grown as crops, but a great nuisance when they occur as weeds. Here, as in most of the other parts of settled North America, a large proportion, in fact nearly all, of the aggressive weeds are immigrants from Europe, and it may not be amiss to consider shortly the reason of this, for it is rather remarkable that it should be the case. It is strange, too, that some which are a great nuisance here as weeds, in their own country are not at all plentiful, and the converse of this is also true; some species which in Europe are most irrepressible are here hardly able to secure a foothold,

but unluckily these are comparatively few, and it is a notable fact that, although so many species of our common aggressive weeds have come to us from Europe, very few from this side have held their own in the old world. A partial reason for this may be that up to this time much more seed has been brought here from Europe for farms and gardens than has been sent back from this side. Dr. Gray's theory, however, is probably the correct one, and it accounts for the large proportion of the European introduced plants becoming so objectionable here. He points out that, up to a quite recent date, our whole country was covered with forests, and consequently all the indigenous plants would be forest plants. It is apparent, therefore, that for this reason they would be unsuited to live in the open spaces when cleared. On the other hand the hardy European ragamuffins used to pick up a scanty living among flag-stones and upon rubbish heaps, would grow apace when introduced into our rich virgin soil, where there were no rivals to oppose them; thus it is merely a phase of the old story—the survival of the fittest. Of course this argument would also apply to seeds accidentally taken to Europe; they would be unable to survive without the constant supply of moisture in the atmosphere which, through many generations, they had been used to in their native forest. This leads us to another theory viz. : that one so ably advocated before the Royal Society of Canada, by Prof. Macoun, to the effect that the humidity of the atmosphere is the chief element which affects the distribution of the different species of plants. Prof. Claypole (Rep. 3, Mont. Hort. Soc.) argues very elaborately, and possibly with some reason, that the types of vegetation in Europe are of a more plastic nature than those of this continent, from having had, during a long period, to live under very varying circumstances, and to adapt themselves to many different changes of habitat. In support of this theory he points out that the fossil Floras of Europe and the American of to-day, are very closely allied. He cites some very remarkable instances of Tertiary and Miocene plants, almost identical with existing American forms, and infers that the type of vegetation which we have here now, once existed in Europe as well ; but from a lack of plasticity failed to survive. This theory may be partially true, but I think that the humidity of the atmosphere, namely the nature of the habitat, is the chief cause. If it were not the habitat which chiefly

affected the existence of introduced plants in any locality, one would suppose that it was due to some quality peculiar or characteristic of the seeds themselves; and this would be, possibly, the line of thought which the mind would naturally at first entertain. Upon examination, however, we are almost startled to find that all the wonderful appendages and beautiful contrivances for the distribution of seeds, such as the copious pappus of the Compositæ, the silk of the Epilobium and Asclepias, the spinous, and hooked seeds of the Borraginaceæ, the attractive esculent fruits and mucilaginous coverings of some seeds as well as the buoyant qualities of the seeds and seedpods of certain plants, have little or no effect on the general question at large of the distribution of genera and species of plants over the surface of the globe. It is not so much a question of getting a seed to a certain locality, but of its survival when brought there. DeCandolle has worked out this idea in a masterly manner, in his "Geographie Botanique," and shows from statistics that the inherent qualities of seeds and their receptacles only apply for their distribution in the localities or countries where the plants are indigenous. He draws attention to the fact that many of the plants which apparently have the most perfect contrivances for their transmission from one place to another have an exceedingly limited range, while others with no such appendages are much more widely distributed.

The following lists give all the introduced plants which up to the present time have been found in this locality. I am of opinion that the divisions proposed will be found convenient for the botanical student. List No. 1, Aggressive Weeds, gives the names of all those plants which are so well established as to require constant attention on the part of the husbandman to keep them in check. It will be noticed that some of the names are in italics, this is meant to denote that, although the plant is introduced, it is probable that it also existed here before that time as an indigenous plant. No. 2 embraces those plants, which, having been introduced, are gradually spreading over the locality, but are not yet sufficiently numerous to have become aggressive weeds. Of these the two Erodiums and Datura Tatula are interesting examples which were first grown here as Botanical specimens in 1881, but are now to be found in waste places all over the city.

No. 3 comprises those species, which, although well established and possibly spreading in a certain locality, are not able to spread far from that spot. Good examples of this class are found in *Rosa micrantha, Onopordon Acanthium* and *Daphne Mezereum*, which occur in single localities where there are plants, which are doubtless many years old, but which do not spread by their seeds any distance. No. 4 is made up of those plants which grow for a short time and then suddenly disappear altogether. Most of these have been introduced with seed, or have escaped from gardens; and many of them too have doubtless been introduced from Europe in seed imported as food for caged birds.

In this list the most interesting plants are *Solanum rostratum* and *Hordeum jubatum*, the former being a Colorado plant, and the latter a North Western, and both far out of their proper range. They are generally to be found in some of the streets of the city every year; but never regularly nor in the same place every year.

1. AGGRESSIVE WEEDS.

Ranunculus acris, L.
Sisymbrium officinale, Scop.
Brassica Sinapistrum, Boiss.
Capsella Bursa-pastoris, Mœnch.
Stellaria media, Smith.
Silene noctiflora, L.
Cerastium viscosum, L.
" vulgatum, L.
Portulaca oleracea, L.
Hypericum perforatum, L.
Malva rotundifolia, L.
Trifolium pratense, L.
" repens, L.
Medicago lupulina, L.
Anthemis Cotula, D. C.
Achillæa millefolium, L.
Leucanthemum vulgare, Lam.
Gnaphalium uliginosum, L.
Cirsium arvense, Scop.
" lanceolatum, Scop.
Lappa officinalis, All.
Cichorium Intybus, L.
Taraxacum Dens-Leonis, Desf.
Sonchus oleraceus, L.
" asper, Vill.
Plantago major, L.
Verbascum Thapsus, L.
Linaria vulgaris, Miller.
Nepeta Cataria, L.
Calamintha Clinopodium, Benth.
Galeopsis Tetrahit, L.
Leonurus Cardiaca, L.
Lithospermum officinale, L.
Echinospermum Lappula, Lehm.
Cynoglossum officinale, L.
Solanum nigrum, L.
Chenopodium album, L.
" hybridum, L.
Amarantus retroflexus, L.
" albus, L.
Polygonum aviculare, L.
" Persicaria, L.
" Convolvulus, L.
" *Hydropiper, L.*
Rumex Acetosella, L.
" crispus, L.
Cannabis sativa, L.
Poa compressa, L.
" *pratensis, L.*
Festuca ovina, L.
Triticum repens, L.

Panicum glabrum, Gaudin.
" *Crus-Galli, L.*
Setaria glauca, Beauv.
" viridis, Beauv.

2. WELL ESTABLISHED AND SPREADING.

Ranunculus repens, L.
Thlaspi arvense, L.
Nasturtium officinale, R. Br.
" *amphibium, R. Br.*
Barbaraea vulgaris, R. Br.
Silene inflata, Smith.
Lychnis Githago, Lam.
Saponaria officinalis, L.
Arenaria serpyllifolia, L.
Malva moschata, L.
Linum usitatissimum, L.
Erodium cicutarium, L'Her.
" moschatum.
Trifolium hybridum, L.
Melilotus alba, Lam.
" officinalis, Willd.
Vicia Cracca, L.
Pirus aucuparia.
Potentilla argentea, L.
Sedum acre, L.
Conium maculatum, L.
Pastinaca sativa, L.
Galium verum, L.
Echinocystis lobata, T. and G. (not indig. here).
Inula Helenium, L.
Artemisia vulgaris, L.
" biennis, Willd. (not indig. here).
Lampsana communis, L.
Sonchus arvensis, L.
Veronica arvensis, L.
Mentha piperita, L.
Echium vulgare, L.
Solanum Dulcamara, L.
Nicandra physaloides, Gærtin.
Datura Stramonium, L.
" Tatula, L.
Chenopodium urbicum, L.
Rumex obtusifolius, L.
Fagopyrum esculentum, Moench.
Euphorbia Helioscopia, L.
Phleum pratense, L.
Poa annua, L.
Bromus racemosus, L.
" secalinus, L.
Triticum caninum, L.
Panicum sanguinale, L.
Phalaris Canariensis, L.

3. WELL ESTABLISHED BUT NOT SPREADING.

Berberis vulgaris, L.
Chelidonium majus, L.
Nasturtium Armoracia, Fries.
Brassica Napi.
" alba.
" campestris, L.
Raphanus raphanistrum, L.
Silene armeria, L.
Lychnis vespertina, Smith.
Saponaria Vaccaria, L.
Malva crispa, L.
Trifolium arvense, L.
" procumbens, L.
Robinia Pseudacacia, L.
" viscosa, Vent.
Vicia sativa, L.
Negundo aceroides, Moench. (not indig. here).
Rosa micrantha, Smith.
Sedum Telephium, L.
Sherardia arvensis.
Sicyos angulatus, L. (not indig. here).
Daucus carota, L.
Helianthus tuberosus, L.
" annuus, L.
Rudbeckia hirta, L. (not indig. here).
Tanacetum vulgare, L.
Artemisia absinthium, L.
Onopordom Acanthium, L.
Tragopogon pratensis, L.
Campanula rapunculoides.
Plantago lanceolata, L.
" media, L.
Verbascum Blattaria, L.
Veronica agrestis, L.

Mentha viridis, L.
Hyssopus officinalis, L.
Nepeta Glechoma, Benth.
Symphytum officinalis, L.
Lycopsis, arvensis, L.
Convolvulus arvensis, L.
Hyoscyamus niger, L.
Nicotiana rustica, L.
Chenopodium Botrys, L.
" ambrosioides, L.
Daphne Mezereum.
Euphorbia Cyparissias, L.
Humulus Lupulus, L. (not indig. here).
Salix fragilis, L.
Populus alba, L.
" dilatata, Ait.
Asparagus officinalis, L.
Dactylis glomerata, L.
Eragrostis poæoides, Beauv.
Festuca elatior, L.
" pratensis, L.
Lolium perenne, L.
Setaria Italica, Kunth.

4. UNCERTAIN TENURE.

Papaver somniferum, L.
" Rhoeas, L.
Lepidium sativum, L.
Brassica nigra, Koch.
Camelina sativa, Crantz.
Spergula arvensis, L.
Malva sylvestris, L.
Abutilon Avicennae. Gaertn.
Hibiscus Trionum, L.
Vicia hirsuta, Koch.
" tetrasperma, Loisel.
Apium petroselinum, L.
Carum Carui, L.
Coriandrum sativum, L.
Bupleurum rotundifolium, L.
Ambrosia trifida (not indig. here).
Senecio vulgaris, L.
Centaurea Cyanus, L.
Tragopogon porrifolius, L.
Lysimachia nummularia, L.
Anagallis arvensis, L.
Satureia hortensis, L.
Calamintha nepeta, Link.
Lithospermum arvense, L.
Lamium amplexicaule, L.
Asperugo procumbens, L.
Solanum rostratum, Dunal.
Physalis Peruviana, L.
" Philadelphica, Lam.
" pubescens, L.
Blitum Bonus-Henricus, Reich.
Polygonum orientale, L.
Fagopyrum Tartaricum.
Urtica dioica, L.
Hordeum jubatum, L. (not indig. here).

THE SAND PLAINS AND CHANGES OF WATER-LEVEL OF THE UPPER OTTAWA.

E. Odlum, M.A. (Pembroke).

Read 7th January, 1884.

By the Upper Ottawa, in this paper, is meant that portion of it which extends from the head of Coulonge Lake, a little below the lower end of Allumette Island, to the entrance of Deep River, about seven miles above the head of the same island. This takes in a stretch of nearly forty miles, following the coast line. Enough, indeed, for one attempt—too much to be very minutely handled.

By a word picture we shall hurriedly outline the position and nature of this portion of the Ottawa Valley.

a. The town of Pembroke is situated on the south side of the Upper Allumette Lake, and about twenty miles from each end of this section. This town furnishes a good point of reference.

b. The Allumette extends throughout a great part of the locality under examination.

c. The Culbute flows on the north between Allumette Island and the Quebec shore.

d. The Upper and Lower Allumette lakes separate Allumette Island from Ontario on the south.

e. At the head of the island, westward about eight miles from Pembroke, are the Narrows, where the water flows in a swift current.

f. Eastward from Pembroke, about four miles, are three rapids almost parallel, and unnavigable. These are the Allumette, Lost Chenal and Beckett's. The last is farthest south, the first farthest north, and the Lost Chenal in the centre.

g. Morrison's Island lies between the two first mentioned, and Beckett's Island between the two last.

h. At the lower end of the Allumette are Paquette's Rapids, a series of swift, but not very dangerous, currents extending about four miles from Westmeath Village to the head of Coulonge Lake. From the foot of these rapids, the Ottawa, grand, placid and majestic, glides along, joined by the Culbute, into which the Black River enters from Quebec, a couple of miles from its mouth.

The beautiful Coulonge Lake lies spread out eastward from this point and is the eastern limit of our subject of study.

Turning our attention to the western limit, we may safely say that the scenery among the islands of the Paquette's, up the Culbute, around the Lost Chenal, through the Allumette lakes, Allumette Bay with its many islands, the Sturgeon Lake and entrance to Deep River, is as fine and enchanting as any to be seen in Canada east of the Rocky Mountains. Dr. Perkins, of Boston, accompanied the writer last summer in circumnavigating the Allumette, and passed through a large part of the district mentioned. This gentleman pronounced it as "grand and beautiful" as anything he had seen in Europe; and he had at that time travelled over most of the Continent. It has been the privilege of the writer to travel over and around our large lakes, through the prairies of the Northwest, the Thousand Islands of the St. Lawrence, the ten thousand islands of Lake Huron, to the head waters of the Ottawa, through the States of Michigan, Minnesota, Dakota and New York, over every tributary on the north shore of the mighty St. Lawrence from the head of Lake Superior to Montreal city; and, in all these glory-containing regions, the scenery of the Upper Ottawa is not surpassed and seldom equalled.

To locate more accurately we may notice that this district lies along latitude 45° 50′, longitude 76° 40′ to 77° 40′, Pembroke being 77° 10′. Height of the Upper Allumette above the sea level 400 feet. The Meteorological Station of Pembroke, under the charge of Mr. A. Thompson, is 423 feet above the sea level.

For the most part the important sand plains lie on the south side of the Ottawa. The ancient Laurentians skirt the north side of the river, scarcely retreating over a mile at any place. We may contrast the coast lines of the two provinces as follows: Ontario lies comparatively low, undulating, and quite unpretentious; but is well supported by ranges of hills farther south. Quebec, on the north, presents a rugged, massive, broken and barren appearance.

a. On the Ontario side, the Chalk River sand plain begins a little above Chalk River Station, twenty miles west of Pembroke, which town it almost reaches. There are a few broken range interruptions towards the lower end of this plain. These interruptions harmonize in

position with the rapids, and are parts of natural barriers between a higher level westward and a lower level eastward. At places may be noticed sand ridges. These lie between ancient mouths of rivers, some of which remain to this day, as the Indian, Muskrat, and Petawawa, while others are quite extinct. Following these sand ridges mentioned, or in the direction of the diverging rivers, we invariably come gradually to higher ridges of native rock. The Chalk River Plain wants only the grass to give us a beautiful and extensive tract of prairie land, but as it is wretchedly barren sand, nothing will grow on it to any extent except ferns, small pines and blueberries, the latter in great abundance.

b. Eastward from Pembroke the sand stretches struggle with the rising and rocky bases of distant hills which skirt the Ottawa from Westmeath in the direction of Renfrew town. At last the old hills with their stores of marble get the upper hand, and the sand tracts are terminated for a time.

c. Back from the Ottawa and between Pembroke and Renfrew there is another factor to be taken into consideration. This stretch of nearly forty miles, extending beyond our present limits, is variegated with sand, clay and irregular hills of rock. One low and very even clay bed contains over 1,000 acres of good and well cultivated land. Before passing to the Qnebec side of the river a few facts may be given which will afterwards form a groundwork of some explanatory remarks.

There are many small patches of sand varying from say ten acres to a few square yards. Most of these are easily understood. The operations which are forming the smaller are going on in the presence of the observer. The larger accumulations are met with *suddenly* after passing ridges of rock in the direction of the running water, while they *gradually* disappear as we approach the next range. Wherever there is a small sand patch there is an old but weather-worn ridge of rock close at hand. Nearly always the order is this: Hard massive rock, next large angular boulders of the same, then rolling stones, after which come pebbles, then coarse, followed by fine, sand. The first is always up stream, while the others range in regular order, ending with fine sand farthest down the current. Where there are clay beds mixed

with sand the rock ridges are generally farther away, and show a variation in their composition. Speaking carefully we may say that "clay is a soft earth which is plastic and may be moulded with the hands, consisting of alumina, to which it owes its plasticity, and also silica with water." Putting it chemically we get alumina (O_8 Al_{10}) silica ($Si\ O_2$) and water (H_2 O).

It results from the slow disintegration of one of the constituents of granite rocks, and when chemically pure is called alumina. The farther from the source of formation the purer is the clay, the nearer to its source the more sand is mixed up with it.

Lime, magnesia, oxide of iron and other ingredients are often present. The oxide of iron is a very common and abundant factor along the Ottawa Valley.

By careful examination the basins of ancient rivers can be easily followed, with their rapids and stretches of calm water. Even the small bays of olden times may be noted. The kinds, qualities and layers of sand must be our guide, always aided, of course, by the configuration of the immediate locality. Having referred to the qualities of sand and clay we shall now specify.

So far as soils are concerned they may be said to come from two kinds of rock, *granite* and *trap*. *Granites* consist of quartz, feldspar and mica, the latter generally an insignificant factor. Quartz is flint, or the silica of the chemist. When the granite hills and ridges are washed down by water the coarse quartz sand lies along the sides and at the immediate base of the hills, while the feldspar is ground to a fine tenacious clay and is carried forward into the valleys. Hence the soil in the flats of granite districts consists of a cold, stiff, wet and impervious clay which needs much manure, draining and labour to make it productive. The hillsides are almost useless, as they consist nearly altogether of quartz grit. Such are the Quebec slopes of the district we are now studying, but their valleys are too narrow, cramped and water hedged to give sufficient space for the sifting out of the feldspar from the quartz silt. Hence these narrow valleys are formed of ground-down feldspar and the finer quartz sand, the coarser being left along the mountain sides and close to their bases. It is on this account that the French *habitants* rejoice in their moderately fertile

fields. In some places the writer has noticed solid bodies of feldspathic clay, but always at a distance from the rock ranges. This clay is known to many under the appellation of *pipeclay*, and is finer in texture and more coherent than marl.

Trap rocks on the other hand, consist of feldspar and hornblende. From this we see that f ldspar is common to both granite and trap. Out of 100 parts of feldspar there are 65 parts of silica, 18 of alumina and 17 of potash and soda; while of 100 parts of hornblende there are 42 parts of silica, 14 of alumina, 12 of lime, 14 of magnesia, 14 of oxide of iron. A granite soil in addition to the silicious sand consists chiefly of silica, alumina and potash, derived from the feldspar. A trap soil, in addition to the silica, alumina and potash of the feldspar contains also much lime, magnesia and iron oxide, derived from its hornblende. Hence as a hornblende soil, or more comprehensively a trap soil, contains more of the inorganic substances most important to plant composition, it is more valuable because more productive than granite soil.

There are a few fine stretches of the former, but many of the latter, along the Upper Ottawa. Using this method of comparison, we must conclude that the Upper Ottawa region will never be a first class farming country; at the very best it can only expect to be considered middling.

But we must return to our line of general observation. Large tracts containing thousands of acres, like the Chalk River Plain, are difficult to explain. The student must travel to the mountains miles away, and take in the different ranges, their bearings and the various streams and rivers which have operated during the long ages of the past. In fact it is necessary to make out the differences of water level over vast areas and the causes of the changes in the water line.

It is remarkable to see how the terraced work of Morrison's Island fits into the lower system of terraces at the mouth of Black River, where it enters the Culbute. These points are about ten miles apart. The broad Chalk River Plain corresponds in its two levels with the two definitely marked steppes standing out on the Laurentians near the head of Coulonge Lake. These two points are at least thirty miles apart. They appear to have been formed during the same water level.

At one time, and probably within a thousand years, there was a grand and mighty lake in whose depths were hidden all the Chalk River Plain, the Pembroke district, Allumette Island, and thousands of the arable acres between Renfrew and Pembroke.

There were in fact two distinct periods, one of which represented a lake 200 feet deeper than the Upper Allumette, and the other 100 feet deeper. In passing down the Culbute, or emerging from among the islands of the Paquette's, the terraced ranges which remain as marks of old water levels show themselves quite prominently, and add much to the beauty, splendour and majesty of the scenery.

In tracing the various systems of change in the water coast line, the interest becomes intense as it is discovered, without doubt, that at one time there was a vast body of fresh water lying over the present Ottawa River, and extending in length over a hundred miles and in width from ten to thirty.

In climbing many old weather beaten and water washed rock ranges one can see clearly the holes, cauldrons and water scored channels of bygone days. At the head of Allumette Bay, into which an ancient river emptied, there are many markings left as guides for the future generations.

To aid the sceptic, who is naturally hard to convince, in understanding that the writer is not simply drawing on his imagination concerning this ancient lake with its far-reaching systems of rivers, most of which are now either wholly dried up or turned into other outlets than the Ottawa River; we shall ask him to add 200 or even 300 feet to the depth of water already indicated. In such case he will have before his vision a body of water as large or larger than Lake Superior itself.

During the summer of 1876 A. P. Coleman, Ph. D., at present Professor of Geology and Natural History in Victoria University, B. E. McKenzie, B.A., M.D., of Riverside, Toronto, F. Munson, B.Sc., and the writer had the pleasure of exploring the whole valley from Ottawa City to the head waters of the Ottawa River.

At the head of Lake Temiscamingue we noticed a magnificent range of fossiliferous limestone. It appeared to be perched on the top of the granite rock; but part of it reached into the waters of the lake

and was lost to view. We climbed to its top, 200 feet or more from the water level, and examined it very carefully. In richest profusion and in every direction fossils of many kinds were lying. Of course this alone proves the presence of an inland sea, or a continental ocean. But the point of present interest is the fact that in every direction the operations of water may be noticed. Now if there were grinding, wearing and boring operations of water, we conclude that these took place under the action of rushing rivers.

To anyone who has a knowledge of the configuration of the Ottawa Valley the above mentioned fact is enough to prove the presence of a vast inland sea which has passed through all the necessary changes in the direction of diminution and contraction in order to leave us our present beautiful river with its islands, lakes, rapids, narrows and variegated coastings.

On the Quebec side of the river there are several interesting patches of sand ranging from 50 to 300 acres in extent, and many smaller. The most important are at Fort William, the Chapeau and Lynch's Bay. With these may be included the lower half of Allumette Island. No observer need look long for the cause of these sand beds. Every step of the formation, which is still going on in some parts, may be seen at any time that the snow is off the ground. At one time there were small rivers at many of these places, which were among the ancient feeders of the great lake system of the Ottawa Valley. These are forever gone from the face of the earth.

The Chapeau district is important from the fact that there are two distinct and prominent water lines. One of these corresponds with the second steppe at the head of the Coulonge Lake, and also with the Chalk River Plain, which is the largest within the forty miles under consideration.

The average height of the lower of these two near Chapeau is about 20 feet, and of the upper about 120. Through the upper and almost on a level with the lower, a large creek or small river meanders from among the Laurentians, and quietly loses itself in the gently flowing Culbute.

The lower part of Allumette Island is a solid mass of sand, and is on the same general plain as the lower range at the Chapeau.

About four-fifths of the whole surface of the island and fully three-fourths of its entire length were formed by sand washed down from the mountains of Quebec, as were also many of the sand patches on the Ontario side.

Let us now look into the causes of these formations and changes. It may seem almost superfluous to make any special and minute references to the origin of these or any sand plains. But it will be of help to some if a few of the particulars are given.

Sand is finely ground rock. Mountain ranges are constantly worn down by the action of heat, frost, wind and rains of the ever-varying seasons.

It is instructive to watch closely all these agents as they do their work. Any day in the year, any hour in the day, the student may examine and learn much. To quote from notes of a trip through the mountains last July will aid us in this connection.

"We left our camp near the Chapeau, walked along the sand, among the beautiful pines on the lower level a little way back from the Culbute, and ascended the first height of 120 feet. The view thus gained was fine, and a very pleasing foretaste of what was to follow. Directing our steps towards the mountains about three miles distant, we crossed a beautiful river with wonderful embankments of sand over 100 feet high. Here we sat, observed and wondered. During perfect calmness of the air the sand kept sliding down in ten thousand almost imperceptible streams, and was hurried along by the swift waters of the river. This sand is forming a bed near and beyond the mouth of the river.

"At one place in this plateau valley there is a washout close to the point of observation. By a rough but sufficiently careful method of calculation we concluded that from 2,000,000 to 4,000,000 cubic feet of sand had been washed away from one small field. Rain begins to fall. The ascent is begun in earnest. The top of the highest peak must be reached. More than an hour is spent in climbing from crag to crag. At length we look down hundreds of feet below us on clouds and rainstorm.

"To stand on the Laurentians during a July rainstorm, and to take in all the strange and hazy grandeur, is one of the richest

treats of a lifetime. The heavens are cleared in patches, the sun shines through the rifts, the rain falls, and rainbow-tinted glory decorates the heavens. The sight is truly grand.

"In ascending these mountains we started from their resting places large and small stones, which rolled down hundreds of feet. Boulders when displaced bounded forth with tremendous force and crashed through the trees below with irresistible violence.

"Streams caused by the falling rain were hastening down the precipices and gorges, carrying with them myriads of shining sand grains. These if examined under the microscope would be found to be granules of mica, quartz, feldspar and hornblende. On the very summit could be seen the simplest formation of these streams. Many almost invisible streams, each formed by a few drops of rain, were uniting and forming minute currents of water following the inclines and slightest indentations of the rocks. On careful examination fine grains of sand could be detected even in the spreading-out rain drops and on the bare head of the hardest and smoothest gneiss rock. In descending we reached the converging points of the smaller streams, and finally the home of the torrents furiously leaping through the deep gorges, and issuing with terrific force to join 'the brimming river.' Here we noticed something more than sand. Pebbles and small sized stones were violently borne along and deposited in the less rapid water. These are covered by the sand and soon lost to sight, but aid in filling up the valley.

"In sunshine and calm we ascended the same peaks the next day. Along the top, at the very summit, we looked carefully to see if any sand grains were left. To our great astonishment, in every direction, we found sand in quantities varying from a cubic foot to a single grain.

"Our curiosity being aroused, we examined not only the top of the bare peak, but the tops of loose boulders, and even the upper edges of small sized stones. Strange but true, this next day after a drenching rainstorm, which finished up not suddenly but very gradually, and in the warm month of July, grains of sand were lying loose on every spot which was examined.

"Another similar rainstorm would wash these grains away, and their places in turn would be occupied at once by other sparkling points.

"On further observation we discovered a constant movement of exceedingly fine sand dust caused by the gentlest zephyrs. While descending we noticed several places where the sand was actually trickling down the crevices. Streams of sand, varying and spasmodically fluctuating, were constantly lessening the mass above and filling the hollows below.

"So far we have said but little concerning the cause of sand formation or rather rock wearing during summer weather. At any time during the warm summer months fine sand dust may be discerned even on clean-looking boulders by means of a small magnifier.

"The weather-beaten exterior of all rocks is more or less cracked and granulated. Numberless fine cracks ramify in all possible directions. Many of these are invisible to the naked eye. When the rain falls the water saturates the surface. After a little while the temperature rises. The expansion of the moisture in the cracks pries off many small grains of sand. In fact we are safe in saying that during the months of warm weather the contraction of the rock surface in the night, and the expansion consequent upon the heat of the following day, without any reference to dampness, wears away the rocks constantly."

When we remember that this section of the valley under consideration belongs to the oldest of all geological periods our interest must increase. Geologists have marked out over thirty geological divisions. Here, however, there is one, the oldest, the Archæan, of which Dana says: "There was first an age or division of time when there was no life on the globe; or if any existed this was true only in the later part of the age, and the life was probably of the very simplest kinds. The Archæan stands apart as preparatory to the age of invertebrates." Now in saying that this district belongs to only one geological period we do not mean that there has been no change during the many ages of the past. But we do mean that the rocks are Archæan with a base surrounding of their own refuse and ruins. Some would prefer to say that the first and last geological periods meet in this valley. Here the Aozoic stands out in majestic sublimity, looking down upon the only child of its many years. This could be called the Quaternary period, and, Minerva-like, came from the head rather than the loins of its pro-

genitor. Since the latter is nothing but the ground grit of the former, it is immaterial whether we say there is a blending of two periods, or the full age and chronicled history of the Archæan alone. This history may be epitomized as follows :

a. The earth's foundation rocks were formed during the first geological period.

b. In many parts of the world the earth building went forward.

c. Various courses of material, called stratifications, have been deposited upon these foundation stones.

d. Many parts of the old formation rock were never utilized for building purposes ; as the Laurentians of the Ottawa District.

e. As they were not built upon they were left unprotected.

f. The warring elements during many cycles of time have continued to grind these foundation stones to powder, which still lies at their base in the form of sand plains.

Passing forward to another part of this subject, we acknowledge frankly that there are serious difficulties staring us in the face. The changes of the water level are necessarily linked with the different sand plains. It is absolutely essential to have different kinds of measurements for our work, such as present water depths, mountain heights and water levels as compared with the sea. The length and breadth of rivers, lakes and plains are also needed.

Anyone knows that the acquisition of all these and many other measurements involve much labour, time and expense. Few earnest students of nature are blessed with all the requisites for accurate observation concerning much of vast importance. Besides, the time marks of the Ottawa Valley are very indistinct. Their language is scarcely known as yet, and is hard to master. One kind of measurement alone is left us, and that may give us some help when acquired and used. This is *space* and lineal measurement. We venture to express an ardent wish that before many years have passed away a tabulated list of careful observations and measurements may be obtainable. In this connection we deem it quite in place to suggest that the Government establish a meteorological station at the Chapeau, and also at DesJoachims. We think, moreover, that the weather gaugers at these stations should be required to give extensive and accurate lists of actual measurements of heights and distances.

In this paper it has been already assumed that at one time there was an extensive inland lake, which has gradually lessened till a few small lakes and river stretches alone remain. The cause of the diminution is easily seen. The water has worn down the channels at what were formerly rapids. When vast quantities of water rush annually over rock surfaces the river beds must be lowered. Observation will show that the rapids of the Upper Ottawa are natural barriers between an upper and a lower water level, and between the rapids there are even lakes or large river expansions. With a given quantity of water, a constant unit of time, and a homogeneous hardness of rock, the rate of lowering of channel must be regular unless the seasons, rains and freshets vary greatly. Even if all these were constant and regular at present, we would be unable to locate the time in the past when the mountains were 100 feet higher, or when any given river channel was 20 feet higher than now.

By an examination of the rocks we can easily perceive that the hardness varies. For example, the rock beds at the Narrows, a few miles west of Pembroke, are very hard, say seven degrees out of a possible ten. But the channel rocks of the Allumette Rapids at the opposite end of the lake from the Narrows, are only five degrees of hardness. These rocks are a fine sandstone compacted with a bluish or brown clay. The corroding action of the water tells readily upon the clay, and thus the sand grit is washed from the surface.

What do we learn from this simple fact? This: The space between the two rapids must be gradually drained of its water by the greater corrosion of the lower rapids. This means that the present Upper Allumette Lake is drying up, or draining off through the Allumette Rapids becoming lower.

This in turn means that the now navigable "Narrows" will in time become too steep and shallow for steamboats to pass. But the now unnavigable Allumette Rapids by that time will be navigable. These are changes going forward to-day, and will be facts of the future.

Again let us compare four parallel rapids, the Allumette, the Lost Chenal, Beckett's Chenal and the "High Water Portage," an old channel of the river, but now completely dry even during high water. The rocks of these four channels are all of different degrees of hardness.

The "High Water Portage" rocks are the hardest, Beckett's Chenal next, then the Lost Chenal, and lastly the Allumette.

After examining these different channels, their positions, their volumes of water and the whole basin, we find that the volumes of water vary in inverse order, beginning with the Allumette, the largest; which means that the oldest channel has least water (it has none now), while over the soft bed of the youngest the bulk of the Ottawa rushes with a constantly increasing effect.

My attention was attracted to the "High Water Portage" by the bare and dry water-eaten rocks. The channel is as easily traced as if carrying water. The rocks are extremely hard. Beckett's Chenal shows a softening in its bed, but the Lost Chenal is more marked in this respect: clayey sandstone beginning to show itself. But when the Allumette bed is examined the conclusion must be that this channel is destined to carry all the water of the Ottawa alone. Then there will be three old and dry channels. This is an inevitable result unless the present soft Allumette channel bed is thinly built upon a hard and more enduring foundation. By this particular comparison and conclusion we are now prepared to rise to a higher plane of study. In such a system of scattering mountains as the Laurentians there are and have been many rivers. These rivers have had many mountain barriers to overcome. They have passed over the lower parts, and cut their way through the softer ridges. At one time in the past a river has rushed wildly along through a rugged and adamantine channel. Now in the later ages of the world the same river lashes itself into fury as it passes through a channel 100 feet below.

Some beautiful and clearly outlined old channels of the Ottawa are easily seen not far below Aylmer.

The Paquette's Rapids at the head of the Coulonge Lake are composed of harder rock than the bed of the Allumette. The result will be that the Upper and Lower Allumette lakes will eventually form one navigable stretch, limited at the western extremity by the "Narrows," and at the eastern by the Paquette's.

At one time the ridges back from Westmeath *connected* with the ranges on the Quebec side of the river. Over these ridges the mighty Ottawa River Lake hurled itself into a vast abyss of seething waters at

least 200 feet below. From this fact, and also from many observations at scores of points westward along both shores and for hundreds of miles up the river we have concluded that there was once a mighty and expansive inland lake of fresh water, as previously stated.

In the interests of science and natural history this and other science associations should memorialize the Government to aid in accumulating vast stores of facts and observations. The present meteorological system is good, but needs extending and perfecting. More work needs to be performed. Not only should the general geology of Canada be studied on an extensive plan, but the ten thousand points of minutest details should be secured and placed within the reach of the earnest students of nature.

Mr. Wm. P. Anderson said he had, during the previous summer, seen the district described in Mr. Odlum's paper, and was then greatly impressed by its beautiful scenery and geological interest, and could now bear testimony to the fidelity of Mr. Odlum's graphic descriptions. He enlarged upon the nature of the sand flats at the mouth of the Petewawa and in the vicinity of Fort William, and described the granitic islands at the Narrows. He did not consider the evidence adduced by Mr. Odlum in favour of a much higher level of water by any means conclusive, as it was well known that changes of level were of constant occurrence, particularly near volcanic centres, which made it quite probable that the fossiliferous beds alluded to had been deposited at a much lower level, and raised when the Laurentians were subject to seismic disturbances; just as similar action was, even in the present day, insuring our planet against the fatal dead level so feared by Mr. Odlum.

He had also proved, by personal observation and measurements upon the sand hills of the Assiniboine Valley, that under certain conditions, the wind was so directed into currents by the inequalities of the ground as to actually drift sand up hill, and deposit it on the very tops of certain hills where different currents met and counteracted

each other, so that it was unsafe to infer that the tops of present sand hills had at some past time been beneath the surface of the waters.*

PROF. MACOUN drew attention to the effect of sand plains upon temperature and rain fall. He had frequently noticed on the great plains of the Northwest that clouds in passing over tracts destitute of vegetation, and consequently radiating much heat were rendered invisible and dispersed, but when carried over wooded regions, again appeared and were frequently precipitated in refreshing rains.

DR. MAY (Ontario Education Department) congratulated the members on the activity of the Club. He corroborated the statements of Prof. Macoun, and made special reference to the injury continually being done to the country by the reckless devastation of the forests, which were now known to be so necessary in equalizing the water supply.

DR. R. J. WICKSTEED stated that his own observations sustained the theory advanced by Mr. Odlum as to the extent of the country once covered by the Ottawa River, or rather by the chain of lakes or expansions, at one time connected by that river. In October last, while on a lecturing tour in aid of church missions, he had spent some days in that district. The line of travel from Westmeath to Rockingham does not deviate much from a due southwest course, or one at right angles to that of the present Ottawa River. The distance between these points is, as the crow flies, about 40 miles, but by the stage route 65 miles. At Westmeath, on the Lower Allumette Lake, (an expansion of the River Ottawa) there lies to the west, the large Allumette Island, (evidently an ancient sand bar or shoal) dividing the river into two parts. To the north, and distant about six miles is seen the high Quebec shore of the river. From Westmeath to Beachburg, seven miles, the soil is light sand, deposited by the mighty river once flowing

* Mr. Anderson appears inclined to think that his reference to "the Sand Hills of the Assiniboine Valley" is sufficient to throw some doubt on my explanation concerning the sand formations. Having travelled on foot over the Assiniboine sand hills, as well as the Ottawa plains, I may state there is a marked difference. Any person who wishes to examine closely will find that the Assiniboine hills are free of stone, boulders and drift, whereas the Ottawa sand plains are well dotted with all these, showing remains of pine roots, knots and branches, cedars and various other remnants of *floated* matter. But when hills of sand are formed by wind currents, boulders and other heavy material will be absent. (Note by Mr. Odlum.)

there. From Beachburg to Cobden, nine miles, the road descends into an old lake bottom, the lake represented by Musk Rat Lake, stiff clay soil and banks proclaiming this fact. The land rises abruptly from the lake to Cobden, and the soil becomes sandy again; but when about one mile from Cobden, the road dips again and proceeds on corduroy over clay lands and marsh bottoms, for about three miles. The line of road then commences to rise, and thence to Eganville and beyond to Rockingham the ascent is quick, and the country rugged, the habitat of those giants of the forest, the white pine and hemlock trees. His impression was that in very ancient times a mighty stream rushed over the country extending from the present Quebec shore of the Ottawa River to the neighbourhood of Eganville; and that the sand was deposited behind ripple bars formed by rocky prominences. The mud or silt was the deposite of two sluggish lake-like streams, now almost dried up and running no longer; the one represented by the Musk Rat Lake and River, and the other indicated by the Osceola River, running about three miles to the southwest of Musk Rat Lake.

Mr. W. H. Harrington having travelled up the Ottawa as far as Deux Rivières, and through the district described by Mr. Odlum was able to bear testimony to the very abundant evidences of former high water levels, as evidenced by the sand plains so well described and by the unmistakeably water-worn and sculptured rocks seen on all the portages, and along the banks of the river. In the water-scored rock bottoms of old rapids are frequently found conspicuous cylindrical holes, varying greatly in depth and diameter, which are undoubtedly due to ancient powerful currents, and which are popularly known as pot holes. These abound in the vicinity of Ottawa, at varying distances from the river, and at different elevations above its present level; sometimes forming natural wells of which settlers have availed themselves. At Deux Rivières is shown a notable one called "Noah's Churn" which is situated many feet above the river, in the rocks on the upper side of the "Devil's Portage." Although very symmetrical in shape, it is not of unusual size, being only about three and one-half feet in diameter and some eight or ten feet deep, the exact depth not being determinable on account of the hole being partially filled with earth. The name

indicates that local tradition does not in this instance sustain the view expressed by Mr. Odlum, that these high-water levels may have existed only a thousand years ago.

LIST OF FOSSILS FROM OTTAWA AND VICINITY.

HENRY M. AMI, B.A., SECOND ASSISTANT PALÆONTOLOGIST TO THE GEOLOGICAL SURVEY OF CANADA.

Read 7th January, 1884.

INTRODUCTION.

In order to bring together in as systematic and compact a form as possible the numerous species representing the fauna of the Palæozoic and other rocks about Ottawa—heretofore scattered in the various palæontological publications of the Geological Survey of Canada, and chiefly from the pen of the late Mr. E. Billings—it has been deemed advisable to catalogue the same.

The list is a purely local one, and is intended merely as a basis for future operations in this locality.

Valuable assistance was obtained from the elaborate collections made by officers of the survey during years past, especially those of the late Messrs. E. Billings and James Richardson. Only those species which are of local interest appear in the list. The number of these has been considerably increased by the subsequent researches of Messrs. T. C. Weston, Walter R. Billings and A. H. Foord, F.G.S., as also by the evidence obtained after five seasons' collecting in this locality by the writer.

The species are classed under the respective formations to which they belong.

It has been deemed neither requisite nor even advisable to refer the species and genera to sub-orders and families, seeing that at present so much diversity of opinion exists on the subject. Only the class under which the generic and specific names appear is mentioned, and will, no doubt, prove quite sufficient for all purposes.

There are included in the list 253 species as representing the fossil fauna and flora of our rocks. This number will evidently be swollen considerably by subsequent researches, as the measures are highly fossiliferous and the exposures extremely numerous.

Some species described and recorded by Billings and others, have been excluded from the list because the types are lost or misplaced—these it would be well to bear in mind as *desiderata*.

Several new species of Palæozoic Polyzoa, recently described by Mr. A. H. Foord, and published by the Geological Survey, are incorporated in the list.

The valuable catalogue of Palæozoic Fossils by Mr. S. A. Miller, of Cincinnati, Ohio, has been used to advantage.

CAMBRO-SILURIAN SYSTEM.

CHAZY FORMATION.

PROTOZOA.

Stromatocerium rugosum, Hall.

POLYZOA.

Prasopora Selwyni, Nicholson.

BRACHIOPODA.

Lingula Belli, Billings.
Orthis imperator, Billings.
Rhynchonella plena, Hall.

LAMELLIBRANCHIATA.

Cyrtodonta breviuscula, Billings.

GASTROPODA.

Pleurotomaria pauper, Billings.

ANNELIDA.

Serpulites dissolutus, Billings, or a very closely allied species.

CRUSTACEA.

Isotelus canalis, Conrad.
Leperditia Canadensis var. nana, Jones.

BIRD'S EYE AND BLACK RIVER FORMATION

PROTOZOA.

Receptaculites occidentalis, Salter.
Stromatocerium rugosum, Hall.

POLYPI.

Columnaria Halli, Nicholson.
Streptelasma profundum, Hall.
Tetradium fibratum, Safford.

BRACHIOPODA.

Rhynchonella increbescens, Hall.
Streptorhynchus filitextus, Hall.

LAMELLIBRANCHIATA.

Cyrtodonta subtruncata, Hall.

GASTROPODA.

Pleurotomaria subconica, Hall.

CEPHALOPODA.

Cyrtoceras falx, Billings.
" sinuatum, Billings.
" vagans, Billings.
Gonioceras anceps, Hall.
Oncoceras constrictum, Hall.
Orthoceras (Ormoceras) Bigsbyi, Stokes.
" bilineatum, Hall.
" decrescens, Billings.
" rapax, Billings.

CRUSTACEA.

Illænus Conradi, Billings.
" ovatus, Billings.
" Trentonensis, Emmons.
Leperditia gracilis? Jones.

TRENTON FORMATION.

PLANTÆ?

Buthotrephis gracilis, Hall.
Palæophycus obscurus, Billings.
Licrophycus minor, Billings.
" Ottawaensis, Billings.
" succulens, Hall.

PROTOZOA.

Astylospongia parvula, Billings.
Pasceolus globosus, Billings.
Receptaculites Iowensis, Billings.
" occidentalis, Salter.

POLYPI.

Diplograptus amplexicaulis? Hall.
Palæophyllum divaricans, Nicholson.
Petraia Ottawaensis, Billings.
Protarea vetusta, Hall.
Streptelasma corniculum, Hall.

CRINOIDEA.

Archæocrinus lacunosus, Billings.
" marginatus, Billings.
" microbasalis, Billings.
" pyriformis, Billings.
Calceocrinus articulosus, Billings sp.
" inæqualis, Billings sp.
Cleiocrinus magnificus, Billings.
" regius, Billings.
Dendrocrinus gregarius, Billings.
" humilis, Billings.
" proboscidiatus, Billings.
" rusticus, Billings.
" similis, Billings.
Glyptocrinus decadactylus, Hall.
" parvus, Hall.
" quinquepartitus, Billings.
" ramulosus, Billings.
Heterocrinus Canadensis, Billings.
" tenuis, Billings.
Hybocrinus conicus, Billings.
" tumidus, Billings.
Iocrinus subcrassus, Meek and Worthen.
Lecanocrinus elegans, Billings.
" lævis, Billings.
Palæocrinus angulatus, Billings.
" pulchellus, Billings.
" rhombiferus, Billings.
Porocrinus conicus, Billings.
Reteocrinus stellaris, Billings.

CYSTOIDEA.

Amygdalocystites florealis, Billings.
" " var. lævis, W. R. Billings.
" radiatus, Billings.
" tenuistriatus, Billings.
Ateleocystites Huxleyi, Billings.
Comarocystites punctatus, Billings.
Glyptocystites multiporus, Billings.
Lichenocrinus crateriformis, Hall.

Pleurocystites elegans, Billings.
" filitextus, Billings.
" robustus, Billings.
" squamosus, Billings.

ASTEROIDÆ.

Agelacrinites Billingsi, Chapman.
" Dicksoni, Billings.
Cyclocystoides Halli, Billings.
Edrioaster Bigsbyi, Billings.
Palasterina stellata, Billings.
Petraster rigidus, Billings.
Stenaster pulchellus, Billings.
" Salteri, Billings.
Tæniaster cylindricus, Billings.

POLYZOA.

Amplexopora discoidea, James sp.
Arthroclema pulchellum, Billings.
Batostoma Ottawaense, Foord.
Constellaria antheloidea, Hall.
" florida var. plana, Ulrich.
Diplotrypa regularis, Foord.
" Whiteavesii, Nicholson.
Heterotrypa solitaria, Ulrich.
Homotrypa similis, Foord.
Monotrypella Trentonensis, Nicholson.
Monticulipora Billingsi, Foord.
" parasitica, Ulrich.
" Westoni, Foord.
Prasopora affinis, Foord.
" oculata, Foord.
" Selwyni, Nicholson.
Ptilodictya falciformis, Nicholson.
" maculata, Ulrich.
" pavonia, d'Orbigny.
Retepora Trentonensis, Hall.
Spatiopora areolata, Foord.
Stictopora acuta, Hall.
" paupera, Ulrich.
Tetradium? Peachii, var. Canadense, Foord.

BRACHIOPODA.

Camerella hemiplicata, Hall.
" bisulcata, Emmons.
Discina Circe, Billings.
Leptæna sericea, Sowerby.
Lingula Philomela, Billings.

Orthis Iphigenia, Billings.
" Merope, Billings.
" subquadrata, Hall.
" testudinaria, Dalman.
" tricenaria, Conrad.
Platystrophia biforata, Schlotheim, var. lynx, Eichwald.
Rhynchonella increbescens, Hall.
" recurvirostra, Hall.
Orthisina Verneuili, Eichwald.
Streptorhynchus filitextus, Hall.
" planumbonus, Hall.
Strophomena alternata, Conrad.
" deltoidea, Conrad.
" recta, Conrad.
" Thalia, Billings.
Trematis Ottawaensis, Billings.

LAMELLIBRANCHIATA.

Ambonychia amygdalina, Billings.
Ctenodonta gibbosa, Hall.
" levata, Hall.
" nasuta, Hall.
Modiolopsis carinata, Billings.
" Gesneri, Billings.
Pterinea Trentonensis, Conrad.

PTEROPODA.

Conularia Trentonensis, Hall.

GASTROPODA.

Bellerophon bilobatus, Sowerby.
" sulcatinus, Emmons.
Cyclonema Montrealense, Billings.
Ecculiomphalus Trentonensis, Conrad.
Murchisonia bellicincta, Hall.
" gracilis, Hall.
" Milleri, Hall.
Ophileta Ottawaensis, Billings.
Pleurotomaria Daphne, Billings.
Subulites Richardsoni, Billings.
" subfusiformis, Billings.
Trochonema umbilicatum, Hall.

CEPHALOPODA.

Endoceras proteiforme, Hall.
Orthoceras amplicameratum, Hall.
" Ottawaense, Billings.
" Python, Billings.
" vulgatum, Billings.
" Xiphias, Billings.

ANNELIDA.

Conchicholites flexuosus, Hall.
Serpulites dissolutus, Billings.

CRUSTACEA.

Asaphus megistos, Locke.
" platycephalus, Stokes.
Bronteus lunatus, Billings.
Calymene senaria, Conrad.
Cheirurus pleurexanthemus, Green.
Dalmanites Achates, Billings.
" Bebryx, Billings.
" callicephalus, Green.
Encrinurus vigilans, Hall.
Harpes Dentoni, Billings.
" Ottawaensis, Billings.
Illænus Americanus, Billings.
" Milleri, Billings.

UTICA FORMATION.

HYDROZOA.

Didymograptus annectans, Walcott sp.
" flaccidus, Hall.
Diplograptus mucronatus? Hall.
" pristis? Hisinger.
" quadrimucronatus, Hall.
Sagenella ambigua, Walcott.

POLYZOA.

Stictopora acuta, Hall.

BRACHIOPODA.

Leptæna sericea, Sowerby.
Leptobolus insignis, Hall.
" occidentalis?, Hall.
Lingula Daphne, Billings.
" obtusa, Hall.
" Progne, Billings.
" quadrata, Eichwald.
Orthis testudinaria, Dalman.
Schizocrania filosa, Hall.
Siphonotreta Scotica, Davidson.
Strophomena alternata, Conrad.
Zygospira Headi, Billings.

LAMELLIBRANCHIATA.

Lyrodesma pulchellum, Hall.
Modiolopsis modiolaris, Hall.

Orthodesma parallelum, Hall.
Pterinea insueta, Conrad.
" Trentonensis, Conrad.

PTEROPODA.

Conularia Hudsonia, Emmons.
" Trentonensis, Hall.

GASTROPODA.

Bellerophon bilobatus, Sowerby.
Murchisonia Milleri, Hall.
Pleurotomaria subconica, Hall.
Trocholites ammonius, Conrad.

CEPHALOPODA.

Endoceras proteiforme, Hall.
" " var. tenuistriatum, Hall.
Orthoceras amplicameratum, Hall.
" coralliferum, Hall.
" lamellosum, Hall.

ANNELIDA.

Serpulites dissolutus, Billings.

CRUSTACEA.

Asaphus Canadensis, Chapman.
" platycephalus, Stokes.
Calymene senaria, Conrad.
Cheirurus pleurexanthemus, Green.
Triarthrus Becki, Green.
" glaber, Billings.
" spinosus, Billings.
Leperditia cylindrica, Hall.

POST-TERTIARY.

LEDA CLAY AND SAXICAVA SAND.

PLANTÆ.

Fucus sp.
Populus balsamifera, Linnæus.
Potamogeton sp.
Potentilla Canadensis, Linnæus.

LAMELLIBRANCHIATA.

Macoma fragilis, Fabricius.
Mytilus edulis, Linnæus.
Portlandia arctica, Gray.
Saxicava rugosa, Linnæus.

PISCES.

Cyclopterus lumpus, Linnæus.
Mallotus villosus, Cuvier.

CETACEA.

Phoca Grœnlandica.

ALLUVIUM (SHELL-MARL DEPOSIT.)

GASTROPODA.

Amnicola porata, Say.
Conulus fulvus, Draparnaud.
Hyalina arborea, Say.
" indentata, Say.
Limnæa desidiosa? Say.
" galbana, Binney.
" stagnalis, Linnæus.
Mesodon albolabris, Say.
" " var. dentifera, Binney.
" Sayii, Binney.
Patula alternata, Say.
Physa heterostropha, Say.
Planorbis bicarinatus, Say.
" campanulatus, Say.
" parvus, Say.
Valvata tricarinata, Say.

EDIBLE AND POISONOUS FUNGI.

PROF. JOHN MACOUN, M.A., F.L.S., F.R.S.C., BOTANIST TO THE GEOLOGICAL AND NATURAL HISTORY SURVEY OF CANADA.

Read 31st January 1884.

The title of my paper needs but little explanation, as I only apply it to those fungi which by common consent are admitted to be edible or suspicious or poisonous. These may be found in abundance in our woods and fields, or by our roadsides at various times during the summer.

I may say with truth that Canadian fungi are almost unknown as regards their numbers, their value as food or their injurious effects on the human system. It is therefore with some diffidence that I approach a subject which to me is less familiar than any other branch of

the vegetable kingdom, and which possibly to you may have no interest whatever. For myself, I entered on their study at the suggestion of my chief, Dr. Selwyn, Director of the Geological and Natural History Survey, and now, when I stand only at the portal of the vast unexplored region beyond, I ask your attention to a few of the facts already gleaned, and hope they may not be altogether without interest, and even profit.

At present the greater number of systematic botanists recognize five great divisions or classes in the vegetable kingdom, of which the fifth or lowest is named thallogens or thallophytes, because organisms of this class instead of growing upright expand into a thallus consisting of parenchyma alone, and never exhibiting a marked distinction into root, stem and foliage. All plants of this class are flowerless. This class includes five orders, viz.:

LICHENS.

FUNGI.

ALGÆ.

DESMIDIACEÆ, single cells of a green colour, found in fresh water.

DIATOMACEÆ, single cells of brown colour, and having silicious cell walls, found in sea and fresh water.

The plants in the first order, lichens, are never aquatic, but grow on bark of trees, earth or rock, and draw their nourishment from the air. Fungi, on the other hand, are parasitic, and live by appropriating the juices of living plants to their own use or the organized matter of dead and decaying animal or vegetable. Algæ are almost strictly aquatic, the greater number of them being seaweeds. You will note that these three orders, although quite closely related, are kept apart by their special modes of obtaining nourishment, and that the fungi always use prepared food even if by so doing they destroy that which man has laid up for himself. Those species which produce rust, smut, mildew and many other plant diseases are parasitic and prey exclusively on living plants, while mushrooms (agarics) and puff-balls live on dead and decaying matter.

As the purpose of this paper is not to give the classifications of the order, I shall pass at once to the section named the Agaricini, as it

is to this division that the greater number of the toadstools and mushrooms of our woods and fields belong, and to these I will at once direct your attention.

We mentioned that fungi had no flowers, and in this division as well as in all others they begin by the production of filamentous threads or attenuated cells which appear like the roots of the fungus which afterwards appears. These threads are called the mycelium, and are the true vegetation of the fungi. What are denominated fungi are therefore the *fruit* and not the *whole* plant, as many believe. Agarics or mushrooms are merely rounded tubercles which are formed on the mycelium below the surface. Some of these rapidly enlarge, burst through an outer covering (called the volva or wrapper), which is left at the base, thrust out a stalk or stipe bearing at its top a rounded body—the pileus, or cap. Underneath this cap are the lamellæ or gills that occupy the whole lower surface, and which consist of a series of plates which bear over their whole surface naked sporules, which on examination under a microscope will be found grouped in fours.

The drawing before you is that of the Fly Amanita (*Amanita muscaria*), one of the most beautiful and widely distributed as well as most dangerous and highly organized of our agarics. This species is commonly found in the depths of the forest, generally under firs or pines, and in the months of June and July is a very conspicuous object in the northern woods. Last June it was a lovely sight in the woods of Nova Scotia near Annapolis. The specimen before you, with many others, was obtained in Rideau Hall woods by Mrs. Chamberlin. In the North of England and Scottish Highlands it is a most lovely object in the dark fir woods, and its crimson pileus when lighted up by a sunbeam falling aslant through the thick foliage is a sight never to be forgotten.

In Northeastern Asia this species is a favourite drug to produce intoxication amongst the Russians and natives of Kamtschatka. The fungi are collected in the hottest month and hung up to dry. When taken to produce intoxication small pieces are rolled up and swallowed without chewing.

Our next drawing is that of the edible mushroom (*Agaricus campestris*), which is so well known that its praises need not be

recited. There are numerous varieties of it in fields and gardens and along our roadsides, but were its value as an article of food better known it would be extensively cultivated and largely take the place of meat on our tables, as it contains nearly as much nutrition, pound for pound, as our best beefsteak. At present only a few of its forms are gathered, and large quantities go to decay through ignorance of their value.

The next figure is a life-like representation of the tall cylindrical agaric (*Coprinus comatus*), which is another common and esculent species. In the latter part of last September this species was a very prominent object on many lawns in the western part of the city, growing in groups or singly, and often throwing up stems nearly a foot high. No one seemed to touch it, and bushels of them went to waste for want of collectors. This species is highly nutritious and quite as palatable as the mushroom, and is apparently better suited for catsup, as it contains a great deal of juice, and if allowed to become old soon melts away. In passing to decay, like all the genus (coprinus), it dissolves into a black fluid. Rhind says: "If this be collected and boiled with a little water, and a few cloves added to prevent it getting mouldy in keeping, and passed through a filter, it furnishes an excellent bistre for painting."

Numerous other species of agarics might be cited and dwelt upon, but time will not permit of anything but a passing notice, which I can best do by explaining these beautiful drawings furnished by "our artist," whom I am happy to see amongst us to-night.

(A collection of water colour paintings by Mrs. Chamberlin was here exhibited.)

Another section of this vast family is represented by the morel (*Morchella esculenta*), which differs from the agaric in having, in common with all the lower forms of fungi, their whole interior, though often of a very large size, filled with a multitude of *asci* (elongated sacs), enclosing single or double sporules such as are found in lichens. This fact has caused some late writers to claim a closer connection between fungi and lichens than I am able with my limited knowledge to perceive.

Our representative of the morel is before you, but those that are acquainted with the true species will observe that this form has an undulated, irregular, gyrose pileus, while the true species has an ovate pileus with firm ribs surrounding deep pits. In colour this species is browner, and as an article of food not so pleasant to the taste. This form is named *Gyromitra esculenta*, or the edible gyromitra, while the morel is named *Morchella esculenta*. Early in spring this species may be found in some profusion in most woods in the vicinity of the city, and was particularly abundant in the woods at the back of Rideau Hall last May and June. Besides these, I have gathered two species of helvella at Belleville, both of which are esculent. Closely related to these are the truffle family, which are of such economic importance in the South of Europe, but of which we have no representatives.

There is still another section which claims more than a passing notice. I mean the puff-balls. These forms, which are included in the genus lycoperdon, are, according to Professor Peck, all esculent when gathered young and cooked before the spores turn yellow. One species, *Lycoperdon giganteum*, grows to an enormous size, and specimens are on record which were over three feet in diameter. Professor Peck mentions one that was a little over eight feet in circumference and weighed 47 lbs.. He says it looked at a distance like a small boulder, and would make a meal for a good sized family. One writer recommends that when one of these large ones is found only a part of it should be taken —enough for a meal—and another part next day, and so on. In this way one of them might serve a family for a week. It is said that when the growing plant is wounded the wounds heal and are filled up with new tissue.

Another species, the cup-shaped puff-ball, is very abundant on our western prairies, forming great rings with the edible mushroom. In summer of 1879, when exploring on the plains northwest of Qu'Appelle, we came upon multitudes of this species, ranging in size from a man's fist to his head, and the same species was gathered in thousands north of the Cyprus Hills and west of Strong Current Creek. Mushrooms being in myriads, we did not eat many messes of puff-balls, for when a man ate a mallard and about half a peck of mushrooms at a sitting he had quite sufficient for one meal. * * * * *

Mr. FLETCHER was surprised to hear that the fly agaric, as figured before the meeting, was identical with the European species, which, instead of having the pileus of a yellowish brown colour, has one of a most intense scarlet. He mentioned as a curious fact that in Italy, where fungi form a large portion of the food, the State Inspector of Fungi condemns the *Agaricus campestris* as unwholesome on account of the large number of edible species superior to it.

Mrs. TRAILL, of Lakefield, Ont., so long known in Canada as a writer on natural history, expressed her pleasure at having had an opportunity of attending the meeting, and had collected in Central Ontario many of the species depicted in the plates shown.

LIST OF OTTAWA COLEOPTERA.

W. HAGUE HARRINGTON.

Read 14th February, 1884.

INTRODUCTION.

Having by request of the Council prepared for publication a list of Ottawa Coleoptera, it is almost imperative that it should be introduced by a brief paper, showing under what conditions it appears. Although it should only be considered as preparatory to a more extended and perfect list, to be issued when a fuller knowledge of our fauna has been gained, it will serve as a basis on which to build in the future, and may, I hope, be found not without a present value. The difficulties encountered in its preparation have been great, but the result brings with it a reward in that much necessary work has now been completed and that future progress will be the more readily made.

The classification followed in the list is that of Drs. LeConte and Horn, published last year by the Smithsonian Institute, and the arrangement of the families therefore differs from that of other Canadian lists. Under this classification the coleoptera of North America are divided into eighty-three families, of which we have represented so

far sixty-seven. The number of named species in my list is 926,* but more than 200 species are yet undetermined, so that the total number of species which have been taken is about 1,150.

Every possible precaution has been taken to guard against errors such as have unfortunately greatly lessened the value of some recent Canadian lists. A large proportion of my elateridæ, buprestidæ, cerambycidæ and chrysomelidæ were named for me by the late Dr. LeConte, and I am indebted to Mr. John B. Smith† for abundant help in the determination of species in other families. Without the assistance so generously given by these gentlemen it would indeed have been impossible for me yet to prepare my list.

The principal value of a local list, other than as a mere catalogue of a collection, is due to the information it affords as to the geographical distribution of species. The consideration of this question must, however, be postponed until it has received the careful attention it so richly deserves. Meanwhile I have made a rough general comparison of our fauna with such lists as I have in my possession, with a view to finding which groups are most fully, or most meagrely represented, and of gaining an idea as to the total number of species likely to occur here.

Six lists have been used in this comparison. First, a list published by Mr. Pettit (Can. Ent., vols. II and III), of 1,143 species taken at Grimsby, Ont. Second, a list by Messrs. Reinecke and Zesch of about 1,400 species captured in the vicinity of Buffalo. Third, a list published by Mr. Couper (Can. Sport. and Nat.) of 1,012 species recorded from the Province of Quebec. Fourth, a list by Messrs. Hubbard and Schwarz of 1,246 species recorded from the Lake Superior region. Fifth, a list by the same authors of 1,787 from the lower peninsula of Michigan. Sixth, one by Mr. Schwarz of 1,457 species captured in Florida. The three last were published in Vol. XVII of the Proceedings of the American Philosophical Society, and were very kindly sent to me by Dr. LeConte only a few weeks before his lamented death.

All these lists contain more species than that which I have prepared, but the reason in each case is not difficult to determine. Com-

* Increased by further determinations to 1,003.
† Now a corresponding member of the Club.

mencing with the Quebec list, it must be remembered that it is for the whole Province, and that it includes all species recorded therefrom. Nominally it contains 1,012 species, but many of the names are merely synonyms for, or varieties of, other species. The Lake Superior and Michigan lists include all species then known from these extensive districts, while that of Florida deals with a very large and varied country having a particularly rich flora and fauna. The only really local lists are those of Grimsby and Buffalo. I do not know how long Mr. Pettit collected at the former place, but from the extent of his list and from his reputation as a coleopterist it is probable that he was working for many years. The Buffalo list is the result, as stated by the authors, of the labour of seventeen years, during which period all their leisure hours were exclusively devoted to the accumulation and study of the species occurring in their vicinity.

Our Ottawa coleoptera have (with the exception of a few species secured at Club excursions) been collected within a radius of ten or twelve miles, and nearly all the species have been taken since the formation of the Club, or within the past six years. I am indebted to Mr. James Fletcher for a number of species, and to Mr. A. W. Hanham, a former member, for several, while a few specimens have been received from other members.

The few families to which special attention has been given in collecting are found by comparison with the above lists to be very well represented, but in many families the number of species is very small. Carabidæ, for instance, are represented in the Grimsby list by 156 species, Lake Superior 202, Michigan 204 and Buffalo 186, while we have as yet only 114. Again, the water-beetles—dytiscidæ, gyrinidæ and hydrophilidæ—are: Grimsby 80 species, Lake Superior 119, Michigan 104, Buffalo 77 and Ottawa only 65. As water beetles are apparently as numerous in these latitudes as they are farther south (the Florida list gives only 60 or 65 species), we should have very many more species on our list. If 119 species occur at Lake Superior, the fauna of which most closely resembles ours, there seems to be no reason why our list should not contain at least 100, when our rivers, lakes and other waters are examined with any degree of care.

Many other large groups have also been almost entirely neglected, and will yield, when properly investigated, many additional species. If there were a few more collectors the different localities could be properly examined, and the list of Ottawa species carried within a year or two to probably fifteen hundred, and eventually to fully two thousand.

Until more of my species are determined it would be almost useless to make any general comparison of our fauna with that of other districts, but I have tabulated three families in which the species are fully determined, with the following results. Of elateridæ we have more species than are enumerated in any of the previously mentioned lists, with the exception of the Quebec one, which has an equal number, viz., 89. The others have respectively, Grimsby 77, Lake Superior 82, Michigan 80, Buffalo 74, and Florida 52. Of the latter species only nine, or seventeen per cent., have occurred here. Three of these *(Alaus occulatus, A. myops* and *Melanotus communis)* are common to all the lists, while one *(Fornax badius)* is unrecorded in any of the others. Of Grimsby species we have 51, Lake Superior 51, Michigan 48, Buffalo 48, and Quebec 58, or sixty-five per cent. That our fauna is essentially a northern one is shown not only by the absence of the Florida species, but from the fact that of 40 species contained in a list of Green Mountain coleoptera (R. Hayward and H. Savage, Quart. Journal Boston Zoölogical Soc.) we have 29, or seventy-five per cent.

In buprestidæ the species enumerated are as follows: Ottawa 37, Grimsby 35, Lake Superior 30, Michigan (which alone exceeds Ottawa) 38, Quebec 28, Buffalo 34, and Florida 29. From the Green Mountains seven species are given, of which we have all. Of the species from the former localities we have from sixty to sixty-five per cent., except of the Florida species, only seven of which, or about twenty-four per cent., occur here. Of these seven species two are the common injurious insects known as the apple tree borer *(Chrysobothris femorata)* and the raspberry borer *(Agrilus ruficollis)*.

Of cerambycidæ there are in the Ottawa list 106 species, Grimsby 103, Lake Superior 78, Michigan 86, Buffalo 138, Quebec 111, and Florida 76. We have 60 per cent. of Buffalo species, 63 per cent. of Grimsby, 65 per cent. of Quebec, 68 per cent. of Michigan, and 73 per

cent. of Lake Superior, but only 13 per cent. or ten species of the Florida list. Of 32 Green Mountain species we have 24, or seventy-five per cent. Only two species are common to all the lists, viz., *Xylotrechus colonus* and *Urographis fasciatus*.

Adding together the three families we have just considered, the totals are: Ottawa 231 species, Florida 157, Lake Superior 190, Michigan 204, Grimsby 215, Quebec 228, and Buffalo 246, or fifteen more than Ottawa. This comparison clearly shows that, were all the other families fully worked up, our collections would be very largely increased.

Although my list contains many species not previously recorded from Canada, it is yet doubtful whether any species new to science have been captured. When Dr. LeConte was here last summer he took home with him a box of rare species and afterward sent me a partial list in which three new species† were indicated. Unfortunately these species, as well as the unnamed remainder, have been probably sorted into his vast collections, and are thus lost to us, although luckily not lost to science.

There are many rare and interesting species worthy of special mention, but for want of time such consideration must be deferred.

Species, one hundred and ten in number, marked with an asterisk (*), have apparently not been previously included in lists of Canadian coleoptera.

OTTAWA COLEOPTERA.

CICINDELIDÆ.

Cicindela longilabris, Say.
6-guttata, Fab.
purpurea, Oliv.
var. limbalis, Kl.
vulgaris, Say.
12-guttata, Dej.
repanda, Dej.

CARABIDÆ.

Omophron americanum, Dej.
Cychrus Lecontei, Dej.
Calosoma frigidum, Kirby.
calidum, Fabr.
Elaphrus Clairvillei, Kirby.
cicatricosus, Lec.
ruscarius, Say.
Blethisa quadricollis, Hald.
Dyschirius nigripes, Lec.
globulosus, Say.
hispidus, Lec.*
sp.
Clivina americana, Dej.*
Nomius pygmæus, Dej.

† Dr. Horn has since determined one of these to be *Malachius Ulkei*, Horn.

Bembidium inæquale, Say.
nitidum, Kirby.
americanum, Dej.
nigrum, Say.
planum, Hald.
bimaculatum, Kirby.
rupestre, Dej.
dorsale, Say.
intermedius, Kirby.
pictum, Lec.
4-maculatum, Linn.
several unnamed species.
Tachys flavicauda, Say.
nanus, Gyll.
incurvus, Say.
sp.
Patrobus longicornis, Say.
Pterostichus adoxus, Say.
dilligendus Chd.*
coracinus Newm.
stygicus, Say.
lucublandus, Say.
luctuosus, Dej.
corvinus, Dej.
mutus, Say.
orinomum, Leach.
erythopus, Dej.
femoralis, Kirby.
mandibularis, Kirby.
Lophoglossus scrutator, Lec.
Amara avida, Say.
exarata, Dej.*
angustata, Say.
impuncticolis, Say.
polita, Lec.*
obesa, Say.
Diplochila impressicollis, Dej.
Badister notatus, Hald.
pulchellus, Lec.
Calathus gregarius, Say.
impunctata, Say.
Platynus sinuatus, Dej.
extensicollis, Say.
decorus, Say.
anchomenoides, Rand.
melanarius, Dej.
propinquus, Gemm.*
cupripennis, Say.
var. nitidulum, Dej.
excavatus, Dej.
picticornis, Newm.
ruficornis, Lec.
lutulentus, Lec.
8-punctatus, Fabr.
placidus, Say.
obsoletus, Say.
quadripunctatus, Dej.
Olisthopus micans, Lec.
Anchus pusillus, Lec.
Lebia grandis, Hentz.
tricolor, Say.
viridis, Say.
pumila, Dej.
ornata, Say.
furcata, Lec.
Metabletus americanus, Dej.
Callida punctata, Lec.
Cymindis pilosa, Say.
borealis, Lec.*
Brachynus americanus, Lec.
perplexus, Dej.
medius, Harris.
alternans, Dej.
fumans, Fabr.
Chlænius tomentosus, Say.
niger, Rand.
impunctifrons, Say.
tricolor, Dej.
solitarius, Say.
sericeus, Forst.
Anomoglossus emarginatus, Say.
Brachylobus lithophilus, Say.
Agonoderus pallipes, Fabr.
partiarius, Say.
Harpalus erraticus, Say.
viridiæneus, Beauv.
caliginosus, Fabr.
pennsylvanicus, Dej.
herbivagus, Say.
laticeps, Lec.
basilaris, Kirby.
Stenolophus conjunctus, Say.
dissimilis, Dej.
ochropezus, Say.

carus, Lec.
Bradycellus vulpeculus, Say.
ruprestris, Say.
Anisodactylus rusticus, Dej.
nigrita, Dej.
discoideus, Dej.
baltimorensis, Say.
(*Xestonotus*) lugubris, Dej.
(*Amphasia*) interstitialis, Say.
(*Spongopus*) verticalis, Lec.

HALIPLIDÆ.

Haliplus triopsis, Say.
ruficollis, Dej.
Cnemidotus 12-punctatus, Say.

DYTISCIDÆ.

Laccophilus maculosus, Germ.
Hydroporus, inæqualis, Fabr.
hybridus, Aubé.*
affinis, Say.
rotundatus, Lec.
consimilis, Lec.
spurius, Lec.
modestus, Aubé
dichrous, Mels.*
americanus, Aubé?*
signatus, Mannh.
tristis, Payk.
notabilis, Sharp.*
sp. near persimilis, Cr.
three unnamed species.
Coptotomus interrogatus, Fabr.
Ilybiosoma bifarius, Kirby.
Agabus, sp.
aeneolus, Cr.
stagninus, Say.
punctulatus, Aubé.
Rhantus binotatus, Harris.
Colymbetes sculptilis, Harris.
longulus, Lec.
Dytiscus Harrisii, Kirby.
fasciventris, Say.
Cordieri, Aubé.
Acilius fraternus, Harris.

GYRINIDÆ.

Dineutes assimilis, Aubé.
Gyrinus borealis, Aubé.
two unnamed species.

HYDROPHILDÆ.

Helophorus lacustris, Lec.
obscurus, Lec. *var.**
lineatus, Say.
tuberculatus, Gyll.
Hydrochus rufipes, Mels.*
Hydraena pennsylvanica, Kiesw.
Hydrophilus glaber, Hb.
Ochthebius sp.
Hydrocharis obtusatus, Say.
Berosus striatus, Say.
Philhydrus cinctus, Say.
diffusus, Lec.
perplexus, Lec.
sp.
Hydrocombus lacustris, Lec.
rotundatus, Say.
Hydrobius fuscipes, Linn.
feminalis, Lec.*
subcupreus, Say.
Cercyon prætextatum, Say.
pygmæum, Ill.*
unipunctatum, Linn.
several unnamed species.
Cryptopleurum vagans, Lec.

SILPHIDÆ.

Necrophorus pustulata, Hersch.
orbicollis, Say.
tomentosa, Web.
Silpha surinamensis, Fab.
lapponica, Hb.
noveboracensis, Forst.
inæqualis, Fab.
americana, Linn.
Choleva terminans, Lec.
Prionochæta opaca, Lec.
Hydnobius, substriatus, Lec.*
Anisotoma punctostriatus, Kirby.

Liodes globosa, Lec.
geminata, Horn.*
sp.
Agathidium oniscoides, Beauv.
revolvens, Lec.
sp.

SCYDMÆNIDÆ.

Scydmænus fossiger, Lec.
basilis, Lec.
fatuus, Lec.
n. sp.

PSELAPHIDÆ.

Ctenistes piceus, Lec.
Tyrus humeralis, Aubé.
Pselaphus Erichsonii, Lec.
Tychus longipalpus, Lec.
Bryaxis conjuncta, Lec.
Brendelii, Horn.*
puncticollis, Lec.*
propinqua, Lec.
rubicunda, Aubé.
tomentosa, Lec.*
Decarthron abnorme, Lec.
formiceti, Lec.
Batrisus globosus, Lec.

STAPHYLINIDÆ.

Falagria venustula, Er.
Homalota lividipennis, Mann.
sp.
Tachyusa, species unnamed.
Aleochara lata, Grav.
gracilicornis, Fauvel, MSS.*
Oxypoda tenebrosa, Fauvel.
sp.
Gyrophæna corruscula, Er.*
Quedius molochinus, Grav.
sp.
Listotrophus cingulatus, Grav.
Creophilus maxillosus, Linn.
Staphilinus vulpinus, Nordm.
cinnamopterus Grav.
violaceus, Grav.
cæsareus, Cederh.
Ocypus ater, Grav.
Philonthus cyanipennis, Fabr.
aeneus, Rossi.
niger, Mels.*
debilis, Grav.
palliatus, Grav.
micans, Grav.
brunneus, Grav.
lætulus, Say.*
agilis (?)*
quadricollis, Fauvel MSS.
varicolor, Boh.
Xantholinus cephalus, Say.
hamatus, Say.
Diochus Schaumii, Kraatz.
Dianous cœrulescens, Gyll.*
Stenus juno, Fabr.
flavicornis, Er.
several unnamed species.
Euæstethus americanus, Er.
Cryptobium bicolor, Grav.
pallipes, Grav.
Lathrobium grande, Lec.
collare, Er.
rubripenne, Fauvel.*
Stilicus sp.
Lithocaris confluens, Say.
Pæderus littorarius, Er.
Sunius longiusculus, Mann.
Tachinus luridus, Er.
flavipennis, Dej.
Tachyporus jocosus, Say.
brunneus, Fabr.
Erchomus ventriculus, Er.
Conosoma crassum, Grav.
basale, Er.
Bolitobius niger, Grav.
cinctus Grav.
intrusus, Horn.
sp.
Bryoporus rufescens, Lec.
cribratus Fauvel.*
Mycetoporus lepidus, Grav.*
americanus, Er.
Oxyporus rufipennis, Lec.
femoralis, Grav.
Bledius semiferrugineus, Lec.

Trogophlœus nitellus, Fauvel.*
Geodromicus nigrita, Mull.*
Homalium sp.
Anthobium sp.
Micropeplus tesserula, Curt.

TRICHOPTERYGIDÆ.

Ptenidium evanescens, Msh.*
Nephanes læviusculus, Matth.*
Trichopteryx sp.

SCAPHIDIIDÆ.

Scaphidium 4-guttatum, Say.
Scaphisoma convexum, Say.
Taxidium gammaroides, Lec.

PHALACRIDÆ.

Phalacrus politus, Mels.
Olibrus consimilis, Msh.
sp.

CORYLOPHIDÆ.

Sacium lugubre, Lec.
sp.
Corylophus marginicollis, Lec.

COCCINELLIDÆ.

Megilla maculata, DeG.
Hippodamia 5-signata, Kirby.
convergens, Guér.
13-punctata, Linn.
parenthesis, Say.
Coccinella trifasciata, Linn.
9-notata, Herbst.
5-notata, Kirby.
monticola, Muls.
sanguinea, Linn.
Adalia frigida, Schn.
vipunctata, Linn.
Harmonia picta, Rand.
Anatis 15-punctata, Oliv.
Psyllobora 20-maculata, Say.
Chilocorus bivulnerus, Muls.
Brachyacantha ursina, Fabr.
var. 10-pustulata, Mels.
Hyperaspis signata, Oliv.
proba, Say.
bigeminata, Rand.*
undulata, Say.
Scymnus fraternus, Lec. ?*
hæmorrhous, Lec.
punctatus, Mels.
sp.

ENDOMYCHIDÆ.

Lycoperdina ferruginea, Lec.
Mycetina perpulchra, Newm.
vittata, Fabr.
Endomychus biguttatus, Say.

EROTYLIDÆ.

Languria gracilis, Newm, *var.*
Dacne 4-maculata, Say.
Megalodacne heros, Say.
Mycotretus pulchra, Say.
sanguinipennis, Say.
Triplax thoracica, Say.

COLYDIIDÆ.

Synchita fuliginosa, Mels.
Cicones marginalis, Mels.
Ditoma quadriguttata, Say.
Cerylon castaneum, Say.
Philothermus glabriculus, Lec.

CUCUJIDÆ.

Silvanus planatus, Germ.
bidentatus, Fabr.
Catogenus rufus, Fabr.
Cucujus clavipes, Fabr.
Pediacus fuscus, Er.
Læmophlœus biguttatus, Say.
convexulus, Lec.*
Dendrophagus glaber, Lec.
Brontes dubius, Fabr.

CRYPTOPHAGIDÆ.

Telmatophilus americanus, Lec.
Antherophagus ochraceus, Lec.
convexulus, Lec.
Paramecosoma serrata, Gyll.
Cryptophagus, sp.
Atomaria ephippiata, Zimm.
several unnamed species.

MYCETOPHAGIDÆ.

Mycetophagus punctatus, Say.
flexuosus, Say.
bipustulatus, Mels.
pluripunctatus, Lec.
obsoletus Mels.
sp.
Triphyllus humeralis, Kirby.
Litargus tetraspilotus, Lec.
Typhœa fumata, Linn.

DERMESTIDÆ.

Byturus unicolor, Say.
Dermestes nubilus, Say.
lardarius, Linn.
bicolor, Fabr.*
Attagenus megatoma, Fabr.
Anthrenus varius, Fabr.
musæorum, Linn.
Cryptorhopalum ruficorne.*
Orphilus ater, Er.
glabratus, Er.* *var.*

HISTERIDÆ.

Hister Harrisii, Kirby.
interruptus, Beauv.
abbreviatus, Fabr.
defectus, Lec.*
16-striatus, Say.
americanus, Payk.
exaratus, Lec.*
carolinus, Payk.
Lecontei, Mars.
parallelus, Say.
coarctatus, Lec.
cylindricus, Payk.
sp.
Saprinus fraternus, Say.
Teretrius americanus, Lec.

NITIDULIDÆ.

Brachypterus urticæ, Fabr.
Carpophilus niger, Say.
brachypterus, Say.
Colastus truncatus, Rand.
Epuræa æstiva, Linn.
rufa, Say.
truncatella, Mann.
sp.
Nitidula bipustulata, Fabr.
rufipes, Linn.
ziczac, Say.
Phenolia grossa, Fabr.
Omosita colon, Linn.
Ips fasciatus, Oliv.
var. 4-signatus, Say.
sanguinolentus, Oliv.
confluens, Say.
vittata, Say.
Rhizophagus remotus, Lec.

TROGOSITIDÆ.

Trogosita mauritanica, Linn.
dubia, Horn.
sp.
Peltis ferruginea, Linn.
Calitys scabra, Thunb.
Grynocharis 4-lineata, Mels.
Thymalus fulgidus, Er.

LATHRIDIIDÆ.

Stephostethus liratus, Lec.
Lathridius, species unnamed.
Corticaria pumilus, Mels.
species unnamed.

BYRRHIDÆ.

Clytilus varius, Fabr.
Byrrhus americanus, Lec.

Pettitii, Horn.
Syncalypta echinata, Lec.*
Limnichus punctatus, Lec.

PARNIDÆ.

Psephenus Lecontei, Hald.
Stenelmis vittipennis, Zimm.*

HETEROCERIDÆ.

Heterocerus mollinus, Kies.
two unnamed species.

DASCYLLIDÆ.

Ectopria nervosa, Mels. *var. thoracica*, Ziegl.
Prionocyphon discoideus, Say.
Scirtes orbiculatus, Fabr.*
tibialis, Guér.
Cyphon collaris, Guér.*
ruficollis, Say.
variabilis, Thunb.
obscurus, Guér.

ELATERIDÆ.

Tharops obliquus, Say.
Deltometopus amoenicornus, Say.
Dromœolus cylindricollis, Say.
Fornax badius, Mels.*
Hornii, Bv.*
orchesides, Newm.
Microrhagus imperfectus, Lec.
pectinatus, Lec.
triangularis, Say.
Hypocœlus frontosus, Say.*
Epiphanis cornutus, Esch.
Sarpedon scabrosus, Bv.*
Adolocera avita, Say.
aurorata, Say.
obtecta, Say.
brevicornis, Lec.
Alans occulatus, Linn.
myops, Fabr.
Cardiophorus amictus, Mels.
convexulus, Lec.
Cryptohypnus abbreviatus, Say
pectoralis, Say.
Elater nigricollis, Germ.
linteus, Say.
discoideus, Fabr.
semicinctus, Rand.
vitiosus, Lec.
apicatus, Say.
luctuosus, Lec.
impolitus, Mels.
nigricans, Germ.
var. pedalis, Germ.
var. fuscatus, Mels.
nigrinus, Payk.*
pullus, Germ.
mixtus, Hbst.
miniipennis, Lec.
sanguinipennis, Germ.
rubicus, Say.
obliquus, Say.
protervus, Lec.
Drasterius dorsalis, Say.
Megapenthes stigmosus, Lec.
Ludius abruptus, Say.
Agriotes mancus, Say.
fucosus, Lec.
stabilis, Lec.
limosus, Lec.
oblongicollis, Mels.*
Dolopius lateralis, Esch.
Betarmon bigeminatus, Rand.
Melanotus decumanus, Er.
scrobicollis, Lec. ?
fissilis, Say.
communis, Gyll.
parumpunctatus, Mels.
Limonius confusus, Lec.
aeger, Lec.*
sp.
aurifer, Lec.
Campylus denticornis, Kirby.
Pityobius anguinus, Lec.
Athous Brightwelli, Kirby.
acanthus, Say.
cucullatus, Say.
rufifrons, Rand.

discalceatus, Lec.
Sericosomus fusiformis, Lec.
incongruus, Lec.
viridanus, Say.
Corymbites virens, Schr.
vernalis, Hentz.
tesselatus, Linn.
resplendens, Esch.
cylindriformis, Hbst.
spinosus, Lec.
tarsalis, Mels.
sulcicollis, Say.
fallax, Say.*
medianus, Germ.
sulcatus (?)
triundulatus, Rand.
hamatus, Say.
hieroglyphicus, Say.
cruciatus, Linn.
aeripennis, Kirby.
splendens, Ziegl.
inflatus, Say.
Oxygonus obesus, Say.
Asaphes memnonius, Hbst.
var. brevicollis, Lec.
decoloratus, Say, *var. aereus*, Mels.

THROSCIDÆ.

Throscus constrictor, Say.
alienus, Bonv.

BUPRESTIDÆ.

Chalcophora virginiensis, Dr.
liberta, Germ.
fortis, Lec.
Dicerca prolongata, Lec.
divaricata, Say.
lurida, Fabr.
tenebrosa, Kirby.
chrysea, Mels.
lugubris, Lec.
Poecilonota cyanipes, Say.
Buprestis fasciata, Fabr.
var. sexplagiata, Lec.
consularis, Gory.
maculiventris, Say.
striata, Fabr.
Melanophila longipes, Say.
fulvoguttata, Harris.
Anthaxia viridicornis, Say.
viridifrons, Gory.
inornata, Rand.
Chrysobothris femorata, Fabr.
trinervia, Kirby.
dentipes, Germ.
pusilla, Lap.*
floricola, Gory.*
sexsignata, Say.
Harrisii, Hentz.
Agrilus ruficollis, Fabr.
fulgens, Lec.
otiosus, Say.
bilineatus, Web.
interruptus, Lec.
torpidus, Lec.
politus, Say.
egenus, Gory.
putillus, Say.*
sp.* (a)
Brachys ærosa, Mels.

LAMPYRIDÆ.

Calopteron reticulatum, Fabr.
var. apicale, Lec.
Celetes basalis, Lec.
Lopheros fraternus, Rand.
Eros thoracicus, Rand.
coccinatus, Say.
humeralis, Fabr.
Plateros modestus, Say.
caniculatus, Say.
Calochromus perfacetus, Say.
Lucidota atra, Fabr.
Ellychnia corrusca, Fabr.
Pyropyga nigricans, Say.
Pyractomena borealis, Rand.
Photinus ardens, Lec.

(a) Unknown to Dr. LeConte and not in Dr. Horn's collection.

Photuris pennsylvanica, DeG.
Podabrus nothoides, Lec. (?)*
tricostatus, Say.
rugosulus, Lec.
diadema, Fabr.
modestus, Say.
punctatus, Lec.
Telephorus carolinus, Fabr.
scitulus, Say.
rotundicollis, Say.
tuberculatus, Lec.
bilineatus, Say.
Silis percomis, Say.
Malthinus occipitalis, Lec. *var. difficilis*, Lec.

MALACHIDÆ.

Collops vittatus, Say.
tricolor, Say.
Malachius Ulkei, Horn.*
Anthocomus Erichsoni, Lec.
flavilabris, Say?
Attalus morulus, Lec.

CLERIDÆ.

Cymatodera inornata, Say.
Trichodes Nuttali, Kirby.
Clerus nigripes, Say.
thoracicus, Oliv.
Thanasimus trifasciatus, Say.
dubius, Fabr.
var. rubriventris, Lec.
Thaneroclerus sanguineus, Say.
Hydnocera humeralis, Say.
var. difficilis, Lec.
pallipennis, Say.
verticalis, Say.
Chariessa pilosa, Forst.
Laricobius rubidus, Lec.
Corynetes violaceus, Linn.

PTINIDÆ.

Ptinus fur, Linn.
Eucrada humeralis, Mels.
Oligomerus sericans, Mels.
Hadrobregmus carinatus, Say.
foveatus, Kirby.
Anobium notatum, Say.
Trypopitys sericeus, Say.
Xyletinus fucatus, Lec.
Hemiptychus punctatus, Lec.*
Cænocara oculata, Say.
Ptilinus thoracicus, Rand.
Endecatomus rugosus, Rand.
Bostrychus bicornis, Web.
Dinoderus porcatus, Lec.
substriatus, Payk.
punctatus, Say.*

CUPESIDÆ.

Cupes concolor, Westw.

CIOIDÆ.

Rhipidandrus parodoxus, Beauv.
Cis, species unnamed.

SPHINDIDÆ.

Sphindus americanus, Say.

LUCANIDÆ.

Dorcus parallelus, Lec.
Platycerus quercus, Weber.
depressus, Lec.
Ceruchus piceus, Weber.

SCARABÆIDÆ.

Onthophagus Hecate, Panz.
Atænius gracilis, Mels.
Dialytes striatulus, Say.
Aphodius fossor, Linn.
hyperboreus, Lec.*
fimetarius, Linn.
granarius, Linn.
ruricola, Mels.
vittatus, Say.
inquinatus, Fabr.

bicolor, Say.
Odontaeus cornigerus, Mels.
Geotrupes Egeriei, Germ.
Blackburnii, Fabr.
Trox porcatus, Say.
aequalis, Say.
scaber, Linn.
Hoplia trifasciata, Say.
Dichelonycha elongatula, Schön.
subvittata, Lec.
testacea, Kirby.
canadensis, Horn. (?)
albicollis, Burm.
Serica sericea, Ill.
vespertina, Schön.
Diplotaxis sordida, Say.
tristis, Kirby.
Lachnosterna fusca, Fröhl.
two unnamed species.
Ligyrus relictus, Say.
Xyloryctes satyrus, Fabr.
Osmoderma eremicola, Knoch.
scabra, Beauv.
Trichius affinis, Gory.

SPONDYLIDÆ.

Parandra brunnea, Fabr.

CERAMBYCIDÆ.

Orthosoma brunneum, Forst.
Tragasoma Harrisii, Lec.
Asemum moestum, Hald.
Criocephalus agrestis, Kirby.
Tetropium cinnamopterum, Kirby.
Gonocallus collaris, Kirby.
Dularius brevilineus, Say.
Hylotrupes ligneus, Fab.
Phymatodes dimidiatus, Kirby.
thoracicus, Muls.*
Merium proteus, Kirby.
Callidium janthinum, Lec.
antennatum, Newm.
aereum, Newm.*
Elaphidion villosum, Fabr.
parallelum, Newm.
incertum, Newm.
Obrium rubrum, Newm.
Callimoxys sanguinicollis, Oliv.
Molorchus bimaculatus, Say.
Purpuricenis humeralis, Fabr.
Cyllene robiniae, Forst.
Plagionotus speciosus, Say.
Calloides nobilis, Harr.
Arhopalus fulminans, Fabr.
Xylotrechus colonus, Fab.
sagittatus, Germ.
undulatus, Say.
Neoclytus capraea, Say.
muricatulus, Kirby.
erythocephalus, Fabr.
Clytanthus ruricola, Oliv.
Microclytus gazellula, Hald.*
Cyrtophorus verrucosus, Oliv.
Euderces picipes, Fabr.
Atimia confusa, Say.
Desmocerus palliatus, Forst.
Rhagium lineatum, Oliv.
Centrodera decolorata, Harr.
Toxotus Schaumii, Lec.
vittiger, Rand.
Pachyta monticola, Rand.
Anthophilax attenuatus, Hald.
Acmaeops proteus, Kirby.
pratensis, Laich.
Gaurotes cyanipennis, Say.
Bellamira scalaris, Say.
Typocerus velutinus, Oliv.
Leptura plebeja, Rand.
subhamata, Rand.
abdominalis, Hald. (?)* (b)
capitata, Newm.
zebra, Oliv.
saucia, Lec.*
sphaericollis, Say.
6-maculata, Lec.
nigrella, Say.
canadensis, Oliv.
chrysocoma, Kirby.
proxima, Say.

(b) Specimen retained by Dr. LeConte as "doubtful."

vittata, Oliv.
mutabilis, Newm.
pubera, Say.
Psenocerus supernotatus, Say.
Monohammus maculosus, Hald.*
scutellatus, Say.
confusor, Kirby.
marmoratus, Rand.
Dorcaschema nigrum, Say.
Goes pulverulentus, Hald.*
occulatus, Lec.
Acanthoderes decipiens, Hald.
Leptostylus aculifer, Say.
parvus, Lec.*
commixtus, Hald.
macula, Say.
Liopus variegatus, Hald.
alpha, Say.
punctatus, Hald.*
cinereus, Lec.
Lepturges symmetricus, Hald.
signatus, Lec.
querci, Fitch.
facetus, Say.
Hyperplatys aspersus, Say.
maculatus, Hald.
Urographis fasciatus, DeG.
Acanthocinus obsoletus, Oliv.
Hoplosia nubila, Lec.
Pogonocherus penicellatus, Lec.
mixtus, Hald.
Eupogonius tomentosus, Hald.
vestitus, Say.
subarmatus, Lec.
Saperda calcarata, Say.
mutica, Say.*
candida, Fabr.
vestita, Say.
discoidea, Fabr.
tridentata, Oliv.
lateralis, Fabr.
moesta, Lec.
concolor, Lec.
Oberea amabilis, Hald.
bimaculata, Oliv.
Tetraopes tetraophthalmus, Forst.

Donacia lucida, Lac.
proxima, Kirby.
subtilis, Kunze.
var. fulgens, Lec.
pubescens, Lec.*
emarginata, Kirby.
cuprea, Kirby, *var.*
aurifera, Lec.
jucunda, Lec.*
flavipes, Kirby.
acqualis, Kirby.
sp.
Hæmonia nigricornis, Kirby.
Orsodacna Childreni, Kirby.
Zeugophora abnormis, Lec.*
Syneta ferruginea, Germ.
Lema trilineata, Oliv.
Anomœa laticlavia, Forst.
Chlamys plicata, Fabr. *var.*
polycocca, Lec.
Cryptocephalus mammifer, Newm.
var. sellatus, Suffr.
var. pretiosus, Mels.
var. luteipennis, Mels.
badius, Suffr.*
4-maculatus, Say.
Schreibersii, Suffr.
Pachybrachys viduatus, Fab.
femoratus, Oliv.*
tridens, Mels.
litigiosus, Suffr. *var.*
Diachus auratus, Fabr.
catarius, Suffr.
Monachus saponatus, Fabr.
Xanthonia 10-notata, Say.
villosula, Mels.
Adoxis vitis, Linn.
Glyptoscelis pubescens, Fabr.
Chrysochus auratus, Fabr.
Tymnes tricolor, Fab.
Paria aterrima, Oliv.
6-notata, Say.
var. 4-notata, Say.
Graphops pubescens, Mels.
Colaspis punctipollis, Say.

Prasocuris Phellandrii, Ill.
varipes, Lec.
Doryphora clivicollis, Kirby.
10-lineata, Say.
Chrysomela elegans, Oliv.
multiguttis, Stal.
var. labyrinthica, Lec.
philadelphica, Linn.
var. spiræ, Say.
multipunctata, Say.
var. Bigsbyana, Kirby.
Plagiodera lapponica, Linn.
viridis, Mels.
Phyllodecta vulgatissima, Linn.
Phyllobrotica decorata, Say.
discoidea, Fabr.
Diabrotica 12-punctata, Fabr.
vittata, Fabr.
Trirhabda canadensis, Kirby.
Galeruca 6-vittata, Lec.*
rufosanguinea, Say.
decora, Say.
sp. near decora.
sagittariæ, Kirby.
Oedionychis vians, Ill.
quercus, Fabr.
Disonycha limbicollis, Lec.
alternata, Ill.
caroliniana, Fabr.*
glabrata, Fabr.
triangularis, Say.
collaris, Fabr.
Haltica bimarginata, Say.
chalybea, Ill.
ignita, Ill.
Crepidodera helxines, Linn.
cucumeris, Harr.
Orthaltica copalina, Fabr.
Systena *hudsonias*, Forst.
frontalis, Fabr.
marginalis, Ill.
Longitarsus testaceus, Lec.
sp.
Phyllotreta vittata, Fabr.
Dibolia aerea, Mels.
Psylliodes punctulata, Mels.
Odontota rubra, Web.
nervosa, Panz.
sp. (?)
Chelymorpha argus, Licht.
Coptocycla aurichalcea, Fabr.
guttata, Oliv.

Bruchidæ.

Bruchus pisi, Linn.
cruentatus, Horn.*
sp.

Tenebrionidæ.

Phellopsis obcordata, Kirby.
Nyctobates pennsylvanica, DeG.
Ipthimus opacus, Lec.
serratus, Mann.
Upis ceramboides, Linn.
Haplandrus concolor, Lec.
Xylopinus saperdioides, Oliv.
Tenebrio molitor, Linn.
tenebrioides, Beauv.
castaneus, Knoch. (?)
Blapstinus interruptus, Say.
Tribolium ferrugineum, Fabr.
madens, Charp.
Paratenetus punctatus, Sol.
two unnamed species.
Diaperis hydni, Fabr.
Hoplocephala bicornis, Oliv.
Platydema excavatum, Say.
flavipes, Fabr.
americanum, Lap.
Scaphidema aeneolum, Lec.
Hypophloeus parallelus, Mels.
Boletotherus bifurcus, Fabr.
Boletophagus corticola, Say.
depressus, Rand.
Strongylium terminatum.*

Cistelidæ.

Allecula nigrans, Mels.
Hymenorus pilosus, Mels.
niger, Mels.
Cistela brevis, Say.

sericea, Say.
Isomira 4-striata, Coup.
Mycetochares bicolor, Coup.
binotata, Say.
three unnamed species.
Capnochroa fuliginosa, Mels.
Androchirus fuscipes, Mels.

LAGRIIDÆ.

Arthomacra aenea, Say.

MELANDRYIDÆ.

Tetratoma truncorum, Lec.
Penthe obliquata, Fabr.
pimelia, Fabr.
Synchroa punctata, Newm.
Melandrya striata, Say.
Emmesa labiata, Say.
Phryganophilus collaris, Lec.
Xylita laevigata, Hellen.
Zilora hispida, Lec.
Enchodes sericea, Hald.
Serropalpus striatus, Hellen.
Hypulus simulator, Newm.
n. sp.
Scotochroa basalis, Lec.*
Dircæa liturata, Lec.
Symphora flavicollis, Hald.
rugosa, Hald.
Eustrophus bicolor, Fab.
bifasciatus, Say.
tomentosus, Say.
sp.
Hallomenus scapularis, Mels.
Orchesia castanea, Mels.
gracilis, Mels.
Canifa pallipes, Mels.
Stenotrachelus arctatus, Say.
Mycterus scaber, Hald.

PYTHIDÆ.

Crymodes discicollis, Lec.
Boros unicolor, Say.
Pytho niger, Kirby.

americanus, Kirby.
Salpingus virescens, Lec.
sp.

OEDEMERIDÆ.

Ditylus cœruleus, Rand.
Asclera ruficollis, Say.
puncticollis, Say.

CEPHALOIDÆ.

Cephaloon lepturides.

MORDELLIDÆ.

Anaspis flavipennis, Hald.
rufa, Say.
Tomoxia bidenta, Say.
Mordella borealis, Lec.
melaena, Lec.
scutellaris, Fabr.
marginata, Mels.
irrorata, Lec.*
Mordellistena trifasciata, Say.
limbalis, Mels.
scapularis, Say.
aspersa, Mels.*
comata, Lec.*
pectoralis, Lec.*
fuscipennis, Mels.
ambusta, Lec *var.**

ANTHICIDÆ.

Corphyra Newmani, Lec.
lugubris, Say.
fulvipes, Newm.
terminalis, Say.*
Notoxus anchora, Hentz.
sp.
Xylophilus fasciatus, Mels.
basalis, Lec.
two unnamed species.
Anthicus formicarius, Laf.
fulvipes, Laf.*
cinctus, Say.*
thoracicus Laf.*
two unnamed species.

PYROCHROIDÆ.

Pyrochroa flabellata, Fabr.
femoralis, Lec.
Schizotus cervicalis, Newm.
Dendroides canadensis, Latr.
concolor, Newm.

MELOIDÆ.

Meloe angusticollis, Say.
americanus, Leach.
n. sp.?
Macrobasis unicolor, Kirby.

RHIPIPHORIDÆ.

Pelecotoma flavipes, Mels.

RHINOMACERIDÆ.

Rhinomacer pilosus, Lec.

RHYNCHITIDÆ.

Rhynchites cyanellus, Lec.
æratus, Say.*

ATTELABIDÆ.

Attelabus rhois, Boh.

OTIORHYNCHIDÆ.

Phyxelis rigidus, Say.
Otiorhynchus ligneus, Oliv.
Scythropus elegans, Coup.

CURCULIONIDÆ.

Sitones flavescens, Marsh.
Trichalophus alternatus, Say.
Ithycerus noveboracensis, Forst.
Apion herculaneum, Smith.*
Walshii Smith.*
segnipes, Say.*
several unnamed species.
Phytonomus nigrirostris, Fabr.
Listronotus caudatus, Say.
Macrops solutus, Boh.
several unnamed species.
Pissodes strobi, Peck.
affinis, Rand.
Hylobius pales, Hbst.
var. stupidus, Boh.
Dorytomus mucidus, Say.
longulus, Lec.*
Grypidius equiseti, Fabr.*
Procas picipes, Steph.*
Tanysphyrus, lemnæ, Fabr.
Anchodemus angustatus, Lec.*
Otidocephalus Chevrolatii, Horn.*
Magdalis barbita, Say.
olyra, Hbst.
inconspicua, Horn.
armicollis, Say.
Anthonomus quadrigibbus, Say.
signatus, Say.
rubidus, Say.
suturalis, Lec.
musculus, Say.
sp. near disjunctus, Lec.
Orchestes niger, Horn.*
subhirtus, Horn.*
Elleschus ephippiata, Say.
bipunctatus, Linn.*
Gymnetron teter, Fabr.
Conotrachelus nenuphar, Hbst.
posticatus, Boh.
Pseudomus truncatus, Lec.*
Tyloderma æreum, Say.
Cryptorhynchus obliquefasciatus, Boh.
Acoptus suturalis, Lec.*
Mononychus vulpeculus, Fabr.
Centorhynchus dicipiens, Lec.*
Cœlogaster cretura, Hbst.
Madarus undulatus, Say.
Stethobaris tubulatus, Say.*
Balaninus rectus, Say.
nasicus, Say.

BRENTHIDÆ.

Eupsalis minuta, Drury.

CALANDRIDÆ.

Spenophorus pertinax, Oliv.
sculptilis, Uhler.
Dryopthorus corticalis, Say.
Cossonus platalea, Say.
Rhyncholus oregonensis, Horn.*
Stenoscelis brevis, Boh.

SCOLYTIDÆ.

Pityophthorus materiarius, Fitch.
puberulus, Lec.
sparsus, Lec.
Xyloterus retusus, Lec.
bivittatus, Hb.
Xyleborus cælatus, Eich.
Tomicus calligraphus, Germ.
pini, Say.
Hylesinus opaculus, Lec.
Phlœosinus dentatus, Say.
Dendroctonus terebrans, Oliv.
Hylastes cavernosus, Zimm.
Hylurgops, pinifex, Fitch.

ANTHRIBIDÆ.

Allandrus bifasciatus, Lec.
Hormiscus saltator, Lec.
Anthribus cornutus, Say.
Cratoparis lunatus, Fabr.

FAMILIES, 67; GENERA, 524; SPECIES, 1,003.

SUCTORIA.

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Read 14th February, 1884.

It would be almost a truism to say that we are indebted to Linnæus for first giving the fleas a systematic position in the animal kingdom. He ranked them under the genus pulex, and placed this genus, along with many other dissimilar ones it is true, in the order aptera, an order under the class insecta. Lamarck also placed them under the same order, and it was left for Latreille in 1805 A.D. to separate them under the name suctoria, though he afterwards abandoned it and adopted the name siphonaptera for these insects. In 1826 Kirby and Spence used the name aphaniptera for the same group, which is that ordinarily used in English books on entomology. In 1844 Gervais described all the species then known of the genus pulex, in a work by Walkeraer and Gervais on "Aptera," a work which is still the principal book of reference on all the so-called apterous insects. In 1867 Landois gave us a careful description of the anatomy of the dog-flea (*Pulex canis*). and in 1880 O. Taschenberg in an exhaustive paper redescribed all the species that were then known, and after a careful examination of those found on a number of different animals considered that, with the exception of ten described species which he had not seen, all could be referred to 24 species grouped under five genera.

The insect itself, as most of you are aware, is of a dark brown colour and from $\frac{1}{20}$ to $\frac{1}{5}$ in. in length, according to the species to which it belongs; is strongly compressed laterally, and possessed of powerful legs adapted for leaping. The head is relatively small, usually rounded on the upper side, and in most species more or less evenly curved from the neck to the point of insertion of the oral appendages. The hinder border of the head projects in two wing-like chitinous processes, which are inserted between the wings of the thorax, while at the same time the hinder border of the head overlaps the front of the thorax in its whole extent. This is noticeable, as it is very different from the arrangement

in the diptera, with which the fleas are usually allied. The head is divided into two nearly equal parts by the antennary groove, in front of which are placed the eyes (when these are present) and the oral appendages. The eyes are simple, and normally appear as dark brown or black spots close to the antennary groove and towards the lower side of the head. On the side of the head are seen several chitinous hairs, which from their position and size in different species form useful specific characters. These are used in assisting the insect to obtain a strong hold on the skin of its host.

The oral appendages are adapted for suction and consist of a pair of free plates and a tube made up of five separate pieces.

The free plates are the maxillae, and are usually triangular in outline and of a dark chitinous colour. Each maxilla bears at its base a four-jointed palps, the joints of which are of different lengths in the different species, and are partly covered with fine hairs. These are the organs which were by old observers taken for the antennæ.

The peculiar sucking tube is formed from the lower lip or labium, the mandibles and an impair piercing tube or lingua.

The labium is impair at its base, then bifurcates, dividing into two four-jointed palps, each of which is hollowed out on the inner side. On the upper side this palp is thick, but it thins out and becomes membraneous on the lower side, being in shape somewhat like the blade of a hollow ground razor. These two half tubes lie together and enclose the mandibles and the lingua.

The paired mandibles are long, narrow, longitudinally ribbed, and are also deeply excavated along the inner side, while the borders, except at the base, are strongly serrated, the teeth becoming more prominent towards the outer end.

In the tube formed by the mandibles, which are generally pressed close together, lies the suctorial organ, or lingua, in the form of a flattened needle, coarsely serrated on the upper border and traversed by a narrow canal, along which runs a very slender trachea or air-tube. At its hinder end it enlarges into a rounded sac before opening into the oesophagus. This organ is considered by some as representing the upper lip or labrum, but, on account of its mode of insertion rather

than from any developmental relations, we have considered it, on the authority of many entomologists, as homologous to the lingua in other insects.

After thus considering the oral appendages at considerable length for so short a paper, as they are the parts which render the order most annoying, if not to ourselves at all events to our domestic favourites, we must hasten on to describe some of the other parts in the anatomy of these insects.

The antennæ are hidden in the grooves which run obliquely backwards and downwards across the head, and it is but seldom, and then only in a few species, that we see them carried erect. Behind the groove on each side a row of small hairs is usually present. The antenna itself is composed of three segments, the third being divided by a number of transverse membraneous joints by means of which it can be lengthened and shortened at the pleasure of the insect. On the back of this segment can be seen in some species a number of small sacs which are probably auditory. Towards its base it contracts considerably to the point where it articulates with the second segment. A row of strong bristles is often present around the anterior end of this latter, standing like guards around the terminal segment.

The thorax is small and composed of three separate segments protected by a chitinous covering, each composed of a dorsal piece or notum, and two lateral pieces or pleurae, which latter are largely developed at the expense of the sternum. The pleurae are more or less freely joined to the notum, the anterior ones being thrown forward almost under the head. On the posterior borders of the pleurae of the two hinder segments of the thorax small scales are present, which by some entomologists are considered as rudimentary wings, though by others this homology is denied. The pronotum on its hinder border is often provided with a collar of bristles which from their different size and number serve as good characters for distinguishing the species.

The legs, which are attached to the pleurae of the three thoracic segments, are large, increasing in size from the first to the third pair, and adapted for leaping. The whole leg is, like the rest of the body, laterally compressed, and consists of five joints, viz., the very large coxa, the trochanter, the femur, the tibia, and the tarsus or foot, which

in its turn is divided into five joints and terminated by two strong claws. The relative length of these tarsal joints is usually used as a distinctive specific character.

The abdomen constitutes the largest part of the body, and is made up of nine segments, the greater number of which are covered by dorsal and ventral chitinous plates, which overlap those of the segment in front. The first segment, however, has a dorsal plate only; the second to the seventh are normally formed. The eighth segment has a somewhat peculiar shape, and differs in the two sexes. In the female the dorsal plate is largely developed at the expense of the ventral, the latter being very much reduced; while in the male the ventral plate is about equal in size to the dorsal. The pygidium or ninth and last segment, which is the smallest of all, is situated in a depression in the eighth, and is composed of three pieces, a dorsal and two ventrals. The former is oval in shape and surrounded by a chitinous ring which encloses 25–28 areoles, each of which bears in its centre a small stiff bristle. In the male this segment is thrown very much farther up on the dorsal surface than in the female.

Respiration is carried on through a system of tracheæ, which, open on the surface of the body in ten pairs of stigmata, two on each of the thoracic rings and the seven anterior segments of the abdomen.

The alimentary canal is composed of a short straight oesophagus opening into a cylindrical stomach, from which the food passes by a short intestine to the anus, situate below the ninth abdominal segment. Two salivary glands open by a single duct into the oesophagus, and four glands, which probably serve the purpose of a liver, open into the lower end of the stomach.

The eggs of the flea are small white oval bodies, which, when newly laid, on account of their viscous exterior, adhere to anything with which they may come in contact.

The larva is footless and made up of thirteen nearly equal segments, the anterior of which, the head, is hard, chitinous, and bears the antennæ and oral appendages, though eyes are absent. The oral appendages are composed of a pair of conical toothed mandibles, a pair of chitinous maxillae, with a two-jointed palp attached on each side, and an upper and lower lip. A small provisional organ, like that on the

bill of a chick, is also present, as a chitinous knob on the dorsal surface, for the purpose of breaking the shell of the egg. The second to the eleventh segments are each provided with a pair of lateral stigmata. The thirteenth segment is provided posteriorly with two strong spines, which are the principal organs of locomotion. The larva, after leading a very active life for a short time, spins a cocoon about it and passes into the pupa state. In this state of development the structure of the body corresponds to that of the adult insect, all the organs of manducation and locomotion being present. After remaining in the pupa state for about thirty days the insect emerges as the perfect imago.

Having taken more time than I had originally intended in describing the anatomy of these interesting parasites, a mere mention of a few of the more common and characteristic species must suffice.

Pulex (Sarcopsylla) penetrans.—the Chicoe or Jigger—is found in tropical countries. The female bores into the feet and ankles of men, and many of the domestic animals, and, the abdomen being distended as the ova undergo development, swells up to about the size of a pea, causing often very severe inflammation.

Pulex irritans is the flea usually found in filthy dwellings, the larva being in the dust and dirt on and around the floors. It is distinguished from others ordinarily met with by having no collar of bristles around the neck.

Pulex canis is found on dogs, cats., etc. It has a prominent collar around its neck and a row of bristles along the under side of the head.

Pulex fasciatus is found on the rat, mouse, etc. It has a row of bristles around the neck, but none on the lower side of the head.

Pulex (Typhlopsylla) assimilis is found on the mole, shrew, etc., and has been found by Mr. J. F, Whiteaves, of this city, on the chipmunk, *Tamias striatus*. The body is long and thin, the eyes are rudimentary, and there is a row of eighteen bristles around the neck.

ON THE OCCURRENCE OF PHOSPHATES IN NATURE

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Read 28th February, 1884.

In proposing to review, in so short a paper, as this must necessarily be, a subject so extensive as that indicated by the title, a difficult task has been undertaken, and I cannot hope to do more than touch upon its main points.

In the first place it may be proper to enquire why phosphate materials are now so much sought for as fertilizers.

It has been said laconically that "Phosphorus is life," but this like most bold generalizations is but a partial, and even misleading statement of the fact. Certain it is, however, that this element, variously combined, is present in all living tissues, whether vegetable or animal, and though in small quantity only, is absolutely essential to these tissues, and, therefore, to the manifestation of life. Animals, depending ultimately for their subsistence on plants, derive from these their supplies of phosphorus, together with the other substances necessary for their nutrition. Unlike the animal, the plant is capable of living, ultimately, on inorganic substances, and while deriving a large part of its food from the air, is absolutely dependent on the soil for those incombustible constituents which, when the plant is burnt, remain as ash. Without these the growth of the plant is impossible, and it is therefore necessary to ensure a sufficient supply of them in the soil. Phosphorus, in a state of combination, is one of these, and that to which I wish particularly to refer.

In following this substance from the soil to the plant, from the plant to the animal, and from the animal again to the soil, we find a system of circulation, which, under certain conditions, might go on indefinitely. In a state of nature, this cycle is generally complete, but it is interfered with and broken by the present organization of humanity, and more particularly by those arrangements which have resulted in the massing of population in large towns. In these it is found necessary to remove the effete and excrementitious matters by a system of

sewage, which results in draining the phosphates, and other substances valuable from an agricultural point of view, into the sea, where they may be considered as absolutely lost. Victor Hugo, in a well known passage, contrasts the wealth to be seen rolling through the streets of Paris to that which is silently but steadily flowing away by the sewers beneath, which he maintains is greater. Be this as it may, in this particular case there is a continuous process on a large scale in action, by which the land is deprived of its phosphates, and particularly in a country like this, which exports great quantities of food material, with their contained phosphates, to be consumed abroad.

Some years ago (1869) Mr. Gordon Brown calculated the amount of phosphorus actually contained in the grains annually shipped from the port of Montreal, estimating it for this purpose in the form of phosphoric acid. Wheat contains about $\frac{8}{10}$ (eight tenths) per cent. of phosphoric acid, or about 16 pounds to each ton, and as the total shipments of wheat amounted to 292,534 tons, the quantity of phosphoric acid sent away in it equalled 2,340 tons. Taking the average quantity of this substance contained in good soils, he found that this meant the total exhaustion to a depth of 12 inches—in so far as phosphates are concerned—of 70,320 acres, and would require the use of 5,850 tons of apatite of good quality as manure to maintain the fertility of the fields. Adding to this the amount of phosphoric acid contained in other grains exported he found the total loss in the year to be 2,574 tons of phosphoric acid, representing a value of over $500,000.

With such statistics in evidence it will not be necessary to enlarge further on the necessity of discovering a source of supply of phosphates for our fields, and for this we must have recourse to some specially concentrated natural deposits. What therefore is the nature of these, how have they been formed, and where do they occur?

In answering these questions, it must be remembered that soils have been produced by the decay and disintegration of rocks, and have derived their contained phosphates from the rocky crust of the earth. Good soils contain say about $\frac{2}{10}$ (two-tenths) per cent. of phosphoric acid, and on analysing rocks chemically or microscopically we find phosphates—generally calcic phosphate—present in them in similar small proportions.

In some crystalline rocks we find apatite, or crystalline calcic phosphate so abundant that it can easily be recognized under the microscope. It is needless to say, however, that the percentage of phosphate present in ordinary rock masses is quite too small to suit them to be used as fertilizers for exhausted soils. We must have recourse to some richer sources of supply, and the concentration of phosphates in nature is generally found to have been brought about by organic agency. Of these concentrated deposits of phosphatic matter we may first glance at those known as Guanos. These are essentially composed of excrements of sea birds. Extensive accumulations of this character can occur only in dry climates, for though formed wherever sea birds congregate in great numbers, the rainfall is usually sufficient to remove them before they reach important dimensions.

Guanos are naturally divided into two classes, though between the extremes of these there are many intermediate varieties. These classes have been named respectively nitrogenous and phosphatic Those of the first class occur in exceptionally dry climates, such as are found on the coast and adjacent islands of Peru, Bolivia and Chili, where rain seldom or never falls. In these the nitrogenous constituents of the organic matter—converted by decomposition into ammonia salts—remain as a part of the mass. In phosphate guanos, on the contrary, the rainfall has been sufficient to remove the whole or nearly the whole of the very soluble ammonia salts, while not enough to wash away the phosphatic material. Guanos of this class are of common occurrence in the West Indian islands, and in some of these in which the subjacent coral rock is penetrated by caverns, only such parts of the phosphatic accumulations are preserved as have been washed into these subterranean hollows through fissures, or have penetrated to them in solution through the porous coral rock.

In the Ardennes region of the south of France, phosphatic deposits occur which, in my opinion, are very similar in origin to those just alluded to. These, however, are very much older and in fact include fossils of Tertiary age, and so far as known, none of modern forms. They fill irregular cavernous fissures which traverse the surface of plateaus composed of Jurassic limestone, and it would appear that the higher parts of these plateaus have at one time formed an archipel-

ago of bird-frequented islands in a Tertiary Sea. The phosphate or phosphorite from these deposits is known commercially as *Bordeaux* phosphate—from its port of shipment—and though very irregular in its occurrence, is largely worked and exported.

Phosphatic deposits like these, however, directly referable to surface accumulations by sea birds, are as a rule quite modern. With rare local exceptions any which may have been found in the earlier geological periods have been washed away and lost; the very process of submersion, necessary as a preliminary step to the preservation by burial in the strata, causing their dissipation.

Most of the truly fossil phosphates found in connection with the older rocks have been formed in a quite different manner. To understand this we may examine first such modern deposits as the "Mussel Muds" of Prince Edward Island. These are accumulations produced in shallow tidal estuaries where great numbers of molluscs and other marine organisms are going to decay, so rich in phosphates and organic matter as to be of great value locally as a manure. Deposits more or less closely resembling these are found in many parts of the modern sea bottom and along the coast, and where just such deposits have been buried deeply, and included in some of the older formations, they produce what are known as "Coprolite beds." This term, however, it must be explained, is in general very loosely applied. It should be restricted to the fossil excrements of various animals, which are occasionally found in the rocks, and often in such beds as those just referred to, but seldom even then constitute more than a small part of the phosphatic matter, most of which usually occurs as concretions or nodules. These have resulted from that slow process of drawing together of like particles in the mass, which is usually designated concretionary action, but is not in all cases fully understood. A fragment of shell, or bone, or a tooth frequently serves as the nucleus of such a concretion, and when the material is abundant such concretions frequently coalesce and form almost continuous layers. The so-called *coprolite beds* of Cambridgeshire, Bedfordshire and other localities in England, and those of Carolina, in the Southern States, are of this nature.

The last named deposit dates no farther back than the Tertiary,

and consists of a layer, usually from six to fifteen inches in thickness charged with nodules of calcic phosphate and containing also bones, teeth and shells, the pores of which have been more or less completely filled with the same material. This deposit lies at no great depth below the surface, and is still nearly horizontal. In some places it is below high-water mark, and large quantities of the phosphatic nodules are obtained by dredging in some of the estuaries and channels which penetrate the low alluvial country. Where the nodule-bed occurs above the sea level it is worked by a system of trenching, the finer material being washed away on gratings, and the nodules then dried—generally by artificial heat—before being sent to the mill.

A long way farther back in time are the "Coprolite" beds of the south of England, which date in fact from the Cretaceous period. Where this deposit occurs at an inconsiderable depth below the surface, it is worked by a system of trenching similar to that employed in Carolina, the soil being carefully put to one side and subsequently restored, and the land again brought under tillage. As the deposits are thin, it does not pay to follow them to any great depth, but some years ago the annual product was as much as 25,000 tons.

These can be considered only as instances of the mode of occurrence of phosphatic materials in the geological series. Deposits more or less closely analogous to those described and sufficiently rich to work are found in a number of other localities, which we have not now time to consider. There is reason to believe that phosphatic or "coprolitic" nodular deposits have been found wherever the local conditions were favourable and large quantities of animal matter were in process of accumulation and decay, throughout the entire geological series. Going a great way back in geological history, we find instances of this in Canada in parts of the Chazy subdivision of the Silurian, in the graptolitic shales of the Quebec group, and even in the Cambrian rocks of St. John. It is true that none of these deposits are of importance from an economic point of view; for instances of workable deposits in these palæozoic rocks we must turn elsewhere. They are merely mentioned here for the purpose of connecting the occurrence of naturally concentrated phosphatic materials as found in the newer rocks, with the deposits of the same material found in the oldest known rocks—those of the Laurentian period.

In the Laurentian rocks—which are those characterizing the great country to the north of the Ottawa, and elsewhere very largely developed in Canada—we have a great volume of sediments, deposited in an ocean of vast antiquity, the earliest in fact of which we find any traces. These sediments which, no doubt, originally resembled in their main features those of later ages, have since been so completely metamorphosed that their materials have entered into new combinations among themselves and become entirely crystalline. While, therefore, still consisting of the *materials* originally deposited, they resemble them as little in appearance as do the crude ingredients of glass the finished product. There can, however, be no doubt of the original sedimentary origin of these Laurentian rocks, the change from muds and sands—and I would also include contemporaneous volcanic materials—to wholly crystalline rocks such as these, is seen in less metamorphosed formations in various parts of the earth's crust, and has been traced in all its stages. If, therefore, ordinary limestones were originally present in these old rocks, we would expect them now to have assumed a wholly crystalline character, and to appear as marbles. Contained beds of a peaty or coaly nature might be expected to pass into crystalline carbon or graphite, and phosphatic nodular or coprolitic layers could appear only as crystalline calcic phosphate or apatite. As a matter of fact we find all three of these substances in the Laurentian, and though the proof may not be absolute that their origin and appearance was at first the same as that of analogous materials in the newer rocks, the evidence is all in that direction.

The main facts in regard to the mode of occurrence of these deposits of apatite in Canada, so far as our knowledge goes, must be very briefly presented. Some of the beds in the Laurentian series are found to be comparatively rich in apatite, crystals and crystalline masses of this mineral being scattered through them. This is the case in some of the marbles, occasionally in the iron ores, and also particularly in connection with the pyroxenic rocks. In addition to these, in which the apatite may be considered as generally distributed, certain layers, apparently of the character of beds, occur, consisting of nearly pure apatite, or containing so large a proportion of the mineral as to pay for working. Still further, we find distinct veins and fissures which have

been filled with apatite by processes of segregation in which the mineral is found either nearly pure, or, more frequently, mingled with crystals of other substances.

Though the exportation of these Canadian deposits may, I believe, be considered as still in its infancy, it has already assumed considerable proportions. Quoting from an interesting paper read a few days ago by Dr. Sterry Hunt, before the American Institute of Mining Engineers, we find that the amount shipped from Montreal, in 1883, was 17,840 tons, of which a portion was delivered in Hamburg and Stockholm, but the greater part went to British ports. Of this amount 15,000 tons were from Quebec, the remainder from Ontario. It is estimated, according to Dr. Hunt, that the shipments during the present year will amount to 24,000 tons.

Besides the very wide spread of these apatite deposits and their great economic importance, one of the most striking facts so far developed is their great irregularity. Taking into consideration the extremely disturbed character of the Laurentian rocks, this is easily understood. Layers and veins which may, before the great folding and kneading together of these rocks, have possessed considerable regularity and uniformity, have been, as a consequence of the excessive disturbance, folded and dislocated in every sense, leading to the production of large pockets and irregular masses of apatite which may now be connected only by narrow and twisted seams, or may occupy what appear to be completely isolated positions.

This being the case, it may be asked : can a Geological Survey do anything to aid in the discovery of apatite and the development of this mining industry? Fortunately we are not quite without a clue in the matter. It has already been discovered (largely by Mr. Vennor's work) that certain broad zones of the Laurentian series, (in part already traced out and mapped,) contain most of the workable deposits of apatite, while extensive intervening belts of country show comparatively little apatite and offer little encouragement to the miner. These zones are pretty clearly recognizable by their composition and character, and though much has already been done in the matter of defining them, much more yet remains to do. They can, it would appear, be mapped down with a degree of certainty nearly as great as regions capable of

yielding good lumber, or lands suitable for farming can be defined by explorations with these particular ends in view. The further question involved in the utilization and working of special local deposits is also one requiring sagacity and special knowledge, but cannot be considered as within the province of a public survey. Like the enquiry as to how many feet of sawn lumber a given tree will afford, or how best to lay out a certain plot of a couple of hundred acres for farming purposes, this remains to be determined by the person who wishes to utilize these for his own pecuniary benefit.

Mr. J. Fraser Torrance being called upon, at the suggestion of the lecturer, explained that the heaviest deposits of phosphate in the County of Ottawa lie along the valley of the Lièvres. As you move either eastwards or westwards from this river, the deposits usually become more and more intermixed with calcite, until they finally cease to be profitably workable. The methods of mining employed are of the rudest and most elementary kind. The only hoisting and pumping machinery employed (with very rare exceptions) is a tub on the end of a rope swung over the pit by a derrick worked with one horse. The pits are almost all quite as wide at the mouth as below and are well calculated to collect all the surface water, snow, etc. The managers have evidently adopted the maxim of Louis XV: "After me the deluge." Deeper sinking will be attended with great difficulty on account of the quantity of water collected in these shallow pits.

Almost all of the pits visited by him were neither veins nor beds, but irregular segregations from the surrounding rock. In most cases it was hard to tell where to draw the line between the ore and the waste rock.

One reason why so little apatite was converted into superphosphate in Canada he believed to be the reckless manner in which the materials were mixed and branded *in former days* by the company at Brockville. The farmers had no guarantee that any two barrels of the same brand would be of even approximately equal value for their lands. He hoped these errors had all been corrected since his visit to Brockville years ago. The Ontario Agricultural College at Guelph is doing good service in convincing farmers of the practical value of such fertilizers.

Although we exported 19,000 tons of apatite last year, almost every ton of it was shipped to Great Britain and Europe. The quantity sent to the United States was trifling. This was the more remarkable as a large amount of American capital is invested in our Canadian apatite deposits. From the statistics supplied to him by Mr. Nimmo at Washington, it appeared that in the year ending 30th June, 1883, the United States imported 49,381 tons of crude phosphate, valued at $429,391; 39,119 tons of Kainit, valued at $246,231, and 7,666 tons of superphosphate, valued at $120,576. Of this quantity, 1,262 tons of crude phosphate and all the superphosphate came from Britain. It thus seems reasonable to infer that some of our Canadian apatite was merely reshipped to the United States from Great Britain without any fresh treatment there, while a much larger quantity was first converted into superphosphate there and shipped in that form to the United States.

The only explanation of this anomaly seemed to be that it was a fresh proof of the conservative nature of trade. The American dealers were in the habit of importing from Britain long before our Canadian deposits of apatite were opened. When these were first opened it was done by men more familiar with the English market than the American. It was less "bother" to ship from Montreal to the Mersey or to Bristol, than to load barges there for New York. After the trade was once established no determined effort seems to have been made to direct it into fresh channels.

It was worth while to notice also in this connection that, although plumbago to the value of $361,949 was imported into the United States last year, not one pound of it came from Canada. The lack of skill or reckless folly of our miners in shipping inferior stuff to gain a temporary profit has given Canadian plumbago a bad name that it may be almost impossible to overcome. Mr. Hoffmann's admirable report showed that it was really quite as good as that from Ceylon.

Mr. F. D. Adams stated that in the Transactions of the Geological Society of Stockholm for April, 1883, H. Sjögren had given a very interesting account of the apatite deposits at Oedegarden in Bamle, Norway. At this one locality alone, in 1882, between 700 and 800 men were employed in mining the apatite, and about 15,000 tons were

raised. The rocks of the district are quartzites overlain by mica-schists, hornblende schists, gabbos and dipyr-diorites, which pass into one another. The apatite veins occur only in the gabbo and dipyr-diorite, or in the immediate vicinity of these rocks, which, although contemporaneous with the other schists, are considered to have probably had an eruptive origin. He believed the apatite to have been derived from the gabbo and dipyr-diorite, and deposited by water in clefts caused by the contraction of the rock on cooling. The apatite deposits of Norway and Canada being so like one another in many respects, it might be supposed that when such a constant relation between the apatite and gabbo was found to exist in the former country, a similar relation would obtain in the latter, but this was apparently not the case. The dipyr-diorite had, however, lately been recognized by him among a collection of rock fragments, from the vicinity of Arnprior, sent to the Survey for examination, and a description of it would shortly be published.

THE DEER OF THE OTTAWA VALLEY.

W. P. Lett.

Read 13th March, 1884.

The moose (*Alce Americanus*, Jardine, considered by many naturalists to be identical with *Alce malchis*, Linnæus, of the old world) or American elk, is the largest of all deer now existing in the world, although much inferior in size to the ancient Irish elk, which must have been an animal of gigantic proportions, if we are to judge by the size and weight of the ponderous antlers occasionally found in the bogs of Ireland many feet beneath the surface. Some specimens of these great horns have been exhumed, with a spread of twelve feet, which will give some idea of the magnitude of the animal which carried them. The American moose, according to the conclusions of all scientific naturalists, is a true elk, identical with the ancient Irish elk, the Scandinavian and the Asiatic elk. A moose of the largest size, when fat, will weigh upwards of fifteen hundred pounds. A bull moose of this description is as tall as the largest horse. The body and neck, for so tall an animal, are short and stout, the neck so much so that the animal cannot touch the ground with his lips, without kneeling. The neck is covered with a thick mass of coarse bristly hair, rising on the crest into a stiff mane, which, when the animal is irritated, stands on end like the mane of a lion, and imparts to the infuriated beast a frightful and most formidable aspect. The legs are long and bony, and, although ungainly in appearance, are are as clean cut and compact as the limbs of a racer. The head is enormously large, and altogether deficient in the fine points of grace and beauty peculiar to nearly all the other branches of the deer family. The fleshy part of the upper jaw terminates in a long flexible upper lip with prehensile powers, used by the animal for the purpose of catching the twigs and branches on which it feeds. The nostrils are long and wide, and the eyes are somewhat small in proportion to the bulky head. The hoofs are large and shaped like those of the common deer. The colour of the hair in the summer coat is nearly black, particularly about the head, back and belly. At this season the hair is short and glossy. In winter the animal is covered with long coarse hair of a brittle nature,

and the colour is lighter in hue, a sort of greyish brown tinge prevailing on the sides, with the belly of a somewhat lighter colour. A tuft of hair nearly one foot long hangs under the jaws of the young moose. "Moose" is an Indian name derived from the Algonquin word moussee, the eater. I quote the following description from Billings in the "Canadian Naturalist and Geologist":—

"The gigantic horns of the moose are well known in almost every town in Europe and America where there is a museum. It is difficult to believe that these enormous solid appendages are the growth of a single season, and yet the fact is too well established to admit of a doubt. Only the males are provided with them, and no matter how large they may be, they grow to their full size in twelve or fourteen weeks. On the young moose one year old they are merely short knobs; they increase in size after each annual shedding, and after the fourth year become palmated, and may be termed full grown about the fifth year. The palms are, in the widest part, on a moderate sized male, about eleven inches wide, the space between the roots, six or seven inches. A very large pair measures over five feet between the tips, and will weigh 60 or 70 pounds. They begin to sprout in April and fall off in February. It is said that their growth is complete in August, when the velvet peels off, and they are then white, but afterwards become brown or yellow. From one to three points, or short prongs, are added to the palms each year, so that the age of the animal is not indicated by the number of these prongs as is generally supposed. In fighting with each other, they use both horns and feet; but in contending with dogs, only the latter, with which they strike tremendous blows. Their pace is a long swinging trot, which they can keep up for several hours in succession." A wounded moose is a very dangerous antagonist to approach unprepared. By an eye witness I was told of a case in point. A shantyman, on the Black River, at some place above Pembroke, ran out in sight of a number of his comrades close to the shanty, with a single barrelled muzzle-loader, and fired at and severely wounded a large bull moose. Seeing the animal wounded, he ran up to him with an empty gun, when the moose rushed at him, knocked him down with a blow from one of his front feet, and before his friends could effectually interfere, the furious animal trampled and pounded the

unfortunate man to death. I have heard also of instances where hunters have been treed by wounded moose; and of one incident where a hunter escaped by dodging around a large tree until he got a second charge into his gun to administer the quietus. To shoot a moose in December or in the middle of January, when he strides proudly along beneath the weight and dignity of his lordly crown, and when he is fat and heavy, is something of which a sportsman may well feel proud; but to slaughter the unfortunate animals in the latter end of February or March, when the females are heavy with young and the males are hornless and lean, is a species of assassin work which ought to be summarily put down by the strong arm of the law, if men are not ashamed of such culpable and inhuman butchery. The moose, which at one time was found in abundance in all the northeastern States of America, at present holds, says Parker Gilmore, "a short leased existence in the northern portions of the State of Maine." They are also in decreasing numbers to be met with in Nova Scotia and New Brunswick, and in various parts of the North-West. Although diminishing every year, they are comparatively plentiful far back on the north side of the Ottawa River throughout its entire length, and in some localities far west on its southern side. In the country lying to the south of James' Bay and stretching westward to Lake Winnipeg, this giant deer can be found in greater abundance than in any other portion of the American continent. Moose are also found in considerable abundance in the country bordering on the St. Lawrence below Quebec, particularly in the Labrador region. Audubon says the moose grows to the height of twenty hands. Others say that they grow even much taller than that. The moose of Labrador are much smaller than those of the State of Maine, or Canada proper, owing, doubtless, to the severe winter and sparse vegetation of the former locality. The moose when captured young is easily domesticated and grows quite tame and docile; but the restraints of civilization do not seem to agree with him, and after a few years' confinement he pines away and dies. In a park of sufficient size, well supplied with hardwood bush and swamp, and well watered, doubtless the animal would thrive. In a state of domestication the moose has been trained to harness, but does not like it, yet when it pleases him to stretch out into a trot he is exceedingly fleet. I have frequently

seen the young bull moose, one of the two owned by our late Governor-General, the Marquis of Lorne, harnessed to a carriage; but, although he could be induced to step out into a pretty decent trot by a little forcible persuasion with the whip, he did not take kindly to the slavery and sometimes used to lie down with his neck at full stretch, to show his repugnance to the idea of being turned into a horse, a transformation scarcely possible in an animal so much resembling a gigantic ass. The male and female moose to which I have referred, have been taken to the Highlands of Scotland by Lord Lorne, but I am sorry to hear that the bull has died in his new home. No member of the deer family makes finer venison than does the moose. The flesh, notwithstanding its being somewhat coarse in grain, is juicy and tender, and has a rich gamey flavour; and the fat, which is abundant when the animal is in good condition, is beautifully clear and white. A delicacy, which only the moose hunter can enjoy, is the marrow from the shank bones cooked immediately after the animal has been killed. I shall finish my description of the moose with the following quotation from Parker Gilmore:—

"The Virginian deer, the fallow deer, the wapiti, and the red deer, are to me perfect in shape, graceful in their movements and ornamental to the landscape; but the moose, on the other hand, with his short, thick neck, asinine head, protruding eyes, heavy, broad ears, tremendous antlers, long, awkward, powerful legs and disproportionate withers, looking even higher than they are, from the mane that surmounts them, can never be considered by an impartial judge but an awkward and clumsy brute. Of all the ruminants of the American continent, the moose is the tallest. I doubt not that a stall-fed ox can be made to weigh as heavy, but not to attain the stature; and on this continent, as well as others, it is really a duty that the legislatures of the various states and provinces owe to the country at large to pass and enforce such laws as will prevent his annihilation."

In any section of the country in which the Virginian deer abound, moose are seldom present. It is said, and I believe truly, that the moose, large and powerful as he is, is unable to withstand the lithe and vigourous attack of the active and sharp horned buck of the smaller species. In the fall of the year, under the natural impulses incidental to

the season, desperate battles take place between the males. These conflicts, however, do not as often terminate fatally as the struggles between the males of the smaller species, the broad, blunt horns of the great elk not being so well adapted to the purpose of inflicting dangerous wounds as the sharp-pointed antlers of the former.

The woodland caribou, (*Rangifer caribou* Aud. and Bach.) or reindeer, inhabits Labrador and northern Canada, and thence may be found south to Nova Scotia, New Brunswick and Newfoundland, the northern part of the State of Maine and Lower Canada, on both sides of the St. Lawrence; thence westerly in the country north of Quebec to the rear of Lake Superior. It never migrates towards the north, but makes its migration in a southerly direction.

The following is the description given of this deer by Audubon: "Larger and less graceful than the common American deer, body short and heavy, neck stout, hoofs thin and flattened, broad and spreading, excavated or concave beneath, accessory hoofs large and thin, legs short, no glandular opening, and scarcely a perceptible inner tuft on the hind legs, nose somewhat like that of a cow, but fully covered with soft hairs of a somewhat moderate length, no beard, but on the under side of the neck a line of hairs about four inches in length, hanging down in a longitudinal direction, ears small, blunt and oval, thickly covered with hair on both surfaces. Horns one foot three and a half inches in height, slender, one with two and the other with one prong, prongs about five inches long, hair soft and woolly underneath the longer hairs, like those of the antelope, crimped or waved, and about one to one and a half inches long. At the roots the hairs are whitish, then become brownish grey and at the tops are light dun-grey, whiter on the neck than elsewhere, nose, ears and outer surface of legs brownish, a slight shade of the same tinge behind the forelegs, hoofs black, and throat dull white, a faint whitish patch on the side of the shoulders, forehead a brownish white, tail white with a shade of brown at the root and on the whole upper surface, outside of legs brown, a band of white around all the legs, adjoining the hoofs, and extending to the small secondary hoofs, horns yellowish brown, worn white in places." This description is all very well, and in the main points correct. The rather arbitrary dimensions given of the horns are scarcely borne out, or corroborated

by the practical naturalist known as the hunter. The horns measured by Audubon for this description were very likely those of a female, which are much smaller than the antlers of the male. Here, before you, are two sets of horns of the woodland caribou, both of which came from the vicinity of the Kakabonga Lake, above the Desert, on the Gatineau River. They are singularly dissimilar in appearance; and, from the size, I judge that both belong to male heads. I saw a pair of caribou horns some years ago in the possession of Mr. Hiram Robinson of this city, which were very much larger, more massive and wide spreading, and had many more and longer prongs than either of these. The height of a full grown woodland caribou is about four and a half feet, and its weight about three hundred and fifty pounds. Large bucks are occasionally met with nearly four hundred pounds in weight. The food of the caribou consists of mosses, lichens and creeping plants found in the swamps in summer, and in search of which, and certain grasses, it paws up the snow with its broad hoofs in winter. The flesh when fat is most delicious, but when lean it is dry and insipid. The skin when tanned, is made into moccasins, and in the raw state is used in the manufacture of snowshoes. It is fine, thin, tough and durable. The caribou is the fleetest of American deer. In galloping he makes most extraordinary bounds. As a trotter, the slow-going 2.15 horses attempting to compete with him would be simply nowhere. Like his useful congener—some authorities believe them to be of the same species—the reindeer of Northern Europe, the caribou is possessed of great powers of endurance, often escaping from the Indian hunters, after the fatigue and starvation inseparable from four or five days of a continued following-up hunt, When the hunted animal gets upon glare ice, over which he can trot at a rate double that of the fleetest skater, the hunter is obliged to give up the chase. The caribou is a shy and exceedingly wary animal, and most difficult to still-hunt; neither can he be successfully hunted in deep snow, he being enabled to go over its surface upon his broad, flat hoofs like a hare. So far as I have been able to learn, it is only time lost to hunt the caribou with dogs. The hounds might follow the scent, but they would scarcely ever be in at the death, as it is a pretty well known fact that dogs cannot drive them to water. They are, however, successfully still-hunted by Indians, and also by white hunters skilled

in the craft. Large numbers of them are sometimes slaughtered when discovered swimming across a lake or river in their migrations. I have heard of a camp of Indians killing fourteen in a few minutes as they were crossing the River des Lièvres. The caribou is still to be found in considerable numbers on the last named river as close as sixty or seventy miles from its confluence with the Ottawa; also on the Gatineau River above the Desert, and in more limited numbers above Pembroke, in the neighbourhood of Black River, and on the shores of Lake Nipissing. They are also plentiful on both sides of the St. Lawrence, beyond Rivière du Loup, below Quebec, and are quite abundant on the northern shores of Lake Superior. While we have no historical record of the woodland caribou ever having been found in any considerable numbers on the south shore of the Ottawa, I think there can be little doubt of its having been quite plentiful in the past on the north side of the stream within a few miles of its banks. Strayed members of the family have been, to my own knowledge, seen on the south side of the Ottawa, one having been killed at L'Orignal about twenty-five years ago. In such cases they had evidently strayed from the north side, which has always been their natural habitat. The caribou migrates in herds of from ten, to one, two, and four hundred; and it is a notable fact that a concealed hunter, with the wind in his favour, if he does not show himself, has ammunition enough, a good rifle, and is the right man in the place, can slaughter a whole herd. Under ordinary conditions, the caribou is the most difficult to approach of all deer, but when accidentally encountered, under circumstances such as I have mentioned, the animals seem to be completely panic stricken and unable to make any attempt to escape.

The wapiti (*Cervus canadensis* Erxleben) is not only the most noble specimen of the genus in America, but by far the most beautiful and stately animal of the deer tribe in the world. No animal known to naturalists carries such a majestic and symmetrical set of horns. In this feature the wapiti far surpasses the great Sambur of India, and the red stag of the British Islands. A large male will weigh between eight hundred and one thousand pounds; the female, when full grown and fat, weighing upwards of seven hundred pounds. The form of this noble animal is exceedingly compact, strongly built and graceful; the

only apparent drawback to its perfect beauty being the disproportionate shortness of the tail. A large stag wapiti stands seventeen hands high, equal to the height of a large horse. The colour is yellowish brown, verging towards a dark glossy brown about the head and shoulders, belly brown, and a yellowish-white patch on each hind quarter. The horns, however, constitute the greatest point of beauty in the Wapiti. Antlers have been frequently met with measuring upwards of six feet from the burr, around the beam, to the highest point, ornamented with four formidable brow antlers, two over each eye, each eighteen, and sometimes twenty-four inches long, curved upward and elegantly tapering and smooth at the points. The other prongs or tines range from one foot to eighteen inches in length and are nicely graduated to fine points, as if they had been artificially tapered and polished. The horns shoot upward with a graceful and commanding sweep, and are remarkable for the almost uniform regularity of their growth. The largest stag of the Scottish Highlands would appear but a mere fawn standing beside a peerlessly crowned full grown stag of Canada. The monarch of the Highland glens seldom reaches more than four hundred and twenty-five pounds in weight, while his giant American congener turns the scale at more than double that weight. The wapiti—long misnamed an elk—was formerly quite numerous in the Ottawa Valley. In contradistinction, to the caribou and the moose, he was found more generally—though not exclusively—on the southern shore of the river. One hundred years ago, these animals were still present in considerable numbers in the County of Carleton, the hard-wood forests of which were their favourite haunts. The horns of the Wapiti are still quite frequently turned up by the plough in the vicinity of the City of Ottawa. I have, when a boy, often found them in the woods around the Village of Richmond, lying upon the surface of the ground, in such a fair state of preservation as to clearly indicate that not very long before those majestic animals must have been natives of our immediate neighbourhood. This specimen of a wapiti horn, which I now show you, was found near Eastman's Springs, in the Township of Gloucester; and, about eight years ago, a much larger and more perfect fragment was found on the farm of Mr. Robert J. Hinton, within two miles of the city limits. Both of these specimens, and others which I have seen, by

their size, indicate that the wapiti of this part of Canada reached the largest size attained by the species. Many naturalists imagine that the last occurrence of the wapiti in this neighbourhood dates back to a period comparatively remote. This, however, is not the case, as facts, more conclusive than even the finding of their horns, can be adduced in proof of those animals having been numerous here less than one hundred years ago. Mr. Rice Honeywell, one of the earliest settlers in this region, positively affirms that within the last seventy years, he has seen the wapiti both alive and dead on the old Thompson farm, within four miles of the City of Ottawa. Mr. Honeywell knows well the difference between a wapiti and a moose, as he frequently saw many of the latter in the same locality. This brings the period of the existence of the wapiti in this locality closer than has been generally supposed. The wapiti can be "still hunted" successfully, being less vigilant and much more easily approached than any other variety of deer. In the North-West the Indians ride in amongst them, keeping well down on the necks of their horses, and thus frequently succeed in killing a herd of eight or ten in a few minutes. A wounded wapiti is a dangerous animal to approach unprepared, as many a hunter has found out to his cost.

The cutting down of the forests, the progress of settlement and the resistless march of civilization have driven these noble animals out of their old haunts. The race in this neighbourhood was by no means exterminated, for there were then but few hunters, and the appliances of slaughter were of a much more primitive description than the arms of precision of the present day. Rifles in Canada were unknown in the days of the wapiti, and the weapons of the Algonquin, the Iroquois and the Abenakis were then the bow and arrow. Like the Indian himself, with his war-paint and scalping knife, the wapiti, before the aggressive strokes of the axe, has had to travel towards the setting sun, and he is now only to be found in Canada, in any great numbers, in the country around the north and south forks of the Saskatchewan. Parker Gilmore, a famous sportsman, and a naturalist of no mean order, says: "I do not think, from the information I have been able to obtain from searching old authorities who have written on the fauna of North America, that the range of the wapiti ever extended eastward to the

Atlantic seaboard; but that their habitat commenced with the prairie country, say Illinois or Indiana. However, these States have long ceased to know them; for, like other large game, they have rapidly retired before the tide of immigration. The upper waters of the Missouri and the plains around the forks of the North and South Saskatchewan, are where, at present, this mammoth stag will be found most abundant." The stag of Canada, like the caribou, is essentially gregarious, the herds frequently numbering hundreds. Those truly grand animals, year after year, are growing scarcer. The skin-hunter and the repeating rifle are doing their deadly work amongst them; and the time will shortly arrive, if legislatures in Canada and the United States do not forthwith grasp the required work of protection with a strong and relentless hand, when this stately ornament of forest and prairie shall have left his last shed antlers to tell the people of no distant day of the folly and improvidence which deprive them of a woodland glory of which any country ought to be proud.

The virginian, or red deer (*Cariacus virginianus*, (Bodd.) Gray), our common species, is one of the most graceful and beautiful of deer. Generally speaking the males only have horns. I have seen, however, within the last three years, two does brought to the Ottawa market each of which had horns somewhat resembling the antlers of a spike-horned deer, and although the time was late in the season the velvet still remained on the horns. These are the only instances in which I have noticed horns on the female of this species. In form the virginian is the most elegant of all the North American deer. The following correct description is from Billings' "Canadian Naturalist and Geologist":—"It has a long, tapering, pointed head and large lustrous blueish black eyes. The legs are slender and well formed, and in proportion to their size possessed of prodigious muscular strength, while the body is moderately stout and flexible. The horns are not large, but they are well armed with strong and sharp spikes. They are, near the base, bent backwards and in the upper part turned forward. They are usually cylindrical, but they are also sometimes met with a good deal palmated. They vary much in size and shape in different individuals. The prongs are round, conical, sharp and directed upwards. Situated partly on the inside of each horn near the base there is a short brow antler on most

of the specimens. A large pair of horns weighs about six pounds, but there are few over four or five pounds in weight." "The colour of this animal varies with the seasons; in the autumn and winter it is blueish gray; in the spring reddish, becoming blueish in the fall. Beneath the chin, throat, belly, inner side of legs and under side of tail white. The fawns are at first red, and spotted with white along the sides. In the autumn of the first year they lose the white spots, and thereafter are the colour of the old ones. The hair is flattened and angular, that upon the under side of the tail long and white. The average length of this species is, from the nose to the root of the tail, five feet four inches, length of the tail without the hairs, six or seven inches, with the hairs upwards of one foot. The females bring forth in May or June, one or two, rarely three at a birth."

Occasionally specimens of this deer are found of a pure white colour, with the pink shade in the eye denoting the albino. I have seen two or three marked with irregular patches of white on various parts of the body. On one occasion, a few years ago, I shot a fine buck at Hemlock Lake, in the County of Ottawa, in the skin of which white hairs predominated so much as to give the animal quite a white appearance. A large doe was brought down by another of the party on the same day with precisely the same peculiarity. A few years ago Mr. Neil Morrison, of this city, had a magnificent white buck carrying a fine pair of horns. As a *lusus naturæ* in the animal creation, of extraordinary elegance and beauty, this lovely specimen was unrivalled. The pure and uniform whiteness of his skin was almost beyond belief. This rare and valuable specimen was caught in deep snow, when almost three years old, about thirty miles up the Gatineau River. It afterwards came into the possession of the Hon. R. W. Scott, who kept it with a number of red deer in a park for some time, where it ultimately died. If a deer be killed in water during the interval of the red coat, say from June until the middle of August, the carcase will sink to the bottom. At all other seasons the dead body will float. From recent accounts given by sportsmen in *Forest and Stream* and in the *American Field*, we learn that the largest male of the virginian species has been found to weigh something over three hundred pounds gross weight; while in the latter journal of January 16th, 1884, it is stated by Mr. Cyrus Butler, of

Anna, Illinois, that: "The virginia deer of the Pacific States are smaller than those of the same latitude in the Central and Eastern States; and I do not think that the deer of Texas will average more than one half of the weight of the deer of Wisconsin and Michigan. From all I can learn on the subject it seems that the virginian deer of the Western States are smaller than those of the same latitude in the Eastern States; and it is certainly true that the further south we go the smaller we find the deer." A beautifully formed variety of this species is called the "spike-horn." This lovely animal, although identical in colour and habits with the branching-horned type of the species, is much rounder, shorter and thicker in body, and has a more elegantly shaped head. The true spike-horned deer has straight, sharp antlers, from six inches to a foot in length, setting backwards like the horns of the African oryx, which renders him a formidable and generally victorious antagonist in the periodical combats which take place between the male knights errant of the deer tribes. These conflicts are often desperate and protracted. I have seen a space in the woods fully one quarter of an acre in size, after a light snow in November, all trampled over, the soil torn up, and small dead trees uprooted in all directions, as the evidences of one of these fierce battles of chivalry. I was told by a "still-hunter," on the Madawaska River, who killed one hundred and fifty deer in one season, (how is that compared with the milder and less sanguinary mode of dog hunting?) that during the same year he came upon two large bucks in the act of fighting, and getting easily within thirty yards, killed both. In such conflicts the animals occasionally get their horns interlocked beyond the power of extrication, and both die of starvation as a rule. I have seen two heads interlocked, facing each other, so tightly that a strong man could not separate them. I am indebted to Mr. James Fletcher for a copy of the *London Field*, containing the photograph of a head of the most extraordinarily shaped horns which I have yet seen. The same paper contains another photograph of two heads with the horns interlocked together, side by side, while fighting. They were fastened to each other in such a firm manner that nothing but the shedding of the horns could have freed them. When found the prisoners were alive and in good condition. In both cases the animals were of the virginian species. This beautiful deer is found

in all parts of the valley of the Ottawa, and between the Ottawa and St. Lawrence, in such places as the hardwoods and swamps are large enough to afford them shelter. They roam through the hardwoods and hemlock ridges in summer; and establish their yards, if possible, in a tamarack swamp in winter. About thirty years ago I saw a deer yard stretching from Bearbrook away beyond the Castor River, in the Township of Osgoode. It must have been, at least, four miles square, and must have contained hundreds of deer. This yard was completely intersected by paths branching off in every direction, and beaten hard enough to carry a horse. Deer yards may be found in the same section of the country still; but like the red-skinned herds of woodland beauties which formerly made the wilderness glorious, they have been perceptibly growing smaller and smaller, and a well beaten deer yard of ten acres in extent within twelve miles of Ottawa is to-day no mean representative of the widely trodden haunts of the virginian deer in the near past. The multiplication of hunters, superinduced by arms of precision, and the expertness acquired by practice in volunteer companies—but above all, the lawless assassins who slaughter them, male and female old and young, on the crust during deep snow—have tended, legally and illegally, to do more than decimate the magnificent denizens of the forests surrounding the City of Ottawa. The unavoidable clearing away for agricultural purposes, and the culpable destruction by bush fires of the forests in many places, have driven the deer back to more, distant haunts. The wolf too, although not a bit more sanguinary in his destructive instincts than the lawless crust hunter, has done his share in thinning out the deer in the valley of the Ottawa. Still, it is astonishing to know that, notwithstanding all these adverse influences, there are yet large numbers of them on both sides of the Ottawa River, and in the forests bordering upon its many large tributaries. In summer the virginian deer delights to hang around clearings for the purpose of feeding on grass, clover, turnips and potatoes. In former times many of them were killed from scaffolds by night watchers in turnip and potato fields. I have not time to give a description of the various modes of deer hunting. As a sportsman, I would scorn to refer in a descriptive manner to fire hunting or crust hunting. Of the two legitimate methods, still hunting and hound hunting, I prefer the latter

on the runway system, as less destructive and more lively and full of sport than the former. To me, with the glorious music of the dogs ringing and re-echoing through the woods, there is more genuine sport and more true skill required in striking a buck on the "full jump" with a single bullet than in doing the same thing in any other style.

No hunter with whom I have spoken, nor any book which I have read, has given me a satisfactory account of what becomes of all the cast off horns of our common deer. I am aware of their being gnawed and eaten up by mice and other rodents; but during the period when the horns are falling off, from the first to the sixth or seventh of January, it is a very rare occurrence to find the horn of a deer, and much more unusual to discover both horns together. Some of the knowing ones say that the deer buries his horns, others that he drops them in water, and others still, that the does eat them. No proof has, however, been adduced that any one of these conjectures is correct. Although it is a common thing to find the shed antlers of the wapiti on the prairies and in other places, the whereabouts of the cast off horns of the virginian deer has not yet been discovered. This is a point in natural history upon which we still want light. It is a strange and mysterious provision in the economy of nature that the periodical growth of a deer's horns—even the ponderous antlers of the moose or the wapiti—should involve only an extraordinary forcing process of little more than four months. Shortly after the dropping off of the horns the new ones begin to appear. The growth is slow at first until the setting in of the warm spring weather, when it is exceedingly rapid. About the middle of August they are full-grown, when they are covered with a soft, velvety skin, which the animal gets rid of by rubbing them against small trees, never against large ones. About the first of October, sometimes earlier in the season, the velvet has disappeared, and the new antlers may then be seen in all their hardness and beauty. The animal may then be said to be in his finest condition and at his heaviest weight. A male *Cariacus virginianus* is seldom seen on the first day of January with his horns on, and never that I am aware of, after the fifth of the same month. It is a well known fact, however, that the moose does not lose his horns until later in the season. I have seen the head of a moose killed in January of the present year with horns still on, and

without any appearance indicating their likelihood to fall off. Here, I imagine, is the proper place to refer to some strange peculiarities and diversities in the horns of the common deer. It is difficult to account for the abnormal growth so frequently visible in the antlers of these animals. Some naturalists seem to think that such irregularities of growth have been occasioned by injuries received by the horn when in its soft and pulpy state. If such were the case, would it not be natural to conclude that after the deformed member had been shed, the new horn would assume its natural and normal shape? This cannot be said to be so. This head which I now show you, as you may observe, is one of the most singular formation; and from personal observation, I know that the splendid animal that carried this strangely abnormal pair of horns, wore his crown in its present shape year after year. I had a fair open view of this deer the year before that in which he was killed, near the spot where he was shot, and I particularly remarked this singular looking horn growing out on the right side of his head. Here, also, are two fine heads each with backward lateral prongs of a style seldom seen. Both have been taken from old and heavy deer. Abnormally shaped horns, as far as I know, are rarely, perhaps never, seen except in deer of great size and age. This is my experience. I have frequently seen very old bucks of the virginian species with immense curved beams with only one or two blunt and worn looking prongs on either side, and others of similar size and form with only rudimentary protuberances, indicating, as it were, where, in the horns of former and more vigourous years, the prongs that had been accustomed to grow. Although usually so, it is not always the largest deer which carries the largest horns. The heaviest and largest deer I ever saw, had the most miserable set of attenuated antlers I have ever seen on a full grown deer. On the other hand, one of the heaviest pairs of horns, which have yet come under my notice, was taken from the head of a buck of not more than one hundred and fifty pounds weight. This pair which I now show you is perhaps the largest and most beautiful that any one present has seen. The animal from which they were taken was shot many years ago on the Castor River, in the Township of Osgoode. They belong to Mr. W. H. Baldwin of this city. They are singularly regular in shape, and, at the same time, strangely irregular and unlike the ordinary antlers of the

Cariacus virginianus. To a certain extent they are palmated and evidently grew upon the head of a very old deer, which I have been told was a complete skeleton, with his teeth nearly all gone, at the time he was killed. Perhaps some gentleman present may be able to enlighten us upon the question of abnormal horns. In telling you the story of what I have learned myself about the deer of the Ottawa Valley, I have aimed at telling it in a manner likely to interest the greater number. I have endeavoured to avoid abstruse technicalities, and above all I have unwillingly been compelled to curb my inclination to tell you the thrilling story of many a glorious run, and rehearse the tale of many a night of killing happiness around the camp fire, where battles were fought over again and memory hung around us the branching antlers of many a woodland king, whose trophied heads can be found in more than one house of the dearly loved companions with whom I have so often pitched the tent in the wilderness. If I have succeeded in any measure in either instructing or interesting anyone in this audience, I shall proudly feel that I have not roamed the woods, stood upon the runway, listened to the deep and matchless music of the hounds, or drawn the rifle-trigger amid the mighty and sublime solitudes of nature in vain.

And now my pleasant task is done,
The fruits of many a glorious run!
Still springing 'mid the lambent haze
Which circles round the camp fire's blaze,
Revealing to fond memory's eyes
The dear, unrivalled days gone by,
When limbs were lithe and arms were strong,
And life one gladsome burst of song.
Revealing 'mid unfading sheen
"The Runway" in the forest green—
"The antlered monarch's" springing bound,
The matchless music of the hound!
When headlong on the steaming scent,
With instinct true as steel, he went,
The gaze into the spreading track—
The breaking twig, the rifle's crack,
The quivering limb, the closing eye,
The forest's dying majesty.

Dr. Baptie said that there had lately been a discussion in *Nature* tending to show that the deer ate their shed horns, and later he read some extracts giving evidence on this point.

Mr. W. L. Scott stated that the buck which his father had owned was *perfectly* white, and after being kept in a park for three or four

years, died of some throat disease. He had seen heads of caribou at Mr. Allan Gilmour's with the horns coming down not only so as to hide the eyes but even to make furrows in the cheeks. Referring to the spike-horn deer, he alluded to the similarly antlered oryx of Africa as the only deer that attempted to resist the onslaught of the lion.

PROF. MACOUN said that moose were very plentiful on the Peace River in 1875, and that 8 lbs. of venison per man per diem was the ordinary allowance there. He described some experiences at Ste. Anne des Monts, when he had watched caribou, himself unobserved, and testified to their intelligence, their dainty habits and the affection shown between mother and offspring. He disputed Mr. Lett's distinction between pot-hunting and legitimate sport as illogical, and condemned both alike as appertaining to man's lower nature. He had seen shed horns of deer marked with the teeth of rodents.

DR. WICKSTEED enquired how the caribou was able to run on ice if its hoof was so spread as to enable it to run on light crust, as that spreading which was an advantage in the one case would appear to be a hindrance in the other.

MR. LETT explained that the rim of the hoof was sharp and pointed and cut well into the ice, the hoof being probably gathered together.

REPORT OF THE GEOLOGICAL SECTION FOR THE SEASON OF 1883.

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

GENTLEMEN,—In presenting the third annual report the undersigned beg leave to state that during the past season a considerable amount of additional information has been obtained both in the palæontology and stratigraphy of the rocks, not only from the numerous immediate exposures within the city limits, but also from those even in more remote parts.

New localities were visited, where valuable points in stratigraphy were noted and collections of the organic remains made, giving such evidence as will greatly assist in ascertaining the true horizon of the rocks in question.

A goodly number of workers have joined our ranks, and it is indeed pleasing to note the results already obtained. The zeal and earnestness manifested in the numerous "hunts" held were very encouraging. To summarize the work done in each formation systematically the notes will be given under their proper heads.

POTSDAM FORMATION.—The typical exposure of this series of conglomerates and quartzites, resting unconformably upon the upturned edges of the Laurentian rocks, was again visited, and that upon the third of the general excursions of the Club, held at Buckingham, Que., the 2nd August, 1883. No definite organic remains were found other than the evidence obtained on a former occasion, viz., *Scolithus Canadensis ?* Billings. One of the leaders addressed the members present and described the line of outcrop of this formation skirting along the base of the Laurentides both in Canada and the United States, in which latter place these are represented by the hilly districts of the Adirondacks.

CHAZY AND BLACK RIVER FORMATIONS.—During the season of 1882–83 the lower measures of the Chazy were observed and reported on as occurring at Pointe des Chênes, a little below Aylmer, Que. The same series was further investigated during the past season and new evidence obtained. Aylmer, Que., and Britannia, on the Ontario shore,

are both built on this formation. To the north of Aylmer, overlying the sandstones, whose thickness is evidently not far from 100 feet, are to be found beds of a transitional nature. They are only a few feet thick, very dark in colour, brittle in texture, and apparently unfossiliferous, with innumerable joints and cleavage planes running in all directions. These are immediately followed by beds of compact greyish limestone holding orthoceratites in abundance, four or five feet above which other beds hold in great profusion the well known *Stromatocerium rugosum*, Hall—a sponge or sponge-like organism. Regular colonies of these fossils are to be seen occupying considerable patches in the fields on the north concession road. These beds have a very slight inclination to the north, with an almost due east and west strike. Following these measures at right angles to the strike numerous Chazy fossils were collected. That very characteristic band of impure friable limestone holding abundance of *Leperditiæ* was found. (See Decade III, Geol. Surv. Can., page 92.) Then following in a north-easterly direction, at some $2\frac{1}{2}$ miles from Aylmer, numerous species of fossils characteristic of the Black River formation fauna were obtained. Much work still remains to be done in this neighbourhood, as the rocks are highly fossiliferous and the specimens in many instances very well preserved. Nineteen species of fossils were collected from these beds. Much credit falls to Mr. E. T. W. Sowter for the work he has already accomplished in these interesting exposures.

Trenton Formation.—The very numerous and highly fossiliferous exposures of this formation about Ottawa, from which the late Mr. E. Billings, the late Dr. Van Cortlandt, and many members of the Field Naturalists' Club obtained a splendid series of fossils—a typical collection of which is to be found in the Museum of the Geological and Natural History Survey—proves still a rich hunting ground for the palæontologist.

During the past season a fine exposure was observed within the Rideau Hall grounds, where an interesting collection of fossils was made, amongst which were *Iocrinus subcrassus*, Meek and Worthen; *Lichenocrinus crateriformis*, Hall; a *Discina* like *D. Circe*, Billings, and about twenty additional species characteristic of Trenton age.

Another crinoid locality was found at the vacant lots on Sussex street below Messrs. Hamilton's offices, where *Heterocrinus Canadensis*, Billings, a form closely related to *H. simplex*, Hall, was found in abundance and in a good state of preservation.

UTICA FORMATION.—Additional researches were carried on during the past season in this formation, but the notes thereon are reserved for a subsequent report.

POST-TERTIARY DEPOSITS—*(Marine, Fresh Water and Human Remains).*—In the Leda clay, Saxicava sand and fresh water marls of the country adjoining Ottawa, as well as in the numerous and extensive deposits of boulder drift, etc., a vast field of special enquiry is open to the observer. In the Post-Tertiary history of our rocks we have to hail a new era in its researches. At Casselman, Ont., where the Club held one of its excursions, numerous *archæological* specimens were discovered in the shape of *pottery, bones,* and other remains. Although the pottery was broken into bits ranging from half an inch to four inches in diameter, still the various designs and patterns peculiar to the tribes of the great Algonquin family, who once inhabited the eastern portion of North America, are quite characteristic.

The sherds were found buried, beneath the sod close by a young hardwood forest on the eastern shore of the South Nation River, at the foot of a rapid, to a depth ranging from three inches to two feet, mixed with bones of beaver, bear and deer, remnants of the chase, together with charcoal and ashes, all plainly indicating the existence of some ancient village inhabited by a tribe of Indians whose customs and manners were not unlike those who dwelt at Hochelaga at the foot of Mount Royal when Cartier first landed, some three hundred years ago. A *gouge* and an *adze* had been found some seventeen years previously by Mr. J. S. Castleman at the same locality, but no more researches had been carried on since that time in this treasury of archæological remains until the Club's excursion there. The pottery remains, together with the adze, gouge and bones, are at present in the Museum of the Geological Survey.

Mr. Walter R. Billings notes that during the past season he has examined the exposures of the *Trenton* formation on Division street, in

Rochesterville. There he found good examples of fossil sponges, which at first sight Mr. Whiteaves referred to the genus *Calathium*. They require microscopic investigation before they can be referred to their proper places.

The following species of unusual occurrence in these rocks are recorded by Mr. Billings: *Astylospongia parvula*, Billings; *Receptaculites occidentalis*, Salter; *Petraia corniculum*, Hall; *Pasceolus globosus*, Billings (a smaller variety); *Amygdalocystites florealis*, Billings; *Agelacrinites* resembling *A. Billingsi*, Chapman; *Glyptocrinus ornatus*, Billings; *Archæocrinus*, n. sp.; *Calceocrinus inæqualis*, Billings; *Hybocrinus conicus*, Billings; *Dendrocrinus proboscidialis*, Billings.

17th January, 1884. HENRY M. AMI.

REPORT OF THE BOTANICAL BRANCH.

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

The work in this branch has been vigourously prosecuted throughout the past season, which, contrary to all expectations, was later than usual. The latter part of April was very cold, with snow on 27th. It was not until May that any work could be done in the field. Soon after their election your leaders made preparations for work by organizing working parties and sub-excursions; the result having been an addition of new species to the Flora Ottawaensis. The botany class conducted by the ex-President was turned into a summer class. This new feature proved to be useful, and was the means of inducing several members to join the Club. It has been continued during the past winter and has been most successful, the average attendance being sixteen at each meeting, and the attendance on one occasion reaching to twenty-eight. Collections were made at all the regular monthly excursions of the Club. The first one on 26th May to the Chelsea Mountains enabled the members to add the beautiful and distinct *Viola Selkirkii* to their collections. At this time also good specimens of *Triosteum perfoliatum, Carex platyphylla, Asplenium Trichomanes* and *Camptosorus rhizophyllus* were collected, and a few specimens of the curious lichen *Umbilicaria Dillenii* were found on the top of King's Mountain. Interesting biological specimens of *Trillium grandiflorum*, showing a transition from the petaloid form to the foliaceous leaves in the flower, were collected by Mrs. Chamberlin. One specimen had three white petals with green stripes down the middle, and one of the petals was developed into a leaf like those of the whorl of leaves proper. Another had an extra leaf half way up the pedicel and one of the petals foliaceous. Several specimens of the greenish-yellow variety of *T. erectum* were found at Stewarton in May. It is much to be regretted, from a botanical standpoint, that Stewart's bush, at Stewarton, is being so rapidly cleared. Only six years ago this bush was one of our richest hunting grounds; but now, where it was almost an impenetrable wood, it is almost cleared of underbrush and the grasses have formed in many places a sward beneath the trees. This was one of the localities for *Calypso borealis*, and also the only near one for

Dicksonia punctilobula. The excursion to Casselman was the means of adding no less than nine species to the flora, some of which deserve special mention. *Hypericum pyramidatum, Plantago Rugellii, Phlox divaricata, Saururus cernuus* and *Botrychium lanceolatum* were the best finds. The last named is a rare moonwort and the two preceding are unexpected discoveries in this part of Canada.

The Mer Bleue has again proved to be a rich locality. Here in the beginning of July several fine specimens of the beautiful orchid *Arethusa bulbosa* were found. In a patch of fourteen growing together eight had well developed leaves like *Calopogon pulchellus.* A remarkable feature of all the specimens found on this occasion was their light colour. At a few yards' distance they could not be distinguished from *Pogonia ophioglossoides,* amongst hundreds of which lovely flowers they grew. The usual colour of the arethusa is a much more intense shade of red. On the same day were collected fine specimens of undoubted *H. fimbriata,* and near the railway station *Calamagrostis Langsdorfii* and a grand clump of *Carex folliculata* were discovered. On the Chaudière Islands *Prunus pumila* was found in flower in June, and in the autumn *Helenium autumnale* was plentiful. From Templeton *Thalictrum purpurascens* is reported and from Buckingham *Carex Grayii.* Several good carices have been added. The well marked variety *latifolia* of *C. laxiflora* was found at Stewarton in company with *C. pallescens. C. sychnocephala,* a rare species only previously collected in Canada by Prof. Macoun, was collected at Billings' Bridge on the last sub-excursion of the branch in September; also good specimens of *Diervilla trifida* in fruit. At Malloch's Bay, *Gratiola aurea, Ranunculus multifidus, Hippuris vulgaris* and *Mentha Canadensis var. glabrata* were found. Hull also produced its contributions to the lists. *Solidago neglecta,* new, and two fresh localities for *Pellæa gracilis* and *Camptosorus rizophyllus. Physalis grandiflora* and *Riccia fluitans* were also collected here.

Riccia natans was found at Deschenes and at New Edinburgh. At Gatineau Point *Osmorrhiza longistylis* was collected by Miss Isabel Grant, and to this lady the committee have very much pleasure in awarding the botany prize for the year. Her collection is exceedingly well mounted and preserved, and comprises 185 species. She has suc-

ceeded in discovering the type of *Solidago cæsia*, from which we find that all the records for Canadian localities of this species refer to the variety *axilaris*. This, then, is not only new to this locality but to Canada. Miss Grant also collected a *Stellaria*, which Prof. Macoun considers to be *graminea*, a European species only previously detected by himself during the past season in the Lower Provinces. Among rare species already recorded from this locality, but which have been again collected this year, *Typha angustifolia*, *Cypripedium arietinum*, *Cyperus phymatodes* and *Carex lenticularis* may be referred to. The last named has only been found on the sandy shores of Duck Island (17th October), where were also found earlier in the year *Carex squarrosa*, *C. monile* and *Juncus filiformis*. *Nasturtium amphibium* is found in many places round the city in low ground flowering in June. *Asperugo procumbens*—several luxuriant specimens of this plant were collected along the banks of the Canada Atlantic Railway at Mount Sherwood.

Amongst aquatics some important observations have been made. In last year's report reference was made to a variety of *Potamogeton pusillus* which the Rev. Thomas Morong had pronounced as very similar to the Sicilian variety *panormitanus* of Bivorni. During the past season a fuller suite of specimens has been sent to Mr. Morong by Mr. Fletcher, the finder, and he now writes with regard to them: "I "have carefully compared your plants with those sent me as *P. pusillus*, "*L. var. panormitanus, Biv.*, and can see no essential difference. In "my specimens the submerged leaves are shorter than in yours; they "are not ruddy at all, and none volatile. The description of the "variety, however, corresponds. 'Leaves longer (than the type), more "'flaccid, the upper flowering ones opposite and spathulate, the whole "'surface of the leaf, with a pretty chain-like areolation surrounded "'near the margin with a ring of denser substance.' I am sure that "your plant meets this description, and when compared as to the "flowering leaves the specimens agree. I should not, however, regard "it as a distinct species, since it bears so many of the characteristics of "*pusillus*. The ruddy tinge and revolute leaves may be owing to the "season or accidental circumstances; but I would watch and see if "these are permanent characteristics. The detection of this variety in

"your locality is particularly interesting as it has not before been "found in America."

With regard to the parasite fungus infesting the leaves of various species of potamogeton, Prof. Farlow at special request has kindly prepared a detailed note of the species, which is appended to this report. This note, coming from such a high authority, is of special value.

Among the latest collections of the year were: Sept. 8, *Aster acuminatus*, at Stewarton; Sept. 23, *Epiphegus Virginiana* in flower. Growing associated with this were found the seed pods of *Corallorhiza multiflora*. In a small beech wood near St. Louis Dam. Oct. 20, *Hamamelis Virginica* in full flower. All of these, although quite abundant where they occur, are very local, only a single locality for each having so far been observed.

On Oct. 27 the bottom of the Rideau Canal, near the Bank Street Bridge, was found to be covered with enormous quantities of a species of nostoc. The plants were round like marbles, and of a deep green. They were generally single; but occasionally double specimens were found, in which case one was smaller than the other. The size varied from that of a small pea to one inch in diameter.

In conclusion, the leaders would suggest to the members the advisability of each one taking up the study of some particular family of plants and making a specialty of it, and they are convinced that if this is done valuable results will follow. Prof. Macoun studying the fungi in this way discovered during last autumn in this locality no less than eight species new to science.

They would also draw attention to the great advantages which are to be derived from cultivating plants from the seed and examining them closely during their different stages of growth. Anyone who has a garden at all can cultivate a few species, and many can even be grown in flower-pots in a window. A large number of plants have been grown during the last three years from seed received from our corresponding members, particularly from Mr. Hill, who is in British Columbia, and many rare plants have thus been examined, and have had paintings made of them by Mrs. Chamberlin. Some which have thriven particularly well, flowering freely and ripening their seeds are: From British Columbia, *Lewisia rediviva* roots received in 1881 bore

last season from two to five flowers and ripened seed; *Sedum spathulifolium* increases rapidly and is very hardy; *Helianthus lenticularis* grows luxuriantly; *Phacelia Menziesii, Astragalus lotiflorus, Chrysopsis hirsuta, Cirsium undulatum, Grindelia speciosa* grow luxuriantly and ripen an abundance of seed. The following have grown well but have not flowered yet: *Pentstemon Lewisii, Elœagnus argentea, Rubus Nutkanus, Ericoma cuspidata, Fritillaria lanceolata,* and *F. pudica, Allium cernuum, Lupinus sericeus.* From the North-West: *Petalostemon violaceus, Lepachys columnaris, Solidago rigida, Monarda fistulosa, Bontelona curtipendula.* All of these would make valuable additions to our flower gardens. It is hoped that before long we shall have Government experimental stations where the suitability of certain plants to different districts can be tested; but in the absence of these the members of this Club can do valuable service for the country by growing and carefully observing desirable plants. Moreover, many botanical descriptions of species have been drawn up from dried specimens alone, and in this way occasional errors have crept in. Now, if by growing a great many plants we can correct even a single one of these errors we shall not only do good work for science but thus a lasting honour will be conferred on the Club.

J. MACOUN,
R. B. WHYTE,
J. FLETCHER,
Leaders.

31st January, 1884.

FLORA OTTAWAENSIS.

(*Additions made in 1883.*)

Thalictrum purpurascens, L., L'Ange Gardien, August, 1882.....Mr. Ami.
Nasturtium amphibium, Rochesterville, June, 20....Mr. Fletcher.
Viola Selkirkii, Pursh, Chelsea Mountains,..... "
" *tricolor, L. var. arvensis, Ging,* Mount Sherwood, June 1..... "
Hypericum pyramidatum, Ait. (leaves) Casselman .. "
Stellaria graminea, Casselman..... Miss I. Grant.
Prunus pumila, L., Chaudière Islands, June.....Mr. Fletcher.
Thaspium aureum, Nutt. Casselman.....Miss I. Grant.
Solidago cæsia, L. (type), Billings' Bridge..... "

Solidago neglecta, Ironsides, July 20.....Mr. Fletcher.
Rudbeckia laciniata, Casselman..... "
Campanula dracunculoides, Sparks Street, June..... "
Plantago Rugellii, Casselman ..... "
Linaria vulgaris, Miller, (Peloria state) Stewarton, August, 1882..... "
Mentha Canadensis, L. *v.* glabrata, Gray, Malloch's Bay..... "
Hydrophyllum virginicum, L. Casselman.....Mr. R. B. Whyte.
Phlox divaricata, L., Casselman.....Mr. Fletcher.
Saururus cernuus, L., (leaves) Casselman..... "
Fagopyrum Tartaricum, Metcalfe Street, June 20... "
Quercus bicolor, Willd, Casselman..... "
Potamogeton amplifolius, Meech's Lake..... "
" pusillus L. *v.* panormitanus, Biv. Rideau Canal, June 28..... "
" lucens, L. *v.* Minor, Nolte, Meech's Lake..... "
Arethusa bulbosa, L., Mer Bleue, July 2..... "
Carex laxiflora, *v.* latifolia, Stewart's Bush, June 15. "
" pallescens, Stewart's Bush, June 15..... "
" sychnocephala, Carey, Billings' Bridge, September 24..... "
" tenuiflora, Wahl., Lake Flora, Hull, June 20.. "
" folliculata, L., Eastman's Springs, July 2..... "
" Grayii, Buckingham, July 2.....Mr. Ami.
Calamagrostis Langsdorfii, Mer Bleue, July.....Mr. Fletcher.

APPENDIX A.

NOTES ON A FUNGUS PARASITIC ON SPECIES OF POTAMOGETON.

W. G. Farlow, Prof. Harvard University.

In November, 1882, I received from Mr. J. Fletcher some seeds of *Potamogeton Vaseyi* collected in August, 1882, near Ottawa. A microscopic examination of the seeds showed them to be filled with a curious fungus growth, which I thought might probably be placed in the order *Ustilagineae*. As the material sent was preserved in alcohol, it was, of course, impossible to ascertain how the spores of the fungus germinated, and unfortunately, in the *Ustilagineae*, it is often necessary to know the mode of germination before referring a form to its proper

genus. The fungus seemed to me to be closely related, at least, to the genus *Sorosporium*, and I sent some of Mr. Fletcher's material to M. Woronine, at that time residing in Paris, and the author of the valuable paper on the development of *Ustilagineae* which had appeared a few months before. M. Woronine replied that he did not himself recognize the parasite, but on showing it to Dr. Maxime Corun, of the Jardin des Plantes, he recognized it as closely related to a form growing on *Alisma Plantago* which he had made the type of a new genus *Doassansia*. In a letter Dr. Corun, supposing that the fungus had been collected by me, stated that he had named the species *Doassansia Farlowii*, and, as his paper in which the species was mentioned had already gone to press, my letter stating that the fungus had been found by Mr. Fletcher, and not by myself, was received when it was too late to change the name.

Dr. Corun's paper appeared in the Annalls des Sciences, 6 Série, Tome 15, bearing the date June, 1883, but the paper was not received in this country until several weeks later. The description of our plant is there given as follows: "*D. Farlowii* sp. nov., *soris ovalibus compressis numerosis, ovarium Potamogetonis cujusdum totum occupans; sporae.* Le diamètre des sores oscille pour le diamètre longitudinal entre 0^{mm}, 2 et 0^{mm}, 18; pour le diamètre transversal, entre 0^{mm}, 18 et 0^{mm}, 14. Le diamètre des spores, non mûres, parait être de 0^{mm}, 02." Prof. DeBary, to whom M. Woronine communicated preparations of the American fungus recognized it as the same as that described and figured in Hoffmann's Icones analytical fungorum, p. 69, Tab. 16 f. 3 as *Sclerotium occultum* found in the fruit of *Potamogeton lucens* and *P. natans.*

Before the receipt of Dr. Corun's paper, I gave a short account of the fungus in the *Botanical Gazette*, of August, 1883, which it may be well to quote in this connection. "The fruit of the *Potamogeton* was swollen, and a section showed globular masses scattered through the substance of the fruit. The masses consisted of densely packed cells, the outer layer of which was darker coloured than the rest and regularly arranged, so that the cells, which had the shape of short cylinders with rounded ends, had their longer axis always in the direction of the radius. Beneath this regularly arranged layer the cells were roundish-angular and presented the appearance of parenchymatous cells."

It will be seen that this curious fungus hitherto unknown in America was first described by Hoffmann, the date of the Icones being 1863, but it was not, however, recognized by him as belonging to the *Ustilagineae*, to which it seems to be correctly referred by Corun. If we are to follow the system of nomenclature in vogue on the continent the species would be called *Doassansia occulta* (H. Hoffm.) Corun. The genus as characterized by Corun is marked by the fact that the external cells of the sori remain as a sterile covering, while the internal cells on the rupture of the sori give off short germinal tubes, which bear at their tips whorls of short cells as in the genus *Tilletia*. The germination was seen by Corun in *D. Alismatis*, a species which has also been found recently in the United States. As I have said, the material first sent by Mr. Fletcher in 1882, was in alcohol, and the germination could not be seen. In 1883, I received some fresh material from Mr. Fletcher, but at the time of sending the spores were not mature, apparently, and I was unable to make them germinate. If the form on *Potamogeton* acts similarly to that on *Alisma*, it ought to be an easy matter for observers in Canada to discover the mode of germination. According to Corun it is only necessary to place the ripe sori of *D. Alismatis* in a damp place, when they quickly split open and the internal cells at once give off the characteristic germinal tubes. From the accompanying figure of a germinating spore of *D. Alismatis*, one can see what to expect from the form on *Potamogeton*.

D. occulta has also been found by Mr. Fletcher or *P. pusillus*, *P. perfoliatus* var. *lanceolatus*, and *P. natans* in Canada, and its range will perhaps be found to extend considerably southward. Besides the true species of *Doassansia*, already mentioned, a third form was doubtfully referred by me to the same genus in a paper in the *Botanical Gazette*, August, 1883. It forms small black spots in the leaves of *Epilobium alpinum* in the White Mountains, and may be expected farther north. Any collector so fortunate as to find it, should, if possible, watch the germination.

REPORT OF THE CONCHOLOGICAL BRANCH.

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

In presenting their report, the leaders of the conchological branch regret that during the past season they were, for reasons unnecessary to mention, unable to devote much time to the collection and study of the mollusca of this vicinity. They have, however, to record the discovery of a species new to your lists and to lay before you a few observations on species already noted.

An important addition to the Club lists has been made by Mr. W. H. Harrington. With a view to obtaining very minute beetles, that gentleman collected in November a quantity of sphagnum and other moss in Dow's swamp. The moss when dried was shaken over white paper, and with the insects which fell from it were found a number of small shells. These he submitted to one of the leaders of this branch for determination. They were found to include a number of interesting species—some so rare as not to have been met with here except by Mr. Heron, and one altogether new. This is, we consider, *Patula asteriscus*, Morse. It is very distinctly characterized, and therefore not likely to be confounded with any other species. Although not hitherto known to occur in this vicinity, it has in Canada an extended eastern and northern distribution, having been recorded from Gaspé and the country north of Lake Superior.

Of the other shells found by Mr. Harrington, the most worthy of note are *Hyalina milium*, Morse; *Pseudohyalina exigua*, Stimpson; *Vertigo milium*, Gould; and *V. Gouldii*, Binney.

Mr. Harrington's success shows that the process of collecting and screening moss may be used with great advantage for collecting not only insects but minute shells.

That shells reputed to be rare may yet be very common is well illustrated by the fact that *Macrocyclis concava*, Say, was found in May last in great abundance in a prickly ash thicket on the banks of the Rideau in Billings' bush. Previously but a few isolated specimens had been found.

Succinea ovalis, Gould, occurred in considerable numbers on the banks of the brook flowing through the beaver meadow in Hull, about

half a mile north of the Aylmer Road tollgate. They were large for the species and of a rich amber colour. Shells of equal size but paler on the body whorl and tinged with red towards the apex were found on the Ontario shore of the Ottawa near Mason's mill in company with *Succinea avara*, Say, and *Hyalina nitida*, Müller.

The young of *Succinea ovalis* were taken on alders in the Hull beaver meadow at the height of eight feet from the ground, where they were observed both by Mr. Harrington and one of the leaders of this branch. This climbing habit of a species which usually lives at the very edge of a pool or stream is not a little remarkable. *Succinea avara* has also been observed climbing to a height of three feet on tall fronds of *Struthiopteris germanica* in Billings' bush.

A *succinea* resembling *ovalis*, but smaller and more acuminate, was found in abundance on floating timber in Skead's Bay near the Remices Rapids in October, 1882. Specimens collected at that time were afterwards mislaid; and on a visit to the same place in October, 1883, no shells of the kind could be found. This locality should be visited again during the coming season and an effort made to collect some of these shells. A small form of *Limnæa stagnalis* is also found there and is of much interest.

In the report of the branch made in 1883 mention is made of the occurrence in a garden in this city of a single specimen of *Limax agrestis*, Linn. In the preceding years this slug was not observed either by Mr. Heron or Mr. Latchford. The garden in which one solitary individual was found in 1882 afforded hundreds in 1883. Last year in and around Ottawa *L. agrestis* was abundant everywhere, both alone and in company with the smaller and common native species, *L. campestris*, Binney.

L. agrestis is of foreign origin, but has long been known as inhabiting the cities along the Atlantic coast. Its migration has since been steadily inland; and its advent in Ottawa is of interest not only from a scientific but from an economic point of view, as it is an exceedingly prolific and voracious species. Gardeners have already complained of its destructive attacks on lettuce, spinach and other tender esculents, and its continued increase may be regarded with some apprehension.

In the past year, as in the year previous, the water in the Ottawa never fell so low as to enable us to collect any of the fine unios which are known to occur down the river.

Undoubted specimens of *Sphærium securis*, Prime, were obtained in the culvert which crosses St. Louis Dam. On Mr. Heron's list this species is marked with a query.

Planorbis bicarinatus, Say, in the typical form was found on the right shore of the Rideau in the rapids near Hartwell's Locks. A small variety with the keels less developed and with coarse wrinkles was found in the pond east of the Bank Street Road near Billings' Bridge, and in brooks in Hull and Masham. Meech's Lake afforded two shells of this species of much greater size than any previously found, but of the typical form. The measurements of the larger shell are as follows : Greater dia. 0.83 in., lesser dia. 0.64 in., height 0.52 in. Both shells were unfortunately dead. They were found near the outlet of the lake. Living specimens will probably be had higher up the lake—a locality still unknown to us and worthy of a visit.

Very fine *Limnæa columella*, Say, were found in the early part of November in the bay above Mason's mill, at Mechanicsville. One specimen clung with such tenacity to the log on which it was observed that, while the empty shell came away in the collector's fingers, the animal itself remained adhering to its foothold.

On the 13th October a good find of *Campeloma decisum*, Say, was made in McKay's Bay, New Edinburgh. The shells, though not of so bright a green as those of the Rideau, are nevertheless of good colour, very large, and beautifully clean.

Two weeks later the same locality was visited, when no living shells were to be found, but numbers of fresh dead specimens were observed with the peristome broken where thinnest and portions of the animal extracted. Whether this was done by muskrats or birds could not be ascertained.

An effort was made during the past year to collect from as many different localities as were accessible large sets of our commonest shells, such as *Limnæa stagnalis, L. palustris, Physa heterostropha* and *Planorbis trivolvis*. Many forms of these protean species have been col-

lected which present characteristics well worth noticing. Comparison of these varietal forms is, however, deferred until more material shall have been accumulated.

In conclusion, we would solicit the co-operation of the members of the Club who have not heretofore taken an interest in the study of our shells. So wide and rich a field as here presents itself should be worked by numerous earnest labourers. Were there more students of this branch of natural science amongst us, vexed questions of variation and distribution might be settled and our present knowledge of the molluscan fauna of Canada would certainly be very much increased.

F. R. LATCHFORD.
PASCAL POIRIER.

14th February, 1884.

MR. WHITEAVES enquired how many species of molluscs were known to exist in this locality.

MR. LATCHFORD replied that the Club lists enumerated over 100 species, and although it was probable that a critical revision might slightly reduce this number, he thought the reduction would in time be more than made up by species yet unnoticed here, but whose distribution to the south and east left little doubt of their occurrence in this vicinity.

MR. WHITEAVES stated that there were in North America two distinct types of bivalve; one eastern, ranging from the Atlantic to the Alleghanies, the other western, from the Mississippi to the Pacific, and that these two types overlapped to some extent. The introduction of the western species was probably due to canals and navigation through the great lakes. He thought that the Anodontas particularly had been unduly increased in number of species, and that the present tendency was to consider all North American forms as a single species analogous with *A. cygnea* of Europe.

MR. LATCHFORD said that while the number of Anodontas had undoubtedly been placed too high by the addition of synonyms, he was still far from thinking that our shells could by any possibility be reduced to one species; and further, that when the unvisited lakes and streams had been examined even a few more might be added to our list.

REPORT OF THE ENTOMOLOGICAL BRANCH FOR THE SEASON OF 1883.

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

The depth of snow by which the ground was covered during the winter of 1882-3 was in a very high degree favourable to the preservation of insect life, by protecting hybernating larvæ and pupæ from sudden alternations of temperature, and from the attacks of birds, mice and other animals. In consequence the depredations of insects became noticeable almost simultaneously with the development of vegetation. Foliage, in many instances, was devoured in the bud, or immediately after expansion by the numerous larvæ which had safely hybernated. An even greater snowfall during the present winter will be conducive to an abundance of insects in the coming spring, and from having been protected for two successive winters, it is highly probable that many injurious species will prove decidedly troublesome during the coming season.

Although specimens of hybernating butterflies such as *V. antiopa* and *V. milberti* were seen as early as the 13th and 15th April, with some coleoptera, diptera and a few hymenoptera, the weather during that month was cold, and the snow disappeared slowly, there being a fall of about two inches as late as the 27th. It was only on the entrance of May that it became warm and favourable to the appearance of the main body of the insect army.

HYMENOPTERA. Observations were continued last summer on the family Uroceridæ, and one species not previously recorded as abundant or injurious was found in considerable numbers in and about the city. The species is known as the white-horned Xiphydria (*X. albicornis*, Harris), and the females may be observed from 15th June to end of July depositing their eggs in the bark of maple trees. A paper on this insect will be found in the Report of the Entomological Society of Ontario for 1883. The minute parasite *Pteromalus vanessæ* which was mentioned in last year's report as so frequently infesting the pupæ of *V. antiopa* was not nearly so abundant last summer, and a large proportion of chrysalids were free from them. Two broods of 19 and 11 were noticed, of which all the members passed successfully to the

perfect butterfly. The chrysalids of *Pieris rapæ*, on the other hand, were very much infested by *Pteromalus puparum*, and the increase of this injurious butterfly was correspondingly checked. Sawfly larvæ, probably of *Nematus similaris*, were found feeding upon locust, but not in sufficient numbers to do much damage.

LEPIDOPTERA. Several good specimens belonging to this order were taken during the past season, and notes were made concerning the life histories of some of the better known species.

Among the Diurnals mention must be made of a handsome specimen of *Fenisica Tarquinius* taken by Mr. Hanham on 17th May, 1882, at Hull, and of a specimen of *Grapta J-album* taken by Mr. F. R. Latchford in the Beaver Meadow at Hull. Both of these are rare in this locality. Besides these not many rare butterflies have been added to our collections during the past season; the injurious insects, however, were, as usual, too well represented. The imported small white cabbage butterfly *Pieris rapæ* (notwithstanding the fact that hundreds of the larvæ died from a fungous disease when half grown), was very injurious in gardens, attacking the sweet mignonette, *Reseda odorata*, in preference to all other plants, not even excepting the cabbage itself. This latter plant, however, did not escape the visits of unwelcome guests; no sooner were the young plants put out in the spring than they were at once pounced upon by the flea-beetles, *Halticæ*, and the cabbage-fly, *Anthyomia brassicæ*, and in many places almost exterminated. The larvæ of the different cut-worms, *Agrotis*, also did their share, and later in the year the survivors were vigorously assaulted by unusual numbers of the beautiful black velvet and yellow striped caterpillars of *Mamestra picta*. This larva has usually been noticed here as feeding on sweet-peas and the feathery foliage of asparagus. In the latter instance, of course, it did very little harm.

The currant bushes seemed freer than usual last season from the ravages of the currant moths and saw-flies. These should never trouble the horticulturist, for with a little care and attention, such as two or three applications of powdered hellebore, they are easily mastered. The gooseberry fruit worm is much more difficult to combat and was very troublesome in the month of June. It was also plentiful on the wild gooseberries *Ribes oxycanthoides*, growing in Dow's swamp.

Some fine specimens were secured of the different kinds of American silk worms. *Actias luna*, the swallow-tailed luna moth was particularly abundant both in the *larval* and *perfect* states, as also was *Telea Polyphemus*. *Platysamia Cecropia* and *Callosamia Promethea* occurred but not so commonly. The cocoons of the last two, however, are not uncommon on our city shade trees and in gardens: *P. Cecropia* chiefly on apple and maple trees, and *C. Promethea* almost entirely on lilac (*Syringa vulgaris*). All of these moths are preyed upon in their preparatory stages by birds who pierce the tough cocoons with their bills, and extract the juicy pupæ. They are also preyed upon in the larval state by parasitic Hymenoptera.

The larvæ of *Edema albifrons* were particularly abundant on maple trees in September and October. Several species of Lepidoptera have been reared from the larval stage during the past season; among the most interesting were *Darapsa versicolor*, from larvæ found on *Nesæa verticillata*. Other larvæ found on *Cephalanthus occidentalis*, but not brought to maturity were referred to this species. *Sphinx drupiferarum*, from plum trees; *Sphinx gordius*, from apple trees; *Sphinx kalmiæ*, from a pupa found beneath drift wood on Kettle Island by Mr. Harrington, on 19th May. This is particularly interesting as it must have been submerged for some weeks during the spring freshets.

Smerinthus excæcatus. A pair of these handsome moths was taken *in coitu* on the trunk of a white poplar in June. From these about 20 eggs were saved which began to hatch out on the 15th June. The first caterpillar was ready to pupate, and buried on 9th July. Last caterpillar buried on 19th July.

Callimorpha militaris. The larvæ of this moth were found very abundantly on wild gooseberry and maple in the month of June. Some larvæ were collected which pupated on 15th June, and produced the moths on 7th July. The moths were in great abundance, especially in Beechwood.

The Hickory Tussock moths, from larvæ collected at Hull on *Carya amora*.

A single specimen of the rare *Platycerura furcilla*, Pack. was bred from a larva taken on *Pinus strobus* at Stewarton in September, 1882. It spun up on 27th September, 1882, and emerged on 3rd June, 1883.

The wingless female moths of the canker worm *Anisopteryx pometaria* were very plentiful during September and October, but no appreciable amount of damage has been observed in this locality from this cause.

On the whole, the season was a fairly good one for Lepidoptera.

DIPTERA. *Anthomyia radicum*, the Turnip-fly, was noticed as common, and as being destructive, while the Radish-fly *Anthomyia raphani*, Harris, (possibly identical with the foregoing) was particulary abundant, and in some localities almost entirely destroyed the crop of radishes. These are small greyish flies, somewhat resembling a diminutive house fly.

Some locust trees on Nepean street were badly infested by the larvæ of *Cecidomyia robiniæ* in July. The eggs are laid along the edges of the leaflets, and the irritation produced by the young larvæ causes the edge of the leaflet to curl over and swell up. Several larvæ were found on each leaflet, and the appearance of the graceful foliage was very sadly altered. The pupa state is also passed under the rolled portion of the leaf, and when the fly is ready to emerge the pupa works itself partially out at one end of the flap in order that the fly may make its appearance unrestrained.

COLEOPTERA. In this order, work has been so far advanced that Mr. Harrington has been able to prepare for publication a list of the beetles found in the vicinity. A visit was made to Ottawa in July by the late Dr. LeConte, for the express purpose of examining any local collections of Coleoptera, and of meeting those interested in entomology. Unfortunately, two of the leaders in this branch were absent, and were thus deprived of the pleasure of meeting that distinguished entomologist. Although Dr. LeConte's health had been failing for sometime, the tidings that he had died on 15th November came unexpectedly to most entomologists, all of whom felt that in his death entomology had sustained the loss of her most experienced and eminent student and teacher.

A great number of interesting species of beetles were taken during the year, including many not previously found, but mention can only be made here of a few species.

Calosoma frigidum. A specimen of this beetle was taken on Kettle Island on 19th May. *C. calidum* is common here, but no other specimen of *frigidum* has come under our notice. Many other species of Carabidæ were taken on the same date. *Diplotaxis tristis.* On the occasion of the Club Excursion to King's Mountain on the 24th May, this beetle was very abundant under and on the pines near which the members lunched. *Hoplia trifasciata* was at the same time somewhat numerous on the flowers of *Viburnun lantinoides* and the catkins of willows. *Phymatodes thoracicus.* During the early part of June, Mr. Fletcher obtained a number of these interesting longicorns which had bred in an old wine cask then used by him as a water-barrel. *Toxotus vittiger.* This beetle was captured at Casselman at the Club Excursion of 23rd June. Among other interesting species taken on the same day were *Elaphrus cicatricosus, Languria inornata* (var. *gracilis*) *Aphodius hyperboreus, Leptura subhamata,* (on oak) *Disonycha carolin-iana,* (on *Rumex salicifolius*) *Silpha inæquale* and *Psephenus Lecontei,* all aditions to list. *Purpuricenus humeralis.* A fine male of this handsome beetle was taken near Rideau Hall on 27th June, and a female was found upon the sidewalk on Sparks Street, about a fortnight later. This species occurs in the middle and western States, and although recorded from Canada we have been unable to find where it was captured.

Tanysphyrus lemnæ, Fab. Immense numbers of this minute weevil were observed on 26th July upon the correspondingly minute water-plant *Lemna minor,* by which the surface of the brook flowing from Fairy Lake was entirely covered. On the same day the voracious blister-beetle *Macrobasis unicolor,* Kirby, was seen in destructive abundance on meadow-rue (*Thalictrum Cornuti*). *Stenotrachelus arctatus,* Say, was unusually numerous during October, and occurred until the middle of November. *Phyllobrotica decorata,* Say, was taken during July, at the Mer Bleue and along the Canal, feeding in large numbers upon *Scutellaria lateriflora.* Among injurious beetles which were destructive during the summer may be specially mentioned *Diabrotica vittata,* Fab., greatly infesting cucumbers, and *Crepidodera cucumeris,* Harris, and *Phyllotreta viltata,* Fab., which did great damage to all garden crucifers, such as cress, radishes, etc.

Several bags of moss were collected in Dow's Swamp, Stewart's Bush, and near Hull, just before the snow fell, and a large number of beetles were obtained therefrom, including many (principally of Scydmænidæ, Pselaphidæ and Staphylinidæ) not previously found. The beetles so collected include representatives of over twenty families, and probably of nearly one hundred species, and are interesting as affording evidence of the hybernation of such a number of our species, including many which were not known to us as hybernating in the perfect state.

HEMIPTERA. So little work has been done in this order that we are only able to mention one or two species, which, by their abundance attracted attention during the summer. The destructive currant-aphis, *Aphis ribes*, Linn., infested both the red and white varieties, the leaves being all curled up and shrivelled. *Pœcilocapsus lineatus*, Fabr., was first noticeable from its ravages upon a large patch of burdocks in the city, the leaves of which were so badly attacked as to have the appearance of being scorched. Later in the season the bugs were found upon currant and mint; but these were by no means the only plants attacked by these very injurious insects. Many species of tree-hoppers and other plant bugs were remarked as being more than usually plentiful.

ORTHOPTERA. The only species which we have to mention in this order is *Œdipoda corallina*, Harris, which was seen in great abundance (it is usually rare here) in oat fields near Hull during the month of June, and which must have done considerable damage.

NEUROPTERA. We regret to have to state that nothing was done in this order.

ARACHNIDÆ. Since the inception of the Club a number of spiders and mites have been collected in this vicinity. A few of the former, mostly belonging to the genus Epeira (the species of which spin a wheel-like web) have been kindly determined by Mr. J. H. Emerton, of New Haven, Conn., and it will be interesting, at least, to record their occurrence.

Epeira trifolium, Henz., is a large and beautiful spider found in and about dwellings. Two specimens were collected by Mr. Ripley, formerly of this city.

Epeira marmorea, Fabr., was found in large numbers hanging on a web between trees and blades of tall grass in the vicinity of Dow's Swamp, near the city.

Epeira patagiata appears to be rather common. A very dark variety is found occurring with the normal light-coloured variety.

Epeira scopetaria.

Epeira strix, Henz., is found along the banks of streams.

Epeira fasciata, Henz., (not the original *E. fasciata*, Latreille,) was found close to the ground in meadows and pasture fields.

Epeira displicata, Henz., is a small species found in meadows in the grass and on low bushes.

Dolomedes tenebrosus, Henz., is a large and beautiful spider, found in dry dark places, coming out of its hiding place at night in search of food. It does not spin a web, and carries its cocoon on its back.

Eylais extendens, Müller, is the round red water-mite which makes such a pretty object swimming round among the weeds in pools and sluggish streams.

Atax Bonzi, Claperède, was found under and between the gills of a number of Unio luteclus from the Rideau River.

Atax ypsilophorus, Bonz., was found in large numbers under the gills of *Anodonta fragilis* from Meech's Lake. This species has been already very well described and figured by Dana and Whelpley in Gilliman's Journal, vol. 30, under the name of *Hydrachna formosa* as occurring parasitic on some American unios.

W. HAGUE HARRINGTON,
JAMES FLETCHER.
J. B. TYRRELL.

28th February, 1884.

In answer to Mr. R. B. Whyte, it was explained that the larva which he had found so destructive to his gooseberries—living in the fruit—was that of *Anthomyia grossulariæ.*

REPORT OF THE ORNITHOLOGICAL AND OÖLOGICAL BRANCH FOR THE SEASON OF 1883.

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

The leaders in ornithology and oölogy beg to report that good work was done during the past season in the branch under their charge.

No sub-excursions were organized, other than those participated in by all the members of the Club, as it was found that, although productive of a large increase of work in other branches, they were, except in special cases, unsuitable to ornithology.

The colony of great blue herons (*Ardea herodias*, L.) mentioned in last year's report was visited on 18th May by a gentleman from Lennoxville, P.Q., who states that he was obliged to wade to the nests through water from three to four feet deep. He climbed four trees, and obtained, in all, thirty-eight eggs, all of which, however, were hard set. He says, moreover, that every nest contained from five to six eggs, whereas, when the heronry was visited in July, 1882, not more than three young birds were found in any one nest. Whether these numbers are usual, and if so, what causes the discrepancy between the number of eggs laid and the number of those which mature are questions well worthy of investigation next season.

During the past season the following species have been added to the "List of Birds found in the Vicinity of Ottawa," published in Nos. 3 and 4 of the "Transactions." The numbers refer to Coues' "Check List of North American Birds," 1882 edition.

13. *Turdus ustulatus swainsoni* (Cab.) Coues' Olive-backed Thrush. A fine specimen of this thrush was shot on the 14th April last, on the banks of the Rideau River, by Mr. Edward White. Later, on the 19th May, a pair was observed on Kettle Island by Mr. W. L. Scott, and the male bird shot. It is quite probable that they breed here, as the last mentioned locality is frequently the breeding place of numbers of Wilson's thrushes (*Turdus fuscescens*, Steph.).

81. *Cistothorus stellaris* (Licht.) Cab. Short-billed Marsh Wren. A female of this bird was shot in a beaver meadow not far from the

city on 2nd June by Mr. Geo. R. White. Mr. Scott found the same species very abundant during the month of August in the marshes along the Rideau, about twenty miles from the city.

126. *Dendroeca tigrina* (Gm.) Bd. Cape May Warbler. Mr. E. White succeeded in securing a pair of these rare warblers near the Rideau River on the 24th May. Dr. Coues says that they are "not a common bird with us," and Audubon states that they are exceedingly rare. According to the list of Messrs. Morden and Saunders, only one specimen is recorded from Western Ontario. Mr. McIllwraith, however, in his list of the birds of Hamilton, considers them as only "rather rare." They are not mentioned in Mr. Chamberlain's list of the birds of St. John, but are stated, in an appendix, to occur in other parts of New Brunswick.

173. *Vireo philadelphicus*, Cass. Brotherly-love Vireo. A single specimen was shot on 2nd June by Mr. E. White.

176. *Vireo flavifrons*, V. Yellow-throated Vireo. A male bird shot towards the middle of June.

177. *Vireo solitarius*, V. Solitary, or Blue-headed Vireo. A male of this bird was shot on 2nd October by Mr. E. White.

227. *Passerculus sandvicensis savana* (Wils.) Ridg. Common Savanna Sparrow. Specimens of this diminutive sparrow were obtained by Prof. Macoun in the month of May, in the vicinity of the St. Louis Dam; and Mr. Geo. R. White noticed them about the Rifle Range, where they were probably breeding, during the whole of the summer.

282. *Passerella iliaca* (Merr.) Sw. Fox Sparrow. Three specimens of this handsome sparrow were shot, one in April, one towards the beginning of June, and one on 8th November.

380. *Contopus borealis* (Sw.) Bd. Olive-sided Flycatcher. A pair was shot within a short distance of the city on 24th May.

385. *Empidonax trailli* (Aud.) Bd. Traill's Flycatcher. Two specimens of this flycatcher were obtained, one on 13th May by Prof. Macoun and a second on 24th May by Mr. E. White.

444. *Picoïdes americanus*, Brehm. Banded-backed Three-toed Woodpecker. A fine female of this bird was shot by Mr. E. White on 5th November.

473. *Asio accipitrinus* (Pall.) Newt. Short-eared Owl. On Oct. 6th Mr. Geo. R. White shot a pair of these owls not far from the city, and on 28th October another individual was seen by Mr. Scott.

505. *Falco columbarius*, L. Pigeon Hawk. A fine male was shot on 7th April while in pursuit of some tame pigeons.

524. *Buteo pennsylvanicus* (Wils.) Bp. Broad-winged Buzzard Hawk. Prof. Macoun shot a specimen of this bird on 15th May; a second specimen was shot on 24th May.

525. *Archibuteo lagopus sancti-johannis* (Gm.) Ridg. American Rough-legged Buzzard. On the 8th November last a male of this fine hawk was shot not far from the city by Mr. Geo. R. White.

532. *Aquila chrysaëtus*, (L.) Cuv. Golden Eagle. A female of this species was shot on 30th Oct. by Mr. J. Saxon Castleman on the banks of the River Castor, about two miles and a half above Casselman Station, and forty miles from the city. Another was seen near the same place a short time afterwards. Mr. Castleman says he recollects having seen two or three other specimens which were taken in his section in the past; and there are also other recorded instances of its occurrence in this locality.

617. *Actodromas bonapartii* (Scl.) Coues. White-rumped Sandpiper. One specimen shot. It was found in company with a number of other sandpipers, principally Least (*Actodromas minutilla* [V.] Coues), and Pectoral (*Actodromas maculata* [V.] Coues).

Most of the species enumerated above were kindly checked by Dr. Coues, of Washington, D.C.

Besides the above, additional specimens of the following species which appeared in last year's "List of Additions" were taken during the past season:

Myiodioctes pusillus (Wils.) Bp. Green Black-capped Fly-catching Warbler. This species appeared to be quite common, for some days, towards the middle of last May.

Chrysomitris pinus (Bartr.) Bp. Pine Linnet. A flock of these birds was seen on 30th October, and another on 11th November; but, so far, they do not appear to be nearly as common as they were last year.

Spatula clypeata (L.) Boie. Shoveller Duck. Two females of this duck were observed on the Ottawa, some distance below the city, last October.

On page 34 of *Transactions* No. 3, No. 609 should have been omitted.

The following is a list of birds, giving the dates on which they were first noticed, in the vicinity of Ottawa, last spring (1883). It is hardly necessary to remark that these dates are merely the dates on which the birds were *first noticed*, and that many of them may have really arrived much earlier :

Feb'ry 20—*Eremophila alpestris* (L.) Boie., Shore Lark.
March 1—*Corvus frugivorus* Bartr., Crow.
" 10—*Astur atricapillus* (Wils.) Bp., Goshawk.
April 1—*Turdus migratorius* L., Robin.
" 6—*Sialia sialis* (L.) Hald., Blue-bird.
" 7—*Melospiza fasciata* (Gm.) Scott. Song Sparrow.
" 9—*Iridoprocne bicolor* (V.) Coues., White-bellied Swallow.
" 9—*Ardea herodias* L., Great Blue Heron.
" 9—*Quiscalus purpureus æneus* Ridg., Bronzed Grackle.
" 10—*Junco hiemalis* (L.) Scl., Common Snowbird.
" 10—*Contopus virens* (L.) Cab., Wood Peewee.
" 11—*Regulus satrapa* Licht., Golden-crested Wren.
" 11—*Sphyropicus varius* (L.) Bd., Yellow-bellied Woodpecker.
" 13—*Sturnella magna* (L.) Sw., Meadow Lark.
" 13—*Sayiornis fusca* (Gm.) Bd., Pewit Flycatcher.
" 14—*Mergus merganser* L., Goosander.
" 14—*Poœcetes gramineus* (Gm.) Bd., Bay-Winged Bunting.
" 14—*Colaptes auratus* (L.) Sw., Golden-winged Woodpecker.
" 14—*Astragalinus tristis* (L.) Cab., Goldfinch.
" 14—*Agelæus phœniceus* (L.) V., Red-winged Blackbird.
" 14—*Turdus unalascæ nanus* (Aud.) Coues., Hermit Thrush.
" 14—*Turdus fuscescens* Steph., Wilson's Thrush.
" 14—*Progne subis* (L.) Bd., Purple Martin.
" 14—*Ceryle alcyon* (L.) Boie., Kingfisher.
" 14—*Certhia familiaris* L., Brown Creeper.
" 15—*Spizella domestica* (Bartr.) Coues., Chipping sparrow.
" 15—*Zonotrichia albicollis* (Gm.) Bp., White-throated Sparrow.
" 15—*Anas obscura* Gm., Black Duck.
" 15—*Molothrus ater* (Bodd.), Gray Cowbird.
" 15—*Zonotrichia leucophrys* (Forst.) Sw., White-crowned Sparrow.
" 17—*Mergus cucullatus* L., Hooded Merganser.
" 18—*Carpodacus purpureus* (Gm.) Gr., Purple Finch.
" 21—*Hirundo erythrogastra horreorum* (Bart.) Coues., Barn Swallow.

April 21—*Gallinago wilsoni* (Temm.) Bp., Wilson's Snipe.
" 26—*Spizella monticola* (Gm.) Bd., Tree Sparrow.
" 28—*Pandion haliaëtus* (L.) Sav., Fish Hawk.
May 2—*Dendrœca coronata* (L.) Ga., Yellow-rumped Warbler.
" 2—*Chaetura pelasgica* (L.) Steph., Chimney Swift.
" 2—*Aïx sponsa* (L.) Boie., Wood Duck.
" 2—*Circus cyaneus hudsonius* (L.) Coues., Marsh Hawk.
" 3—*Anorthura troglodytes hiemalis* (Wils.) Coues., Winter Wren.
" 3—*Troglodytes domesticus* (Bartr.) Coues., House Wren.
" 3—*Accipiter fuscus* (Gm.) Bp., Sharp-shinned Hawk.
" 5—*Passerculus sandvicensis savana* (Wils.) Ridg., Savanna Sparrow.
" 5—*Ægialites vociferus* (L.) Cass., Killdeer Plover.
" 5—*Tringoïdes macularius* (L.) Gr., Spotted Sandpiper.
" 10—*Mniotilta varia* (L.) V., Black and White Creeper.
" 10—*Parula americana* (L.) Bp., Blue Yellow-backed Warbler.
" 10—*Helminthophila ruficapilla* (Wils.) Bp., Nashville Warbler.
" 10—*Dendrœca aestiva* (Gm.) Bd., Summer Yellowbird.
" 10—*Siurus auricapillus* (L.) Sw., Golden crowned Thrush.
" 10—*Pyranga rubra* (L.) V., Scarlet Tanager.
" 10—*Zamelodia ludoviciana* (L.) Coues., Rose-breasted Grosbeak.
" 10—*Melospiza palustris* (Bartr.) Bd., Swamp Sparrow.
" 10—*Icterus galbula* (L.) Coues., Baltimore Oriole.
" 10—*Falco sparverius* L., Sparrow Hawk.
" 11—*Turdus mustelinus* Gm., Wood Thrush.
" 12—*Tyrannus carolinensis* (L.) Bd., Kingbird.
" 13—*Myiodioctes pusillus* (Wils.) Bp., Green Black-capped Fly-catching Warbler.
" 13—*Anthus ludovicianus* (Gm.) Licht., Titlark.
" 13—*Rhyacophilus solitarus* (Wils.) Bp., Solitary Sandpiper.
" 14—*Mimus carolinensis* (L.) Gv., Cat-bird.
" 14—*Chordediles propetue* (V.) Bd., Night Hawk.
" 14—*Totanus melanoleucus* (Gm.) V., Greater Yellow-legs.
" 15—*Setophaga ruticilla* (L.) Sw., Redstart.
" 17—*Helminthophila perigrina* (Wils.) Cab., Tennessee Warbler.
" 17—*Ampelis cedrorum* (V.) Bd., Cherry Bird.
" 19—*Myiodioctes canadensis* (L.) Aud., Canadian Fly-catching Warbler.
" 19—*Myiarchus crinitus* (L.) Cab., Great-crested Fly-catcher.
" 19—*Empidonax minimus* Bd., Least Fly-catcher.
" 19—*Melanerpes erythrocephalus* (L.) Sw., Red-headed Woodpecker.
" 24—*Dendrœca castanea* (Wils.) Bd., Bay-breasted Warbler.
" 24—*Actodromas minutilla* (V.) Coues., Least Sandpiper.
June 2—*Vireo olivaceus* (L.) V., Red-eyed Vireo.

Last spring, most of the winter birds were very late in going north. Red Cross-bills(*Loxia curvirostra americana*, [Wils.] Coues) and Pine Linnets (*Chrysomitris pinns*, [Bartr.] Bp.) were seen as late as 10th May, and the Pine Grosbeaks (*Pinicola enucleator* [L.] V.,) which had been particularly abundant all season, were not all gone before 21st April, up to which date also the lesser Red-polls (*Ægiothus linaria* [L.] Cab.) were still with us.

Several pairs of the last mentioned species, indeed, must have remained a good part of the summer, for Prof. Macoun noticed them up to the 6th of June, among some cedar bushes at the west end of Maria street, where they appeared to be breeding. But, as Prof. Macoun left town on the date mentioned, and remained away the greater part of the summer, their further movements are unknown.

This fall, too, the winter birds have appeared very early. Five Bohemian Waxwings (*Ampelis garrulus*, L.) were seen feeding on the seeds of a Black Birch (*Betula lenta*) on 11th November, and two others were seen a few days afterwards. The Pine Grosbeaks and Red-polls were still earlier, the former arriving on 1st November and the latter on 30th October. ' Some of our summer birds have, on the other hand, far outstayed their usual limits; for a Robin (*Turdus migratorius*, L.) was shot on 15th November, and a male Goldfinch (*Astragalinus tristis* [L.] Cab.) on the 25th of the same month.

Tree Sparrows (*Spizella monticola* [Gau.] Bd.) were unusually abundant here this fall, while on their way south, i. e. from 24th to 30th October, Yellow-rumped Warblers (*Dendræca coronata* [L.] Gr.) were seen on 6th October. The latter species was particularly common last spring, from the beginning till towards the end of May. The Nashville Warbler (*Helminthophila ruficapilla* [Wils.] Bd.), formerly considered very rare in this locality, was also quite common towards the middle of last May. Two additional specimens of the Hudsonian Chickadee (*Parus hudsonicus* Forst.) have been noted this fall, the one by Mr. Scott, the other by Mr. George R. White, bringing the total number recorded from this locality up to six.

The leaders beg to call attention to the fact that every member of the Club, whether directly interested in the study of Ornithology or not, may render very material assistance to the work of the branch by

noting down the earliest date on which any bird is seen in the spring, and transmitting these notes to the leaders at the close of the season. Notes of the latest dates, on which the birds are seen, in the autumn, are also of great value.

The leaders cannot close this report without calling attention to a great event in the history of Ornithology, which took place during the past season. Last September, a number of the ablest Ornithologists on the continent held a meeting in New York City, and founded the "American Ornithologists' Union." The formation of such a society was the one thing necessary to ensure the rapid and systematic development of American Ornithology. Should any of the members of the Ottawa Field-Naturalists' Club be desirous of bringing any notes, or other communications, before the notice of the Union, they may do so through the medium of either Professor Macoun or Mr. W. L. Scott, both of those gentlemen having been elected associate members of that body.

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

20th December, 1883. *Leaders.*

REPORT OF THE ZOÖLOGICAL BRANCH.

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

In making a report on what was done last year in this branch, the difficult question presents itself, what is left to zoölogy outside of the branches of it which have already reported on their sections of animal life, viz., the ornithological, conchological and entomological, seeing that the field of enquiry and discovery has been well worked by the leaders of those branches. As, however, zoölogy covers all animal life, the leaders of this branch consider that it embraces any fact in the animal kingdom worthy of notice not as yet reported during the past year. No regular sub-excursions of the Club in this branch were held, but a number of interesting facts were noted by various members, and the following brief observations are now submitted as likely to prove of local interest.

Mr. Scott, who partially took up the study of the *randiæ* or frogs, mentions four species as coming under his notice, viz., the Leopard Frog (*R. halecina*, Kalm), both green and brown skin, with large distinct spots (the green being the true edible frog), and the Bull-frog (*R. catesbiana*), both abundant; the Pickerel Frog? (*R. palustris*, LeConte), which he found only in Patterson's Creek, and the Wood Frog (*R. temporaria*, LeConte,) var. *sylvatica*, tolerably common. The last is a small species, with a heavy dark brown line on each side of the head, and varying considerably in colour. Mr. Scott has experimented with a pair taken by him on the 9th November, since which date he has kept them in his room in a vessel with about half an inch of water, renewed daily. Although not becoming torpid, owing probably to the artificial warmth, yet they refused food of all kinds absolutely, and this circumstance evinces the fact of the *ranidæ* being able to sustain life for long periods without food.

The duration of the hibernation of frogs depends materially on climatic conditions of the seasons. A Leopard frog is reported to us as found above ground on the 7th November, and a mass of frog spawn was noticed on the 20th April, showing that the depositors of it had already been at work. The 23rd or 24th April is usually the date on which frogs are first heard in this vicinity, but local causes may so

influence certain ponds as to arouse the hibernating animals earlier than in others, such, for instance, as a large inflow of warm surface water into a small pond, or the effect produced by the reflection of the sun's rays from rocks surrounding it.

Three species at least of tree toads have been noticed in this vicinity, but only one actually placed, the common Tree Toad (*Hyla versicolor*), of which several young specimens were seen on small pines on 17th May. A few full grown specimens were met with during the summer. The study of the tree toad is desirable, as there is no record of the varieties in this vicinity. Mr. Harrington reports having taken a smaller yellowish tree toad whilst beating shrubbery for insects. It is apparently not so abundant as *Hyla versicolor*, and he thinks it is *H. Pickeringii*, Pickering's tree toad of Polbbook. It would be desirable to have a good series of frogs and toads, snakes and lizards collected, so that the varieties and species might be separated.

The study of snakes and the dates of their first appearance and hibernation in this district has not yet been specially taken up, as far as we are aware. Both Mr. W. L. Scott and Mr. Harrington are working with a view to presenting notes and lists to the Society at some future day on this subject. Mr. Harrington, on 6th May, observed quite a gathering of snakes in Stewart's bush amongst some loose stones, beneath which they had probably hibernated, fully two dozen being seen within a radius of a few yards. Amongst them he noticed three ring-necked snakes (*Diadophis punctatus*), one young and the others 16 to 19 inches long respectively; several large red-bellied snakes (*Storeria occipitomaculata*) about ten inches long, and a number of young snakes one-third that length; also several garter snakes (*Eutænia sirtalis*) about 15 inches in length.

On May 8th, Mr. Harrington found a specimen of the viscid salamander (*Plethodon glutinosus*, Baird) under a rotten log, and on 19th May five specimens of a pretty blue spotted salamander about three inches long under pieces of board and rubbish on the lower end of Kettle Island. This is apparently Jefferson's salamander (*Amblystoma jeffersonianum*, Baird). On 24th May, a number of small semiaquatic salamanders were observed under stones at the edge of the rapids at Hogsback, probably the yellow desmognath (*Desmognathus ocrophæa*,

Cope). Careful research may reward the student in this branch, of which very little is known in this district.

Mention was made in a paper on the fish of the Ottawa district, read before your Society last winter, of a red-bellied minnow, supposed to be a species peculiar to this district, but of the existence of which as a separate species there is much doubt. Nothing has been ascertained further during the past year, but information is desired respecting it. The sheepshead (*Haploidonotus grunniens*, Jordan), which, years ago, was abundant, but which of late has been a rarity in the Ottawa River, is again making its appearance on our markets, and it would be interesting to ascertain whether its reappearance is due to fish protection and the absence of universal netting, or to local causes affecting the water, or to the reappearance of certain food it preys upon. Mr. Harrington noted a large number of dead fish—pike, bass, suckers, perch, etc.—in St. Louis Dam on 28th April. This circumstance has been frequently noticed in that locality in spring, and has been attributed to impurities draining into that body of water during winter from factories and tanyards in its vicinity. Another probable cause of this recurring mortality might be traced to the solid coating of ice over the shallows which are left after the water has been let out of the canal at the approach of winter, and which prevents the fish which remain there from obtaining air. It is a well known fact that, in a pond completely frozen over, unless an opening exists where the fish can approach the surface for air, the majority of them will perish during winter. As the water of the canal is not let out until ice of a considerable thickness has formed, the superincumbent weight settling down with the outflow of the water probably prevents the passage of the fish from many of the pools or shallows, and even presses upon them, or they may congregate in the slightly deeper parts of the dam which later in the winter freeze to the bottom.

A close study of the lake trout of this district is desirable, as it is a disputed point amongst naturalists whether there are really more than one species, and if the so-called different species are not only varieties, influenced by locality, water and food.

Two species of field mice were noticed, the white-footed or deer-mouse (*Hesperomys leucopus*), and the meadow mouse (*Arvicola riparia*),

which is troublesome both in the cellar and garden; in the latter especially, being very destructive during early spring, preying on the tender shoots of plants. These are the mice so detrimental to young orchards in winter, when they bark the young trees beneath the snow to such an extent as to destroy them as completely as if girdled. Last summer a pair of jumping mice (*Zapus hudsonius*, Zimmerman) were found at Prescott, and although that place is not in the Ottawa district, yet it is so near as to induce the idea that it is not improbable they may be found in this vicinity. We have heard of a pair being taken on the Aylmer Road a few years ago, but nothing accurate is known of the capture.

In conclusion, we appeal to the members of the Club to note down any interesting fact that comes before them during the next season of outdoor observations. Much information full of valuable import might thus be imparted to the Club as a body which may appear perhaps trivial to the individual. If members also would make lists of the objects they notice for the purpose of comparison and record the dates of first and last appearance of the rare species, these would be very useful. In following out one branch of natural history any interesting feature of another branch should never be overlooked, as every contributor to science of local interest becomes to a certain extent a public benefactor.

H. B. SMALL.
W. P. LETT.
Leaders.

31st January, 1884.

Mr. R. B. Whyte said the refuse from tan vats was quite sufficient to kill fish, and there was a tannery emptying into St. Louis Dam. He stated that in former years a creek ran down Mosgrove street, on which a tannery was situated, and that every time the vats were emptied numbers of dead fish were seen in the creek.

Mr. Fletcher said that the kangaroo mouse had been found near Aylmer, and that he had, in the month of January, seen frogs moving about in the canal near the Bank Street Bridge, in a pool possibly kept open by a warm spring.

MR. SCOTT said the finding of the kangaroo mouse was important, as it belonged to the Alleghany fauna. He enquired whether pure spirits should be used for preserving reptiles.

MR. SMALL said that care should be taken that the spirits were not too strong, as, if they were, the colour and tissue were both apt to be damaged and perhaps destroyed. He had found from experience that the ordinary druggists' alcohol, 15 above proof, diluted with one-third its quantity of water, was the proper strength. It would also be found very convenient for the collector to keep a common wide-mouthed jar in which to place his specimens when collected, to lie in the spirits till required. A few days after being placed in the liquid they should be taken out and pricked in several places with a sharp pin or needle. This would allow the gas to escape and prevent any discolouration. They could always, if kept under the liquid, be placed in any shape required, as they remained perfectly pliant.

PROF. MACOUN had lost some specimens of small fishes by using too strong alcohol.