1884. 1885.

OTTAWA

FIELD-NATURALISTS'

CLUB

Transactions No. 6

VOLUME II. NO. II.

OTTAWA, CANADA:
Citizen Printing and Publishing Company, Metcalfe St.
1885

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CONTENTS.

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Young, Chas. J. (Perth).
Young, James.

ANNUAL REPORT OF THE COUNCIL.

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

The Council has much pleasure in reporting that the progress of the Club during the past year has been very encouraging. The membership has largely increased, being now 168, the number of new members elected having been 50. Two corresponding members have also been elected, viz.: Mr. J. B. Smith, of Brooklyn, N.Y., a prominent entomologist, and Dr. C. Hart Merriam, the secretary of the American Ornithologists' Union.

The Club excursions were four in number. The first was held on 22nd May, and to it were invited the members of the Royal Society of Canada, then in session in Ottawa, and delegates to that society, with their families. Kingsmere was visited and there were present over 100 persons, of whom 36 were guests of the Club. The second excursion was to Buckingham on 12th June, while the third was held on 24th July, when, through the kind liberality of Capt. Goulet, the Club was enabled to visit the Chat Falls in the Steamer *Chaudiere*. As a slight recognition of Capt. Goulet's generosity toward the Club, two volumes on natural history have been purchased and bound for presentation to him. They are "La Terre et les Mers," by Figuier, and Wood's "Natural History." The fourth excursion was to Casselman on 21st Aug., when the members were kindly received by Mr. and Mrs. Castleman, who have since removed to California. All these excursions were well attended, and were successful in every respect; the first one being the largest and most important yet held.

Sub-excursions were also held on Saturday afternoons during the season, and a number of interesting localities were thus visited.

At the Dominion Exhibition held here in September the Club was represented by collections in various branches, and the exhibit attracted much attention. A silver medal and diploma were specially awarded the Club for the exhibit as a whole, while the following members received individual awards:—Dr. Small, a silver medal for collection of reptiles; Mr. Henry M. Ami, first prize and diploma for geological specimens; Mr. H. P. Brumell, several prizes for minerals;

Mr. R. B. Whyte, first prize for botanical collection; Mr. Fletcher, two first prizes and extra prize for insects; Mrs. Chamberlin, special prize for paintings of fungi; Mr. F. R. Latchford, special prize for collection of land and fresh water shells; and Mr. W. L. Scott, special prize for collection of eggs.

The application mentioned in last year's report, as having been made to the Ontario Legislature for a grant, was unsuccessful, and further efforts during the present year have also resulted in failure.

A large number of very valuable publications have been received in exchange for the Transactions of the Club, or as donations from persons interested in its work, and it has been necessary to purchase book shelves for their reception and to have a number of volumes bound.

Transactions No. 5, Vol. II, No. 1, were published in due time, and contained 152 pages. They have been very favorably noticed by various scientific journals, and have been largely asked for in exchange for other publications.

The winter course of meetings comprised six Soirées, which were well attended, and at which valuable papers and reports were read, which will appear in the next number of the Transactions.

In addition, afternoon lectures were given in Botany, Mineralogy and Ornithology by Prof. Macoun, Mr. Willimott and Mr. W. L. Scott, respectively.

The Botanical Class conducted during the previous winter by Mr. Fletcher was continued by him until the end of May.

At a special general meeting of the Club held on the 28th March the Rules formerly in force were somewhat modified and enlarged in order to provide a Constitution in accordance with the terms upon which incorporation was obtained. A copy of this Constitution was sent to each member, and it was published in the Transactions.

The Council, in performance of their duties, met twenty-three times, with an average two-thirds attendance, while a large proportion of the work was performed by the Standing Committees on Excursions, Soirées and Publishing.

Signed on behalf of the Council,

W. H. HARRINGTON,
Secretary.

TREASURER'S BALANCE SHEET.

Dr. *The Treasurer in account with the Ottawa Field-Naturalist's Club*, 1884-85. *Cr.*

RECEIPTS.		EXPENDITURE.	
To balance from 1883-84.....	$ 12 32	By excursion expenses.....	$ 92 61
Membership fees.....	184 00	Soirée do	5 50
Excursion receipts.....	96 45	Cost of Transactions No, 5..	162 50
Soirée do	2 50	Library expenses.....	13 07
Sales of Tansactions.....	30 75	Printing, miscellaneous....	17 45
		Postage, stationery, etc.....	13 42
		Balance on hand.....	21 47
	$326 02		$326 02

20th March, 1885.

WM. P. ANDERSON,
Treasurer.

ADDITIONS TO LIBRARY.

Among the more valuable exchanges and donations received during the year by the librarian (space cannot be afforded for his complete list) were the following :—

Geological and Natural History Survey of Canada :—"List of Publications," "Reports of Progress." 1870-1882 and Maps, "Palæozoic Fossils," "Mesozoic Fossils," "Fossil Plants," "Figures and Descriptions of Canadian Organic Remains," Decades I-IV, "Catalogue of Canadian Plants," Part I., etc., etc.

Linnæan Society :—"Transactions." Vol. I, etc.

Historical and Scientific Society, Winnipeg :—"Transactions." 12 Nos., etc.

U. S. Geological Survey :—"Mineral Resources of the U. S.," etc.

Brooklyn Entomological Society :—"Bulletin." Vols. I-VII.

Dr. C. Hart Merriam :—"Mammals of the Adirondacks," etc., etc.

Cambridge Entomological Club :—"Psyche." Vols. I, II, Vol. VI, Nos. 117, 129.

Royal Society of Canada :—"Transactions." Vol. I.

Torrey Botanical Club :—"Bulletin." Vol. XI, Vol. XII, Nos. 1, 3.

American Association for the Advancement of Science :—"Proceedings of the Minneapolis Meeting, 1883."

Prof. Edward S. Morse :—A very valuable collection of Papers and Addresses on Ornithology, Conchology, Ethnology, etc., etc.

Dr. George Vasey :—"Agricultural Grasses of the U. S.

American Ornithologists' Union :—"The Auk." Vol. I.

H. B. Small :—"Reports of Dept. Agriculture, Canada," 1870-1883.

Prof. C. V. Riley :—Entomological "Bulletins" and "Reports," etc.

Entomological Society of Ontario :—"Canadian Entomologist," Vols. I-XVI., "Annual Reports," 3-14, and Index 1-13.

REPORT TO THE ROYAL SOCIETY OF CANADA.

(Read at the Third General Meeting, May, 1884.)

During the year that has elapsed since my last report, the Ottawa Field Naturalists' Club has pursued its special work of developing the Natural History of this neighborhood, with all its former vigor and activity, and its prospects have never been more promising than at the present time. It has added forty new names to its roll; it has become an incorporated society in accordance with the Ontario Statutes, and marked success has attended its efforts in every branch of Natural History. In the summer months much zeal was displayed in pursuing the field work, and the efforts of the Council have been specially directed to rendering this work as systematic as possible. Under the direction of the leaders, the various branches,—representing Geology, Mineralogy, Botany, Entomology, Conchology and Ornithology,—made numerous afternoon excursions, some of them being held fortnightly throughout the season. These were well attended by the working members, and those desirous of becoming acquainted with the study of the branch; and in many instances they assumed the character of classes for the instruction of beginners. The regular excursions were held monthly, the attendance varying from twenty-five to sixty. The first excursion of this season has been arranged for Thursday next, that the Club may have the honour of entertaining the Fellows of this society on an outing among the ever attractive Laurentides, and to allow those who are interested in Natural History an opportunity of studying this neighbourhood.

Our soirées or winter meetings were seven in number, at which reports of the work done in the sections during the summer were presented, and papers read on subjects of local interest. The following is the programme:—

Dec. 6th, 1883.—Inaugural Address, by the President.

" 20th, 1883.—Notes on the "Flora Ottawænsis," with special reference to the introduced plants, by J. Fletcher.

Report of the Ornithological Section.

Jan. 7th, 1884.—The Sand-plains and Changes of Water-level of the Upper Ottawa, by E. Odlum.

Report of the Geological Section.

Notes on, and a list of, the Cambro-Silurian Fossils of the vicinity of Ottawa, by H. M. Ami, B.A.

Jan. 31st, 1884.—Edible and Poisonous Fungi, by J. Macoun, M.A., F.L.S., F.R.S.C.

Report of the Botanical Section.

Feb. 14th, 1884.—Ottawa Coleoptera, by W. Hague Harrington.

Revision of the Suctoria, by J. B. Tyrrell, B.A., F.G.S.

" 28th, 1884.—The occurrence of Phosphate Deposits, by G. M. Dawson, D.S., Assoc. R.S.M., F.G.S., F.R.S.C.

Note on a new species of Archæocrinus, by W. R. Billings.

Report of the Entomological Section.

March 13th, 1884.—The Deer of the Ottawa Valley, by W. P. Lett.

Report of the General Zoology Section.

Classes of instruction were continued throughout the winter months, that in Botany being especially successful under the direction of Mr. Fletcher. The attendance was large, and the examination held at the close showed that the course had been earnestly followed. No. 4 of our Transactions has been issued, containing 84 pages and a plate. It embraces the work of the winter of 1882-3, (a copy of which is presented herewith). Our Library is now assuming considerable proportions, being entirely formed of publications received in exchange for our Transactions. As they are all devoted to Natural History and kindred subjects, and represent the work of Naturalists throughout the country, they form a most valuable collection of original papers, such as are not to be found in the ordinary scientific works.

The officers for this year, elected at the annual meeting in March, are :—

Patron—His Excellency the Governor General.

President—H. Beaumont Small, M.D.

Vice-Presidents—1st, James Fletcher; 2nd, R. B. Whyte.

Secretary—W. H. Harrington.

Treasurer—W. P. Anderson.

Librarian—W. L. Scott.

Committee—Prof. J. Macoun, H. M. Ami, F. R. Latchford.

As an evidence of the work we have accomplished, the lists published in our Transactions are worthy of notice. In the field of Botany 920 plants have been collected ; of shells we have found 208 species ; of birds 198 ; of fishes 48 ; and of insects 1004. This last collection, presented by Mr. Harrington during the past winter, is one of special merit. It is arranged and named after the revised classification of Drs. LeConte and Horn, and is probably the first so adopted in this country. As all the collections have been made within a few miles of this city, I think we can reasonably claim to have one of the most thoroughly worked districts of Canada. This local study of Natural History is one we would earnestly ask the Royal Society to encourage. Were local societies, instead of wandering aimlessly among the paths of natural science, to devote themselves to this work, and report it to the meetings of your Society, there would soon be accumulated a fund of information more perfect and complete than by any other method.

May, 28th, 1884.

PRESIDENT'S INAUGURAL ADDRESS.

H. Beaumont Small, M.D.

(delivered 4th dec., 1884.)

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

It is a very great pleasure to me to welcome you here this evening, to inaugurate our sixth series of winter meetings, more particularly as the prospects of the Club are in no way dimmed, and the continued success that attends our efforts is a subject for mutual congratulation. It has been the fate of many Natural History associations to have commenced with equally bright prospects, to have flourished for a year or two and then to have languished and died from a lack of the energy that brought them into existence. With our Club it has been different, each year brings increased strength and each season's work attracts and retains the interest of its members. The reason for this is obvious, for we have a special object in view and a congenial work to perform, and as the knowledge of our local resources increases the desire to augment that information becomes greater.

Since my last address our society has become incorporated in accordance with the Statutes of Ontario. In taking such a step the Council has recognized the prospects of our permanent existence and made the foundation more secure, but the main object in thus becoming a legitimate provincial organization was to pave the way for procuring a Government grant. In this, however, we have not been successful. Our application was apparently received with favor, the Commissioner of Education was visited personally and acknowledged the worthiness of our claim, but we have not received any substantial response. Further attempts will be made this winter, let us hope with better results. The grant of even a small sum would prove of inestimable value; at present all our revenue has to be carefully expended to provide for the necessary current expenses and many much needed improvements postponed for want of funds. Had we the required means our usefulness would be much increased; many schemes might be adopted to stimulate members to greater activity, original research

could be more forcibly promoted, and public benefit achieved by circulating in the surrounding country much useful information.

That members have been doing valuable work has been recognized, and a compliment has been paid to the Club by the selection of one of our number to fill the position of Honorary Entomologist to the Department of Agriculture. We all congratulate Mr. Fletcher on the position he has attained, and I am sure he will receive assistance from every member of the Club in carrying on such observations as may be required of him.

The summer which has passed by has been one of more than ordinary activity to those inclined towards science. The Royal Society met in this city for the third time, affording us another opportunity to attend its meetings and listen to its papers and discussions. As no effort was made by our citizens to recognize the presence of the society here, your Council extended to them an invitation to attend our first excursion, arranged specially for their convenience to the Chelsea mountains. The spot selected was the ever-attractive Kingsmere, the suitableness of which was greatly enhanced by the kindness of Mr. and Mrs. Bourinot, who placed their house and grounds at our disposal and assisted in every way to arrange for the comfort of our visitors.

The day was all that could be desired, our members supported the Council by attending in large numbers, and the guests expressed themselves well pleased both at the natural beauties of the locality and the interesting work of the Club. To those of our members who were active naturalists, working in the field with Dr. Sterry Hunt, Prof. Lawson, Prof. Saunders, Dr. Merriam or Dr. Percifer Fraser was a rare treat, and an opportunity for an interchange of ideas that may never present itself again.

The visit of the members of the British Association later in the season was not lost to us. All must have been interested in seeing so many of the leading English minds personally visiting our country, and at the opportunity it afforded to become acquainted with authorities previously known only through their writings. As one result we have now been placed on the exchange list of several similar British Clubs, at whose gatherings any of our members would be certain to receive a cordial welcome should they present themselves.

The regular Club work has been followed with the usual energy, the system of field work of the previous season being continued in this. The leaders have been actively engaged in directing their various branches, and their reports will show continued progress. The Saturday sub-excursions were well attended by their followers, especially in the early part of the season, as the summer advanced and towards its close they were only held at irregular intervals owing to the absence of some of the leaders and a number of the more active members. The general excursions were as popular as ever. The first of these to Kingsmere, with the Royal Society, I have referred to as particularly interesting. That to the Chats Falls was well attended, and though the time for exploring the surrounding country was limited, our Geolcgists succeeded in making important discoveries in the formations that occur there. The genial Captain Goulet's well-known generosity once more manifested itself, for he again conveyed the party on his commodious steamer. To show that we appreciate his kindness and goodwill, a set of works on Natural History are being appropriately bound and inscribed, to be presented to him. The excursions to Buckingham and Casselman also brought us in contact with distant members. At the former Mr. Warwick did all in his power to point out the places of interest in that district, and at the latter Mr. and Mrs. Casselman renewed the hearty welcome of last year.

This year the Transactions were presented to you early, and are greatly in advance of any of the previous numbers. The papers were lengthy as well as more numerous than in former years, and too valuable to be presented in abstract. In addition, the very valuable list of Coleoptera and unusually interesting reports, maintain the usual excellence of our publication. That the Council is enabled to publish such a work and keep the expenses of the Club within its moderate income, is a sign that no extravagance is permitted, it is for this reason they expect the members to support them by purchasing extra copies. Nearly all have friends elsewhere interested in scientific pursuits by whom the Transactions would be greatly appreciated, and it is by distributing a few copies in such channels that you will extend the influence of the Club and add to its reputation.

Our library is increasing rapidly. In exchange for our Transactions we receive twenty-eight regular publications, eight of which appear monthly. Besides this our free list numbers seventy-three, and of these only twenty-three have not donated something in return. When it is remembered that all are on purely Natural History subjects and all of them modern works, it will be understood what a useful collection we are founding. The librarian is now endeavoring to adopt some scheme by which they may be circulated that all may benefit by what we possess in common.

The winter programme, I hope, will meet with your approval; the papers are fewer in number than those of last year, but more time will be allowed for discussion and short notes on any subject. In the afternoon lectures, to be conducted by the leaders of the several branches, we hope to furnish a very thorough course of instruction, specially adapted for those wishing to gain an insight into any branch, teaching you not only the science, but also how and where to look for the objects you are in search of and how to preserve them, in fact all the information requisite to commence work when the summer arrives.

The work that our Club has in view is perhaps the most attractive that can be offered to those who have a few spare hours and a desire for some intellectual recreation, and it allows of the consoling reflection that the time so spent is in no wise wasted, for besides adding to the range of one's information, it is also aiding a work of lasting benefit. The world is rapidly learning the value of this knowledge, and many are awaking to the fact that there are many interesting fields of science hidden behind the veil of ignorance, a veil which is easily drawn aside by a little study or association with those already versed in Natural History.

Any that attend our meetings or join in our excursions show their appreciation of this knowledge, and by their presence manifest a fondness for nature and a desire to learn something of its mysteries. Many, no doubt, wish they were versed in some branch, but fear to commence, they are overawed by the apparent vastness of the subject and the extensive knowledge of those who have made it their study. Instead of watching the progress of those long experienced, they should look at what there is to do and select some branch suited to their tastes and

circumstances. The beginning once made, all will follow easily, for when viewed with method, each division and sub-division is complete in itself and leads gradually to others more extensive.

Some of our members will attain an eminence and be recognized beyond our little circle; some will build up a reputation that will extend over the American scientific world and reach transatlantic centres; but the greater number of us must rest content with a local record, and be satisfied that our mite, when added to that of others, will be made of some value. We are only amateurs and the work presented is eminently suited for such. There are large fields and small fields; some, where members have already worked and prepared the way, others, for those more ambitious, where little or nothing has been done. For those who cannot take long walks or have not time to make large collections, there are subjects that may be studied in an occasional spare hour, and which may even be studied by the roadside in the daily walks to your office. It is always beneficial to make a retrospect of one's work, to consider the advance made and compare it with what there remains to do, and on the present occasion it may not be inopportune to glance over our work to see what has been accomplished, and ascertain what remains for new workers to begin upon.

Before entering the domain of the lower animals, a subject presents itself which has not yet received our attention, but which would furnish a very appropriate paper for one of our meetings. It is not very many years since where we now live was the home of the native Indian, and a paper on this subject with some historical facts of local interest would prove both attractive and instructive. The remnant of the once numerous tribe that frequented this district is gathered in a few scattered settlements, and as each succeeding year comes and goes the opportunities of acquiring a knowledge of their natural habits and customs becomes less, and with them will pass away innumerable legends and stores of Indian lore which can never again be obtained.

Beginning at the head of the animal series the class *Mammalia* is the first to receive our attention. This comprises all that are popularly known as *animals*. Strange to say, this important division has received very little attention. A paper on the deer has been brought before you, and one on the otter will be presented this winter; beyond this,

nothing has been done with the exception of a few notes embodied in the reports on general zoology. The need of studying this at once, must be evident to you all, as no other class is so influenced by the settling of the country ; species that once were numerous, in a very few years may be reduced to an occasional stray individual. Even now, a paper on any family would, to a great extent, be taken up with detailing how plentiful they were in former years. But while the number of individuals is greatly diminished, the number of species is much less affected. Dr. Merriam in his recent work on the mammals of the Adirondac region mentions 46 species that occur there, and Dekay, in the report of the New York State government, gives about 50. A list published in the bulletin of the Natural History Society of New Brunswick contains 43 as found in that province. In our neighbourhood we should find the class well represented. It would astonish many of our people were they aware of the good-sized animals that may be found in the woods they frequently visit, whose size it would be supposed would render them easily visible, but whose habits of life make them wary, and they easily escape the eye of the unobservant. Within very short distances of the city we may expect to find the greater number on these lists, while at no very great distance the more ferocious are constantly making their presence known, to the detriment of the farmer.

One of our first objects then is the systematic study of our mammals and the preparation of a perfect list. More is required than simply an enumeration of species, to this should be added whatever information may be gained regarding their numbers, their range, and the fact of their being permanent or only visitors. When this is prepared, then notes and papers on particular families may follow with more advantage. In this study all the information you require may be obtained from "Jordan's Handbook of the Vertebrates," and "Dr. Merriam's Mammalia of the Adirondacs." The former is now the generally accepted authority, not only on this, but also on all the classes of vertebrates, and furnishes an excellent working key. In the latter you will find the result of many years observations of a thorough naturalist in a region where the Fauna is essentially Canadian.

The next class, *Aves*, is one we are very intimate with, our ornithologists being among the most active of our members. The list

of those observed is now very complete, numbering 203 species, and the reports of the leaders contain many valuable facts relating to the habits of our pretty songsters, but only one paper has been read, that on the ducks. A beginner entering this field has much to attract and occupy his attention. Although the list must be very complete their migratory habits allow every possibility of discovering a new species. Besides their general habits and characteristics there are many subjects adapted for special lines of observation. Their eggs and nests furnish a study of themselves ; the arrival and departure of the various species is a point that is receiving particular attention just now, and to which should be given a large share of our time ; their songs would make an interesting series of observations, while their power of communicating with one another would provide the subject for an excellent paper. It has always appeared to me that birds, of all members of the animal series, are the ones most suited for our lady members. It is here that nature puts on her most showy and pleasing attire, no long tramps are required to seek them in their haunts, nor any tedious work required to prepare collections. A bird may almost always be watched in its native state and a few minutes reference to the handbook establish its identity. Unlike other members of the animal kingdom, they are visitors, not residents. Some spend the summer with us and take their departure for the south on the approach of cold, while others come for shelter in the winter months from a still colder north, others again only rest a short time in journeying from one clime to another. These pretty visitors are looked on with a more friendly interest when it is remembered that they will return again after several months of wandering, and the very same bird, fed and watched one season, returns the next.

In the classes of reptiles and amphibians we find another field as yet undisturbed. We want some one to tell us what kind of turtles are to be found here, what snakes, what lizards, what frogs, and many other interesting members. For those with limited time these branches are particularly suitable, they are easily sought for and obtained and their number is not great. In a stroll to the nearest woods or along the Ottawa or Rideau rivers several species may be noticed. The whole number will not exceed 50 species. The study of their habits will

quickly become interesting, the wonderful contrivance of nature allowing them to carry their lungs outside, that they may breathe in the water or in the air, will soon attract your attention, as will also the transitions that take place, such as the development of the tadpole into the full formed frog. This branch will also allow much scope and great facilities for original research, information regarding its members is very sparse, and a description of their life will always be valuable.

The class *Pisces* is one that has been studied and a very complete list published, but much yet remains to be done, and more workers are to be desired. The study, unfortunately, has many obstacles to impede its progress. Inhabiting, as they do, an element that cannot be explored, their habits are obscure, while their peculiar structure and delicacy of coloring make them difficult to preserve. For this reason our information regarding their life and habits is very scanty. We want members to trace their range and numbers and habits of life. A very practical point well worthy of your attention is the influence of sawdust in our rivers. Does it affect them or does it not?

In passing from the Vertebrata to the Anthropoda, we enter a most extensive and varied field, where orders surpass in numbers whole classes of the former sub-kingdoms. In addition to the study of individuals, the general characteristics are subjects well worthy of being brought before our meetings. The higher animals are so constituted that life is maintained in a single course, but in the lower, the organs are so rudimentary that the animal makes entire changes to accommodate itself to external influences. This is witnessed in the development of the beetle from the grub, the fly from the maggot, or the butterfly from the caterpillar.

The highest class, *Insecta*, furnishes a continuous series of attractions. The descriptions of the Hymenoptera read like a fairy tale. The peculiar habits of life of the bees and wasps are known to many of you. The ants, with their soldiers and toilers, their aphidian cows carefully tended and even reared from eggs, for the sake of the honey they supply, the evident language they possess, all combine to place them amongst the most marvellous objects of nature and should cause them to receive your attention. They may be found in vast numbers everywhere, but how few stop to watch them! The ichneumons, which

deposit their eggs in the body of living insects, which, when hatched, generally destroy their hosts to sustain their own life, and the gall-flies, each of which forms a characteristic gall on its own special tree, are well worthy of your notice. The horn-tails and saw-flies, destructive foes to some of our most valuable trees, will be brought to your notice during the present course of soirées.

It is remarkable that the order Lepidoptera has not possessed more followers, the gay colours of the butterfly are generally the first attraction of the young naturalist, and all clubs might be expected to have many members working in this branch. Those who are so occupied should make it their primary duty to prepare a list of our species.

The order Diptera, comprising flies, is large and important and presents many suitable fields for beginners.

The order Coleoptera, comprising beetles, you are familiar with. All our Transactions contain papers on them, and a very valuable list was issued in our last number. In the order Hemiptera, or bugs, we want systematic workers. They occur everywhere, in water and on land, some are found only in the top branches of trees, some only in the lower, while other forms remain stationary all their days. Any one possessing house plants may follow this study most readily; here we meet with the plant lice, which are so sought for by the ants and carefully tended for the sake of their honey-like secretion. Then there are the grasshoppers, locusts and crickets that should be described, each forming a good subject for those by whom limited collections only can be made, as also the dragon-flies, and allied insects.

The class of *Myriapoda* or centipedes is not so numerous as the insects, nor as attractive, but should receive your attention as they are wholly unstudied here.

The class *Arachnida* offers you the mites and spiders. The former have received some attention and several new species are figured in our publications. The spiders are repulsive objects, but most interesting in their habits and modes of living. The webs furnish a study of themselves, ranging from special forms, like the diving-bell of the water-spider, to the common geometric web so well known to all.

The *Crustacea* are the lower division of the arthropods, forming to the waters of the world what the insects are to the land. Nine-

tenths are supposed to exist in the sea, the remainder being found in fresh water. Numerous not only in species, but also in individuals, they are found in every pool of water or collection of moisture. They live on animal matter and are active scavengers of our waters. Some are parasitic on other animals inhabiting their element—a favorite place to obtain many forms being the gills of fish. In their turn they are the chief food for our fishes. Nearly all are microscopic, but a few forms grow to a great size, the most familiar of which is our cray-fish, and these would make an excellent beginning for observations in this class.

Of all the sub-kingdoms the Mollusca is the one least represented with us, the term being equal to Vertebrata or Arthropoda with their vast number of species. But two of its classes, *Gasteropoda* and *Conchifera*, are present, the combined number of their species collected being only 116. This is not for want of work on the part of our conchologists, as it is one of our most thoroughly studied branches, but because the land and fresh water contain but few members of that division, so abundantly present in the ocean. The collections in this branch are not difficult to make, and to those who wish to study their habits they offer special inducements, for an aquarium and a handful of snails will supply all the necessary material for a long series of experiments.

In passing beyond the divisions enumerated we come to those lower forms of animal life, the study of which may hardly be in keeping with the title of our Club; with the exception of one class all are microscopic, and so demand work confined to the library rather than to the field. But there may be many who find this more suited to their tastes and circumstances, and to each a varied and attractive world is opened, from which might be produced papers most acceptable for our meetings. The only member who brought this subject before our notice was the late Dr. Kemp, who presented a few notes on the fresh water sponges, and referred incidentally to some members of other classes in a paper on the filterings of our water supply.

The *Annelida* form a class well worthy of your attention and are known to you through the common earth worms and leeches.

The *Rotifera* form a very numerous class, the great majority inhabiting fresh water, the number found in salt water being comparatively small. They are to be found everywhere, in little pools or large bodies of water and by their presence indicate its freedom from the products of decomposing matter. The characteristic feature of the little animals is a circle of processes arranged around their head, each one performing a circular motion, the whole giving the appearance of a wheel revolving around the head.

The marine jelly-fish are represented by two forms. The best known being that many armed minute monster, the *hydra*, which, when cut in pieces, grows into as many fully formed individuals. It is very plentiful, and may always be obtained from the muddy bottom of the canal. The other form is more uncommon, its arms are many branched and it remains anchored to other objects, this species grows as much a two inches in length and in all probability will be found here.

The fresh water sponges form a sub-order of that extensive class; some ten genera have been described from all quarters of the globe representing a great many species. They occur in clear water and grow to a considerable size, though the cold of winter always destroys them.

From these we descend to the single-celled animals, to which the term *Infusoria* is properly applied. They are present in all water and moisture in countless numbers and furnish a vast field for study; researches in this class has been mostly confined to Europe, the American forms have scarcely been worked at all.

Still lower are the *Protozoa*, soft, structureless animals without shape or form, known to you by the amœba. They are innumerable and occur everywhere. It is a class that has received much attention on this continent, and the recognized authority is Prof. Leidy's recent work on the Fresh Water Rhizopods of North America.

This superficial glance over the vast and varied region, the animal kingdom, thrown open for us to wander in, is given with the hope that knowing what there is to be done, in learning how many attractive fields there are yet without workers, some others may be induced to take a more active interest. Each year should see an addition of new members eager and ambitious to continue the work and act as a spur to those already engaged. Our first requisite is a complete catalogue of

all the objects of Natural History that occur in the adjoining country. Among the lower forms of life the difficulties are so great that the prospects of obtaining this end are very dim, but with this exception there is no reason why we should not become thoroughly acquainted with our resources. To accomplish this we want leaders in every class and in many instances we need workers devoted to particular orders or families. It is not necessary that the first lists should approach perfection, any list is better than none, once commenced they are centres which will rapidly increase, and form starting points where others may begin, while an incomplete list will—from its very defects—prove an incentive to many to bring it to perfection.

A natural outcome of all intelligent collecting, beginning with the first efforts in that line, is the developing of the power of observation. Things that before were passed by unnoticed now attract attention and the many relations that natural objects bear to each other are discovered. This is the source of the attraction with which this science retains its followers, without it the hardest worker can never become a naturalist, and rarely continue a steadfast student.

That this power may not be wasted notes should be made of all observations during the preparation of lists, for a record of a series carefully followed is the matter we require for our papers and must mainly constitute our offerings to science. Every fact is of value whether it be general in character or refer to some particular local condition. Notes of local interest, by themselves, may not appear of much importance, but when compared with similar observations from other sources, may prove of the greatest value and may tend to add to our knowledge of faunal distribution, that very important phase of the science of Natural History.

Our work must not end with the perfecting of our lists and publication of scientific records, something more is required of us in this practical age, which it is our duty to furnish. We must be prepared to answer the question which might be put to us by the captious—of what practical use is the Club? Our response to this should be found in the Transactions; there the agriculturalist should learn what are the pests that destroy his crops and how they may be conquered or prevented; the speculator should be able, from their perusal, to obtain the

information that directs him to the mineral deposits that are to be found. In the papers to be read to you, this will, in a great measure, be carried out, and in our notes and discussions it would be well if this practical end were kept in view.

Prof. Macoun said that when the President of the Literary and Scientific Society in his inaugural address a few days previously had stated (when referring to the Club) that the mere collection of a great many species should be but a small part of the work of the Club he had quite agreed with him. But it should not be lost sight of that collections were of great value, for the work performed by any naturalist would to a great extent die with him if his collections were not placed in a museum. He had, for instance, a knowledge of several hundred species of cryptogams, but a list of these without the possession of the specimens would be of little value. Each collector should deposit duplicates where they would be accessible to every one for study and comparison.

Mr. H. B. SMALL alluded to the great value of such a collection, for instance, as one of insects injurious to crops, showing the species destructive to the various plants, as well as the insects which prey upon these injurious ones. There was in Washington such a collection as he had described, and he hoped soon to see one in Canada. With reference to the appointment of Mr. Fletcher as Government entomologist, referred to by the president, he could give a practical instance of the value of such an officer. Specimens of very fine grains intended for the Antwerp Exhibition were condemned by him as unfit, and if sent they would have brought discredit upon the country.

Mr. R. B. WHYTE said that the small resources of our societies rendered it difficult to sustain a museum, and that while it was perhaps posible to overestimate the value of a public museum it was probably too often the case that private collections were undervalued.

Mr. W. L. SCOTT thought that not more than twenty-five reptilia and batrachia could be looked for in the vicinity.

The PRESIDENT explained that the number mentioned by him had been suggested by Dekay's list of those found in New York State.

Mr. HARRINGTON explained that many species found there could

not be look for so far north as Ottawa, and he was disposed to consider Mr. Scott's figure large enough to include all the species likely to be found in the vicinity.

The PRESIDENT stated that he believed this number of species had already been noted.

THE CANADIAN OTTER.

WILLIAM PITTMAN LETT.

Read 18th December, 1884.

The Canadian otter (*Lutra Canadensis*), of which I am briefly to treat this evening, like the wapiti and the wild goose, derives its distinctive designation from Canada, over every part of which, as at present constituted, it is distributed. It belongs to the Mustelidæ, or weasel family, and genus Lutra; of which interesting group of our indigenous mammalia it may be said to stand at the head. With the exception of the black and silver grey fox, the otter is by far the most valuable fur-bearing animal to be found in Canada. Its fur is thick and fine next the pelt, with longer and coarser hairs of uniform length of a glossy dark brown colour, inclining in old animals to greyish, around the under part of the head and belly. Above all other kinds of fur that of the otter is extremely durable, and the darker it is in colour it is the more valuable. I have known an otter-skin cap to have been worn for thirty years, winter after winter; and although somewhat faded in appearance, after frequent repairing and periodical remodelling, the skin was still strong and tough, and the fur by no means worn out. Plucked-otter, dyed, is almost as beautiful as South Sea seal, with the advantage of being much more lasting. Otter-skin coats, caps and gloves are always costly articles of apparel, but when the beauty and durability of the fur is considered, they are always worth the money. From the nose to the tip of the tail a full grown otter measures five feet. The body is thick, compact and muscular. The eyes are small and black in colour. The head short and flat. The teeth are fine and sharp. The neck long and thick, the legs short, and

feet entirely webbed to the nails. The tail, which is somewhat elliptical in shape, rather than flat, is broad, thick and powerful at the root, from whence it gradually tapers off to a point. This massive and muscular tail—which is about eighteen inches long—acts as a rudder, and aids the animal in its rapid turnings when in pursuit of fish, upon which it principally feeds, although not exclusively; for the otter is fond of eating any kind of flesh, especially that of birds. It is said that these animals make considerable havoc among wild ducks, which they can easily surprise and capture by diving underneath them and seizing them by the legs. An adult otter of the largest size weighs about thirty-six pounds. The average weight, however. may be estimated at about twenty-five pounds.

The otter is, perhaps, the strongest and most muscular animal of its size living. In its wild state it is extremely shy; but when cornered beyond the possibility of escape, it is singularly bold and ferocious. Singly, very few dogs can match a large otter. Like many other individuals of the *ferœ naturœ*, which are naturally fierce in their wild state, when domesticated the otter is gentle and docile to an extraordinary degree.

Strictly amphibious, yet chiefly aquatic in its habits, and physically constructed rather for navigation than pedestrianism, the otter, as swimmer and diver, is scarcely second to the seal or the walrus. Amongst the digitigrade carnivora of America no animal of the same size possesses so much muscular power, and few, if any, wear so costly a garb.

Although similar in size and appearance to the otter of the British Islands, the skin of which is of little value, the coldness of our Canadian winter naturally imparts its superiority and commercial value to the skin of the Canadian otter.

As yet, otters have never been hunted in this country with packs of hounds (a cross between the large wiry-haired terrier and the fox-hound) as in the old country. They are invariably taken in steel traps set in the water at the entrance to their dens, or at the foot of their slides, and frequently also at "air-holes" in the ice. During the season of open water, in setting his traps for otters, the hunter, if he can avoid it, never goes on land. While at this work he remains in

his canoe, lest his footsteps, or the touch of his hand might leave any traces of the scent of an enemy on shore. A long chain is usually attached to the trap, the weight of which is intended to drown the animal when it plunges into deep water on finding itself caught. Otherwise, it has been frequently known to gnaw it's paw off and escape. When surprised alive in a trap on land, as sometimes occurs, an otter is exceedingly ferocious and difficult to kill. Its strength and activity under such circumstances are amazing.

I extract the following on the otter from "Mammals of the Adirondacks," a recent most interesting and instructive work written by that accomplished naturalist, Dr. Merriam, of Locust Grove, in the State of New York. I quote from Dr. Merriam, not only because he is an established authority as a naturalist; but also for the reason that his remarks are generally strongly corroborative of what I shall say further on; and which was written before I had the pleasure of seeing his valuable book. Of the otter Dr. Merriam says :—

"It is thoroughly amphibious, making long journeys through the forest, and swimming the lakes and rivers. It can remain under water almost as long as a loon, and I have known one to swim nearly a quarter of a mile without showing its head above the surface. Its food consists chiefly of various species of fish, and the lobster-like fresh water decapod, called the cray-fish. When unable to procure these in sufficient quantity it devours frogs, and it is said to depopulate the poultry-yard, and even to prey upon young lambs. It can dive and swim under water with such speed and rapidity, that it can overtake and secure with great ease and certainty any of the fresh water fishes. In confinement it will eat meat, and is said to prefer it boiled. The number of cray-fish (*Cambarus*) that the otter destroys in the course of a summer, is almost incredible. The otter "sign" that one finds so abundantly about our lakes and streams, on rocks and logs, often consist wholly of the chitinous exo-skeleton of this crustacean. At other times fish-bones are mingled with the broken cray-fish shells. Otters are restless creatures, always on the move, and are constantly roaming about from lake to lake, and river to river. They sometimes go from place to place "just as it happens," so to speak; while at other times they

travel in definite routes, following one water course for a number of days or weeks, and returning by another.

"The nest of the otter is generally placed under some shelving bank, or uprooted tree, and has been found in a hollow stub. The young are commonly brought forth about the middle of April, and two (rarely one or three) constitute a litter. Three otters, the female and her two young, are generally seen together during the summer and fall.

"At all times and on all occasions they manifest an insatiate and uncontrollable desire to break the peace with any dog that chances to cross their path—and woe to the unfortunate brute!"

The extraordinary pugnacity referred to by Dr. Merriam may possibly occur in certain cases, and may, perhaps, be superinduced by age. With domesticated otters up to the age of two years, so far as my daily experience has enabled me to form an opinion, I am obliged to pronounce their demeanor towards dogs to have been of the most friendly and pacific character. On every occasion both of my pet otters were almost affectionate in their advances to their canine friends. I have heard also of other tame otters that had been kept for a number of years, at least four or five, that bore a character of the mildest kind under the circumstances. Wild otters, of course, are always ready for a fight.

Essentially differing from nearly every other species of the family *Mustelidæ*, the otter is peculiar for the total absence of that mephitic and unpleasant odor which so strongly characterizes the skunk, the mink and the weasel. Even the apartment in which an otter has been confined for months is completely free from anything resembling the heavy, disagreeable smell of a dog kennel.

From personal observation I can fully corroborate Dr. Merriam's account of the exterminating manner in which the otter levies contribution upon the cray-fish. In the course of half an hour either of the tame otters which I kept would capture and devour fifteen or twenty of those little fresh water lobsters. They were, also, very fond of mussels, or shell fish, so common in our rivers, diving for them and bringing them to me on shore, and waiting with much impatience while I broke them open with a stone.

Respecting the otter eating frogs, I shall give my experience upon this point presently. When other and more agreeable food is scarce, the animal, driven by hunger may, and possibly does, prey upon frogs in its wild state; but nothing is more certain than the fact that when partially under the restraints, and influenced by the etiquette of civilization, the taste for music in this connection is by no means epicurean.

In India and China otters are taught to fish, and when expert they are let down out of boats with a rope or small cord fastened to them, by means of which they are drawn back into the boat when they have caught a fish. I never found this kind of a safeguard necessary. If one of my otters was in the water and I left the shore or hid from view the instant it rose to the surface it came to land and went in search of me.

The otter usually burrows in the banks of streams, or, if not, appropriates the already excavated den of the muskrat. The entrance to its den from the side of the river, creek or lake is always under water. About three or four feet inwards from the external or lower entrance the hole inclines upwards to a sufficient height for the formation of a dry nest to sleep in. From the sleeping-place an opening is made obliquely through the top of the bank for the double purpose of admitting air and of allowing the passage of the animal in that direction. Advantage is constantly taken of this upper and second mode of exit, which is sometimes concealed by fallen leaves, for the purpose of looking out in order to be certain that no enemies are near.

The sport of sliding, amongst animals, I believe, is peculiar to the otter alone. Otter-slides down the face of steep banks may be seen in both summer and winter. Upon those slides the playful animals amuse themselves for hours at a time, much in the style of taboganning. I spell and pronounce this fashionable word according to the orthography and mode of accentation of Chief Mayaskawatch, late of the tribe of the Algonquins, of which aboriginal branch of the red men of America I have the distinguished honor to be a regularly baptised and duly initiated member. According to the traditions of my tribe, the tabogan was first suggested to the Indian mind by the otter gliding down his slide. The tabogan and the bark canoe are both purely Indian inventions, so perfect in their model and construc-

tion, and so admirably adapted to the purposes for which they were originally intended that no white man has yet been able to improve upon either of them. Like the boomerang of the native Australian they are perfect and insusceptible of improvement.

In the act of sliding, the otter, after a few rapid jumps to gather momentum, stretches himself at full length, with his front legs drawn close to his sides, and his hinder legs stretched out on each side of his massive tail, and on his belly down he goes, if the season be winter, sometimes forty, fifty or a hundred yards, according to the height of the hill. When the ground is free from snow the slides down the bank are not usually more than twelve or fifteen feet. In travelling over ice barely covered with snow or hoar frost the otter generally takes three long bounds and then slides along the smooth and level surface a distance of twenty feet, continuing this mode of travelling for miles. The process of sliding appears as if it gave the animal a rest, as well as its usual amusement, between each succession of jumps.

On account of the shortness of its legs the otter makes very slow progress in deep snow. If the snow has recently fallen and remains in an unconsolidated state, if pursued, it dives under the surface and in an incredibly short space of time may be seen popping up its head twenty or thirty yards off to reconnoitre. After taking an observation down it goes again, regulating its direction by the position of its enemy. If the snow happens to be heavy and closely packed this mode of progress fails and its movements are slow and labored. It can then be easily overtaken by a man on foot; but when overhauled it makes a fierce resistance and a determined battle for its life. It is a well-known fact to those acquainted with its history and habits that the otter in its wild state is fully as fierce, and, under any circumstances, as courageous as a bulldog, and almost as skilled an adept at fighting. Owing to its short legs, on land the gait of the otter is awkward, although a little too fleet for the time of the fastest pedestrian. In water its motions are simply the perfection of ease, grace and elegance. The lightning rapidity of its sinewy plunges is almost beyond belief.

In the pursuit of fish for food the otter does not depend entirely upon its extraordinary speed; nor does it always catch its prey by what might be called a tail on end race. It approaches its intended

victim from behind with great caution. It stretches itself at full length, as when sliding, and with its short front paws paddles itself slowly and stealthily along with its body perfectly motionless, no movement being perceptible but the gentle action of its short fore legs. When within about eighteen inches of its unsuspecting quarry the pursuer arches up its back, like the bending of a bow, and with the speed of an arrow darts upon its victim, seldom failing to seize and secure it at the first plunge. Should it fail in the first attempt, providing the water is clear, the chase is continued, very generally with success. Otters are very destructive to fish. When abundant in a stream they eat a small portion only of each one caught; but when scarce and difficult to find they usually devour the entire body. A full grown otter is quite capable of catching and killing a fish twenty pounds and upwards in weight, either pike, maskinonge or salmon; but I am inclined to the belief that it prefers fish of a smaller and more manageable size.

Otters are extremely fond of cray-fish; but, strange to say, they are not lovers of frogs. After frequent trials I never could induce either of my pet otters to eat a frog, although they were by no means slow at killing them. When fish was not available both of them were satisfied with bread and milk, meat or potatoes. They were, also, always ready for fresh fish or salt, if allowed, of any kind, raw or cooked; although they always preferred getting them living, if possible.

In a domesticated state otters are very docile and playful animals They will follow their master like dogs, literally answering to their names when called. They have two notes or tones of voice, one a sort of satisfied grunt, like that of a pig, the other a shrill half squeal half whistle. The latter is given short and sharp and with peculiar vindictiveness of tone when they are enraged. They are singularly fond of playing with dogs, more especially with water spaniels, with which animals they delight to frolic in the water. In common with dogs, otters appear to have an intuitive knowledge or consciousness of the dispositions of people who either like or dislike them, and exhibit their love or hate at first sight. After a close scrutiny of a stranger, if the impression is favorable they act accordingly, if otherwise they display their repugnance forthwith by an angry whistle, which is invariably

the warning prelude of an unpleasant application of their teeth, most commonly to the bare hand, which they manage to reach by standing erect on their hind legs.

As I have before remarked, tame otters are remarkably fond of dogs of every kind. They seem also to possess the power of exercising a strange fascination over the whole canine race. The conditions are as follows. When a tame otter meets with a strange dog it advances quietly and insinuatingly towards it with a singular serpent-like motion of the head and neck. When close enough the otter endeavors to smell the nose of the stranger. If the dog undergoes this operation quietly for half a minute it is conquered and immediately transformed into a friend, no matter how hostile or uncertain its first intentions may have been. I have seen an Irish water spaniel eight years of age playing around the yard for hours with one of my pet otters in a friendly manner that nothing could induce him, at such an age, to assume towards one of his own species. This mesmeric power of the otter, so far as I know, is a new idea for zoological students, which is no less strange than true. It is a species of animal magnetism which I have frequently seen exercised with unfailing influence and certainty. Another fact may be worth relating. As they sometimes do with members of the human race, I have never seen tame otters manifest any dislike at first sight to dogs; and never that I have authentically been able to learn, do they show any disposition to quarrel or fight with dogs unless first attacked; and then "the tug of war" requires a Spartan in the canine foe. In such a case, even with dogs, their apparent affinity, they become bitter, unrelenting and revengeful, until they have taken vengeance upon their assailants, after which they are always quite willing to establish friendly relations with their antagonists.

With very little trouble I taught both of my tame otters, "Pontiac" and "Pocahontas" to fetch from water; at which accomplishment, for quickness, no dog was a match for them. Their mode of fetching was entirely different from that practiced by dogs. They plunged under water and reappeared at the exact spot where the object thrown out for them to fetch floated, which they seized and brought under water to the shore. With a persistent system of instruction,

and the exercise, perhaps, of much patience, an otter might be sufficiently educated to make a good retriever from water. If his capabilities could be developed to their utmost, the sportsman, on open water, could do without a gun. The chief difficulty would be to prevent the animal from mutilating the game, which, unless taught otherwise, it would be liable to do.

In this connection I remember an incident in which Pontiac was the chief actor. I was sitting a short distance below the Queen's Wharf on a Thursday evening, while Pontiac was disporting himself in the water. Generally, on such occasions, we used to be favoured by twenty or thirty spectators. On the evening in question we were alone. About thirty yards from shore a fisherman came along with a canoe load of fine pickerel for market next morning. I requested him to sell me a string of fish. He agreed to do so if I went to the market next day. In the meantime Pontiac had stretched out his neck and winded his game. He then quietly disappeared under water, and came up on the outside of the canoe, into which he climbed; and having secured one of the best strings of pickerel without having been noticed by the owner, he dropped into the river, and with his plunder, soon made his appearance at my feet, to the profound astonishment of the fisherman. It is needless to say that I had no difficulty in persuading that fisherman that it was actually necessary that he should dispose of that particular string of fish. I had a peculiar method of enforcing obedience, therefore I experienced no difficulty in inducing Pontiac to relinquish his plunder. By experience I had discovered that the most effectual mode of mastering an otter was to seize him by the tail and raise him from the ground. When thus suspended, well out from the side, the otter is powerless, although a little too heavy to retain for any length of time at arm's length.

On another occasion Pontiac robbed a careless citizen of two or three pounds of beefsteak which he was carrying home from market. After perpetrating the robbery he ran off with his booty, and concealed himself amongst some thick cedars which grew in front of the house, and could not be found until after he had finished his banquet. Pontiac was a perfect terror to cats. Whenever he could catch an unfortunate member of the feline race, a short, sharp and decisive line of

action followed. Poultry, also, to use the language of the venerable African, had to "roost mighty high" when Pontiac was round. From this fact you may naturally conclude that hens and otters cannot advantageously be kept at large on the same premises. Next to fish, Pontiac had an unconquerable partiality for fat chickens, irrespective of plumage or pedigree.

Pontiac knew his name, always came when called, and followed his master on the street, or in the woods, as faithfully as a dog. One evening in summer I started in a bark canoe for "Brighams's Creek," leaving Pontiac on shore. Apparently in great trouble, he immediately began whistling, and started after me swimming on the surface of the water, seeming as if afraid of losing sight of me. When he found that he was losing ground—or rather water—he concluded that a desperate alternative was necessary; and under he went, and in less than two minutes, all dripping with water, he was on my back. The afternoon was warm and I did not mind the wetting.

Pontiac had a nose as keen as that of a highly bred hound or pointer, both of which dogs, in extreme sensitiveness of smelling, excel the setter. In our rambles, when we chanced to get into a cedar swamp, which was quite frequently the case, I have seen him running on hare-tracks with the spirit and vivacity of a beagle or a harrier. On such occasions he has been often upwards of half an hour at a time out of sight. When wanted, a call or two would bring him out instantly, and no matter how winding or circling my track might be to a hiding place, either on snow or on bare ground, he followed it with the precision of a blood-hound, whistling almost at every jump to let me know that he was coming.

Notwithstanding his apparent craniological defects, Pontiac was singularly sagacious; so much so, as to constitute a living contradiction to the dicta of phrenology. In his flat, serpent-like head Prof. Fowler would find it difficult to imagine where there was room for brains. His organs of alimentiveness and destructiveness, however, must have been fully developed, a fact which cats, fishes and poultry, if they could speak, would amply confirm.

My other little otter, "Pocahontas," I regret to say, died young, from the effects of a blow on the head from a stone; an unlucky inci-

dent which, perhaps, happily for the offender, I did not witness. The occurrence was annoying, and the loss to me considerable. Pocahontas was an accomplished capturer of fish ; so much so, that had she lived to become two years old, my rod and line might have been entirely dispensed with, and the ichthyological branch of sport left altogether to her. After having taken and devoured about thirty cray-fish, on the day preceding that on which she was assassinated, she caught in the evening three fine pickerel to the surprise and admiration of a crowd of spectators.

At two months old Pocahontas commenced her piscatorial studies by catching minnows in a large tin dish—then went through a course of cray-fish—then advanced to rock-bass and chub, ascended then to pike and suckers, and finally went through the higher branches of a finished education by graduating with distinguished honors in the epicurean curriculum of black bass and pickerel. I had taken great pains and trouble to develop her natural instincts ; and had she not met with such a tragic end, I feel certain that her future performances under water would have proved marvellous.

I am done. If I have been able to interest my audience. If I have advanced a single theory, or related a single fact hitherto unknown, or unpublished, in relation to the Canadian otter, I shall feel happy to think that my connection with the Field Naturalists' Club of the City of Ottawa, means something more useful and something better than one of a mere honorary character.

Mr. W. L. Scott wished to call attention to a valuable series of otter skins kindly loaned by Mr. Devlin for inspection, and including raw, dressed and plucked Canadian otter, as well as a beautiful example of the sea otter (*Enhydra lutris*) for comparison with them. Mr. Devlin had informed him that the most of his skins came from the Upper Gatineau and Lièvres, about 100 miles north of Ottawa, and that they were only equalled by those from the northern parts of British Columbia. Skins from Manitoba and the North-West were larger, but coarser and less valuable. Those from the upper Ottawa were not so dark or rich in color as those from the upper Gatineau, while those obtained south of us were light and poor and only worth

half as much. He (Mr. Devlin) bought annually from 400 to 500 skins. The value of the otter skin fluctuated less than that of most furs, and ranged from $4 to $15, according to size and quality. The sea-otter skin is much larger and very much more valuable than that of our own species. That animal, besides being much bigger, had the feet also more webbed, and differed in its dentition and in other points so much as to be placed in another genus. Its range is now northward from British Columbia along the Pacific coast. The European otter (*Lutra vulgaris*) was smaller than the Canadian, but had a longer tail.

Mr. ANDERSON said that his friend Mr. Noble had informed him that he had frequently trapped "sea-otters" on the shores of the north of Scotland, and he wished to ask if these were the true "sea-otter;" for if so its range was not so restricted as had been stated.

Mr. NOBLE then described the manner in which he had captured the so-called "sea-otters," and from his description it was apparent that the animals in question were merely coast-frequenting specimens of the common European otter.

Prof. MACOUN and Mr. J. B. TYRRELL gave very interesting accounts of the occurrence of beaver, otter and muskrat in various districts of the North-West, but differed as to localities producing the best skins.

Mr. WHITCHER referred to Mr. Lett's mention of the otter preying on ducks, and stated that he had seen an otter come up and sit on the rocks along side of ducks, and that the birds did not apparently mind him, although the appearance of a mink would have made them all fly. Possibly this was because the otter seizes his prey from beneath the water and therefore the ducks do not recognize him as an enemy on land, whereas it is there that the mink attacks them. He had killed on one occasion six otters on the Constant creek (about fifteen miles above the city). He had observed that the otter, viewed from above, when swimming under water looked surprisingly small, owing to the dark color of its back tending to render it almost invisible.

Dr. BELL explained that the quality of the furs from the North-West did not depend altogether on the latitude. The animals inhabiting the open plains were lighter in color than those in the mountain and wooded districts.

MINERALS OF THE OTTAWA DISTRICT.

CHAS. W. WILLIMOTT.

Read 15th January, 1885.

It will be unnecessary to enter into any introduction, more than to define the limits expressed in the title as the Ottawa district. As my own observations have extended only over portions of the three neighboring townships, Templeton, Hull and Wakefield, and having a strong aversion to indirect information, I think perhaps it might be best to concentrate our views to this area, and even to do justice to these three townships would require a far more voluminous treatise than our available space will permit.

About sixty minerals are found in these three townships, many of which are not rivalled in the Dominion. It is doubtful whether the same extent of country elsewhere in Canada can claim one half that number.

In bringing together such a large variety of minerals in such a limited space I must necessarily curtail many of their features, and, indeed, little more than giving a general outline, touching on their more important characters, is all I can expect to accomplish.

Each mineral will be treated separately, giving at the same time the lot and range, or the name of the mine at which it occurs, so that those interested in this science may have an opportunity of testing the merits of this paper, as well as forming an introduction to the minerals of our neighborhood.

We shall first consider the metallic minerals, foremost of which is native gold.

Native Gold.—The only instance of the occurrence of this metal is based on the authority of the late Mr. H. G. Vennor, who obtained a specimen from Capt. Cates of the Péche village. It was said by the latter gentleman to have been picked up during a journey through the woods on the east side of the Gatineau river, in the township of Wakefield. The mineral, which I had the pleasure of seeing, consisted of fine visible native gold in a ferruginous quartz, associated with green apatite. This specimen assayed, gold, 11.725 ozs. to ton, silver, 52.323 ozs. to ton

Lead and Zinc.—The only representatives of these metals observed in our district are the two sulphides, galena and blende. These minerals are found associated in a greyish-white crystalline garnet that occurs in lenticular masses in a crystalline limestone on lot 6 of the 1st range of Wakefield. The blende, which is in black, shining cleavable masses, is often so intermingled with the galena as to give, apparently, more prominence to the latter mineral, a feature that must ever be guarded against by intending speculators.

Copper.—The only mineral representing this metal is the yellow sulphide (chalcopyrite) found in specks and small imperfect crystals in some of the veins of the apatite mines.

Iron.—Under this heading we shall, for the sake of convenience, include both the oxides and sulphides of this metal, viz, magnetite, hematite and varieties, limonite, pyrite and pyrrhotite. The magnetic oxide, or magnetite, is found in more or less quantity in the above townships. The more workable deposits, however, so far as our present knowledge goes, lie in the township of Hull, where mining operations have been carried on at intervals for the last thirty years.

The ore coming from these mines is coarse in texture and is often traversed by veins of red hematite, besides occasionally enclosing scales of graphite and mica. Lenticular patches of this ore occur in a dark green pyroxenite on the south half of lot 7, in the 1st range of Wakefield, and also on the north half of the same lot it fills a vein in limestone. The outcropping portion is highly crystalline, and owing to the crumbling nature of the walls good crystals often variously modified may be obtained.

The variety known as specular iron ore occurs at the Haycock location in Templeton and Hull. According to Dr. Harrrington it is in parallel beds in a highly feldspathic gneiss. This ore is often mixed with the magnetic oxide, and often to such an extent as to almost wholly replace the former. A white granular apatite, and a translucent variety of greenish fluor are often associated. The finest crystal of specular iron found in Canada came from these mines.

The next iron ore noticed (although probably not in sufficient quantity to be available for practical purposes) is a vein of limonite of about 1 foot wide, resulting from the alteration of iron pyrites.

Flanking this vein is a less altered pyritous substance enclosing black shining crystals of tourmaline.

The variety bog iron ore is found in several places in Templeton and Hull. But the area covered by this mineral has yet to be ascertained.

We now come to the two sulphides of iron, pyrrhotite and pyrite. The former, by far the more uncommon, occurs in small veins and masses in some of the apatite mines. The latter is much more abundant, and is rather an objectionable than a desirable substance.

It frequently permeates apatite deposits, often to such extent, as to detract greatly from the commercial value of the latter. In some of the apatite mines, large bedded masses of this mineral occur, enclosing various minerals, the most noticeable of which are crystals of apatite nd scapolite with their angles more or less rounded. At other times it is evenly distributed through large deposits of apatite. To enumerate all the physical characters exhibited by this mineral would be both endless and useless. I shall therefore select from a few places, this mineral that offers various physical characters. At Haldane's mine in Wakefield, large bedded masses of pyrites were penetrated in sinking their deep pit, often enclosing rounded green crystals of apatite, and a rusty brown scapolite. During the progress of oxidation of the pyrites, the latter mineral (scapolite) only, is affected, the apatite in all cases retaining its original color, even when partly liberated by the disintegration of the pyrites. This locality has afforded from time to time, fine brass yellow crystals of this mineral, exhibiting such faces as the cube, octahedron, dodecahedron and other modified forms.

At McBryde's Mine, in the same township, this mineral is found associated with blende, galena, garnet, &c., in bronze-brown masses, which might, at first glance, be taken for pyrrhotite, but which, however, is not magnetic.

At the Jackson Rae Mine in Templeton, large quantities of this mineral have been extracted, graduating in color from a brass-yellow to almost grey. Sometimes thin coatings entirely envelope apatite crystals.

Molybdenum.—The sulphide of this metal (molybdenite) has been detached in small foliated masses at McBryde's Mine in Wake-

field. This mineral, until within the last few years, commanded a very high price; even as much as $4 per pound being paid for it. At present it is scarcely saleable at any price. It was formerly used in the production of a blue color for calico printing, which is now superseded by the bright and less expensive aniline colors.

Graphite or Plumbago.—This mineral bears a strong resemblance to the above mentioned molybdenite, physically, although to the accustomed eye it presents some points of difference; its lustre is scarcely ever as bright, and does not give the peculiar greenish streak on porcelain. But I doubt whether those characters would be conducive to its ultimate recognition. And I think, perhaps, in all cases it would be better, at least more reliable, to test it chemically. The disseminated foliæ of this mineral may almost be considered as a constant inclusion in the various bands of limestone and pegmatite that traverse these townships, in, however, as far as my observation goes, insufficient quantity to be available for practical purposes. On Lot 7, R. 1, of Wakefield, lenticular masses of serpentine enclose this mineral in foliated masses and disseminated foliæ. On the same property a fine granular variety, somewhat similar to the Cumberland plumbago, occurs in pockets of a crystalline limestone.

Apatite.—The elucidation of all the characters, physical as well as mechanical, that so conspicuously characterize this important mineral, must necessarily be attended with many theoretical ideas which will ever present themselves to the practical observer. It is a stupid idea, and yet rather a prevalent one, that the various products in nature must conform to the formulæ laid down by man. As practical observers can we reject such chains of evidence, linked as they may be by actual facts, because intricate nature will not divulge her secrets to an imaginative mind, I say no. If the existing laws that govern the chemical nature of minerals are not conformable with man's ideas, then all I can say is, so much worse for the man. For assuredly, the various gradations that mark the progress of alternation and dissemination of minerals will ere long (assisted by the all powerful microscope) crush out of existence many wild and exaggerated theories. So leaving the origin of this mineral (apatite) to the investigators of the near future, we will pass on to some of its physical characters. No mineral in the Ottawa dis-

trict is perhaps better known, especially the freshly fractured specimens. Out-cropping veins or beds are seldom so conspicuous, being generally made apparent by a whitish weathering, and might easily be passed over unnoticed. The similarity existing between pyroxene and apatite has often been the cause of much annoyance to the pseudo-miner. The mineral, locally known as phosphate, is found of almost all shades of color, from white to almost black, passing through various shades of green, red, yellow, and blue, the last color being by far the most uncommon. Small prisms of this color are sparingly dispersed through a disintegrating coarse crystalline limestone on the south half of lot 7, range 1, of Wakefield. The yellow variety occurs in crystals two inches in length, associated with oblique rhombic prisms of pyroxene, on lot 14, range 1, in the same township. The black, or dark-greenish variety is found in nuggets of a slaggy appearance, with pitted surfaces, at the Jackson Rae Mine in Templeton. The white is generally confined to the granular varieties, known as "sugar phosphate," but rarely occurs in a state of absolute purity, being more or less mixed with the coarse cleavable mineral. A dark-green granular variety, impregnated with iron pyrites, forms a large deposit on lot 12, range 1, Wakefield.

The green and red varieties may be regarded as the predominating mineral, and in many of the mines the two colors are interblended, which feature may continue through the entire mass. At the Jackson Rae Mine in Templeton, and at a pit known as the "Spring Mine," a quantity of a beautiful, translucent, sea-green apatite has been extracted comparatively free from foreign inclusions. A very pure reddish mineral, assaying as high as 86 per cent of tribasic phosphate of lime, occurs in bedded masses at Gemmill's Mine in Wakefield. A block, estimated at 4 tons, was blown out by a single blast from one of the masses. "Moore's Mine," in the same township, is remarkable for the abundance of crystals that have been extracted during the last four years. Huge crystals, hundreds of pounds in weight, have been met with imbedded in a pink cleavable calcite.

When visiting this mine two years ago, a beautiful vein of interlocking crystals of a translucent sea-green color, had been developed. The gangue formerly surrounding these crystals had been dissolved to

the depth of one foot, giving great prominence to these forms. But owing to their frangibility and easy cleavage, they could rarely be removed intact.

We may certainly infer from this that the phosphate mineral is less acted upon than the surrounding limestone, and yet, if these crystals are entirely liberated and exposed to a moist atmosphere they soon undergo disintegration.

The rounding of the angles of these crystals has drawn forth many theories respecting their disfigurement, fusion being offered as an explanation by some mineralogists, whilst others attribute it to a solvent action. Now, whether we adopt the igneous theory, or that of partial solution, serious objections may arise to refute either. In the first instance, minerals easily fusible and yet preserving their sharpness of outline, are found associated with rounded crystals of a less fusible apatite. Then again, we meet with rounded crystals of pyroxene (although much more rare) imbedded in limestone, also enclosing rounded crystals of apatite. Now, it is hard to understand how the apatite and pyroxene alike should be attacked by the action of a solvent, when the latter mineral is almost insoluble. Some aluminous varieties are, however, decomposed with great difficulty by sulphuric acid at the temperature of 250° c. It frequently happens that crystals of apatite assuming sharp angles are indiscriminately mixed with others that have been rounded, imbedded in the same limestone. On the other hand it rarely happens that crystals lining the walls of fissures have their angles rounded, although frequently one or more of their faces are obliterated or otherwise contorted, probably due to an interrupted crystalization. Bent or broken crystals that have been recemented are of common occurrence. The same crystals often enclose calcite, and others again have cavaties extending the whole length of the crystal, are entirely empty, or contain a rounded pebble of cleavable calcite.

I should like to engage your attention for a few moments on the occurrence of this mineral in Hull and Wakefield. At an opening known as the "Gow Mine," in Hull, a pit has been sunk 150 feet in limestone, parallel to the wall of a large fissure which may be said to characterize this band for several miles, it being made the more conspicuous by the abundance of crystals everywhere adorning its walls.

Several mines have been established on this band with gratifying results. The apatite, which is mostly of the greenish variety, runs in most cases conformably with the limestone, although some small veins were seen intersecting it. The aggregate yield of this band in the township of Hull may be roughly placed at 4,500 tons.

We also find this mineral an ingredient of the orthoclase band running through this township, and like the latter, characterized in places by a contact wall covered with crystals of pyroxene, apatite, phlogopite, &c. I am not aware of any remunerative mines situated on this band. Many attempts have been made to work the small veins that occur at places, but have generally resulted in failure.

At Haldane's Mine, in Wakefield, a pit has been sunk 125 feet, on what appears to be a vein, cutting the stratification, of a dark-green granular apatite, impregnated with pyrites, also often enclosing epidote, scapolite, pyroxene, &c. The latter mineral is frequently of a cavernous nature, in which case the cavities are filled with chabazite and a silky fibrous mineral resembling natrolite.

At Wilson's mine in the same township a fine granular, strongly coherent, reddish apatite, mixed with a green, cleavable variety filled a vein 12 inches wide in gneiss, which, however, became "nipped" at no considerable depth.

In following some of the crystal beds at "Moore's Mines" large cavernous "*bugs*" were struck, walled with beautiful crystals of pyroxene, phlogopite and apatite. One of these caves was 30 feet long, 6 feet in width and 8 feet in height, roofed with a pink crystalline limestone, studded with green crystals of apatite standing out in relief on its partly dissolved surfaces.

The following statistics for the three townships may be summarized as follows:—For the township of Hull, up to the present time, between 5,000 and 6,000 tons have been extracted. Wakefield has probably afforded between 8,000 and 9,000 tons, and Templeton between 16,000 and 17,000 tons. The total output of all the mines in Canada for this year (1884) is 22,143 tons, extracting 1,790 tons supplied by the Perth and Kingston district, we have 20,353 tons, the product of the Ottawa county for one year.

We now come to the anhydrous and hydrated silicates, of which we have about 30 representative minerals.

The first of these we shall notice is the fibro-tabular Wollastonite, occurring on lot 7, range 1 of Wakefield, in small delicate pink crystals, but which, however, soon fade on exposure. This mineral also occurs in large, fibrous masses in a dark sky-blue calcite at the same locality. A similar mineral occurs on lot 14 of the same range, enclosing an amber-colored garnet and prisms of a brown or greenish idocrase.

Pyroxene.—This mineral, either massive or crystallized, may be regarded as the most common associate of the apatite deposits. Now, under this heading, we have a number of varieties, but until more extended research shall have established their authenticity it will be better to retain the general name of pyroxene. The massive variety, which is mostly of some shade of green or grey, comprises large areas of rock masses, which may conform to the general deposition or cut it.

No attempt can or will be made, with our limited space, to enumerate every physical character offered by this mineral. But we will select such illustrations as may offer the widest points of difference.

On lot 9, range 13, of Hull, crystals of a grayish or grass green color, often doubly terminated, occur in a band of pink limestone, making up one-half its volume. They vary in size from 1 oz. to many pounds in weight. Good crystals are often found in the soil, that have been liberated by solution. The largest and finest crystals of this mineral are found at Moore's Mines, in Wakefield. Their planes, however, are rough and dulled by an incipient decomposition, a defect more than counterbalanced by their sharpness of angles. These crystals frequently attain an enormous size, often enclosing portions of calcite, phlogopite and apatite, and like the latter mineral are often found bent, and sometimes broken and recemented. On the 7th lot of the first range various modified forms of the four-sided prism occur in a crystalline limestone, and by extended replacements of their basal edges produce such forms as the octahedron with rhombic bases. Other complications exist, such as the enlargement of one set of faces at the expense of others, giving rise to very unsymmetrical shapes. Their color is white and translucent, their opacity depending on the advancement of decomposition that so conspicuously in places mars their exterior lustre. On this same lot a mineral is found, having the crystalographic form of pyroxene, exhibiting every hardness between 6 and

2. In the vicinity of some lenticular patches of a serpentinous mineral fine inclined square prisms of pyroxene are associated with a scaly white garnet, and although their external planes are converted into an unctuous steatitic mineral their internal fracture are vitreous; generally semi-transparent to translucent, of a greenish white color. These crystals are built up of thin laminæ, parallel with their lateral planes, in the direction of which they cleave with great facility. The dark green lamellar variety occurs in patches in a massive scapolitic rock on lot 7, range 7, of Templeton, and at the same locality in calcite veins, crystals with rounded angles, often semi-translucent, are frequently met with. Fine crystals of a black color are said by Dr. Harrington to occur on lot 13, range 11 of Templeton.

The mineral uralite, also mentioned by the same gentleman, is found in many places in Templeton, where it apparently forms a transitory mineral between pyroxene and hornblende.

Hornblende, although a common associate of the apatite veins, is nevertheless never as constant as the latter mineral (pyroxene). Independent of the extensive rock masses wherein this mineral forms a variable ingredient, it may be said to be confined to mixed veins, commingling with such minerals as apatite, pyrite, pyroxene, epidote, scapolite, &c. The crystallised varieties are seldom observed in the apatite veins, although remarkably fine prisms often occur in close connection. On lot 12, range 16 of Hull, dark green translucent prisms nearly 4 inches in length are interspersed through a band of pink limestone. They are also met with in radiating groups in cavities in a pyroxene rock. A pale green translucent variety, occurs in modified rhombic prisms on lot 17, range 1 of Wakefield. A greenish gray fibro-bladed variety in reticulating masses occurs at one of the openings at Gemmill's mine in the same township, associated with apatite and occasionally enclosing ferruginous prisms of zircon. A broken section of the latter mineral measured half an inch by a quarter. The fibrous variety actinolite may be frequently met with. On the 12th lot in the 12th range of Templeton, a bluish, fibrous, partly altered hornblende occurs on the walls of an apatite vein.

A white fibrous tremolite is found in the neighborhood of Old Chelsea, in white crystalline dolomite.

Garnet.—This mineral, until within the last two or three years, was regarded as a rare occurrence in this neighbourhood, being principally confined to small crystals, distributed through the laurentian gneisses. In the vicinity of the Baldwin Mines in Hull, the precious variety, probably almandine of a blood-red color, in lamellar masses, often an inch or more across, occurs in a schistose rock. A massive variety of a dingy reddish-brown color occurs on lot 18, range 2, of Wakefield, in a vein cutting the stratification. Crystals showing rhombic faces sometimes an inch or more across, are associated with crystals of epidote and stilbite in the more cavernous portions of the vein. The above garnet was mined to the extent of about two tons, in supposition that it was apatite. A red variety of this mineral occurs—according to Dr. Harrington—on lot 12, range 12, of Templeton. An amber-colored garnet, probably essonite, occurs on lot 14, range 1, of Wakefield. This locality a few years ago afforded some handsome crystals, having been extracted for apatite. A certain gentleman on hearing of the occurrence, with an eye to dollars and cents rather than national development, obtained, either by gift or purchase, nearly all the output. I am told some of these crystals measured three inches across, all of which were sold in the States. This locality has since been visited by dealers from Philadelphia and New York, who have now almost exhausted the mineral. These crystals occur in a bed of wollastonite, with brown prisms of idocrase; sometimes the latter mineral is imbedded in the former. Occasionally patches of a translucent scapolite are entirely enveloped in a coating of garnet. Notwithstanding its high lustre and bright color, it could not be applied to any ornamental use, owing to the grains constituting the crystals, being so loosely coherent.

A few miles west of this locality, on lot 6, in the same range, handsome crystals of a lime garnet, occur in a band of crystalline limestone, associated with pyrite, galena, sphalerite, wollastonite and pyroxene, forms exhibiting the faces of the rhombic dodecahedron and trapezahedron being common. Layers of the latter are often extended almost to the obliteration of the former. Their color varies from white, or almost colorless, to dark-green, passing through wine-yellow, sulphur-yellow, and purple. One perfect crystal from this locality would

weigh about one pound, being of a dark-green color, translucent only on the edges. One of its planes was penetrated by an octahedron of grey pyroxene. The white variety attains even a much larger size, and crystals as large as a cricket-ball may be frequently met with. On the next lot, 7, a garnet apparently containing much more iron, fusing to a black glass, occurs in a band of disintegrating limestone, and, like the latter rock, is rapidly losing its cohesive properties. A portion of a large crystal obtained near the surface could not have weighed less than five pounds originally. Its color is more of a brownish tinge, and it is seldom as bright in lustre. A peculiar white scaly variety in crystalline masses, more or less mixed with a serpentinous mineral (its line of contact being often difficult to discern) occurs in close connection with the above. It sometimes exhibits one or more rough faces, which are invariably altered to a steatitic mineral.

Chrome Garnet.—Beautiful little dodecahedrons of this mineral occur in small groups, or attached crystals, in a fine granular grey pyroxene, on lot 29, in the 4th range of the same township.

Zircon.—Fine specimens of this mineral have been found at various times during the development of the apatite deposits in the above townships. A crystal 15 inches in length is said to have been found by a miner on lot 23, range 13, of Templeton, who, being doubtful of its nature, broke it up to satisfy his inward curiosity. You may imagine the poor man's feelings when he was told that he had just let slip through his fingers $200. One crystal preserved from this locality, now in the possession of Mr. J. G. Miller, measures four and a half inches laterally and one inch across the faces. Another crystal from Gemmill's Mine in Wakefield is said to be six inches in length. Small crystals may frequently be found in calcareous portions of the pyroxene rocks. On lot 14, range 1, of Wakefield, crystals from a quarter to an inch in length occur in a thin layer of shaly limestone that is intercalated between beds of wollastonite. At Haldane's Mine, in the same township, minute pink semi-transparent prisms occur in pyroxene.

Idocrase.—Handsome crystals of this mineral are found in Templeton and wakefield. Brownish-red slightly modified prisms, an inch in diameter, occur on lot 7, range 12, of the former township, and on lot 14, range 1, of Wakefield, brownish and greenish prisms often over an inch in diameter, occur in a wollastonite rock.

Caxoclasite.—In this connection may be mentioned a mineral that has been described by Prof. Lewis, of the Academy of Natural Sciences, Philadelphia, as caxoclasite. This mineral occurs in blue calcite on lot 7, range 1, of Wakefield, in square prisms with their solid angles unsymetrically truncated. Its color is white, generally more or less stained with oxide of iron, lustre resinous, sometimes inclining to pearly, opaque.

The name chosen would imply that the mineral in question has a poor cleavage, whereas it has none. Then again, in the analysis given by the same gentleman, two or three per cent. of phosphoric acid was determined. Perhaps Mr. Lewis did not observe the minute prisms of green apatite that sometimes penetrate this mineral, and from which source, no doubt, his phosphoric acid was obtained.

Scapolite.—This mineral may be regarded as one of the most constant associates of the apatite deposits, generally occurring in bedded masses, sometimes alternating with hornblende, producing a banded structure of several feet in thickness.

At times masses of this mineral are made up of aggregations of huge but rough crystals of a grayish white color. However, some good examples of crystallized forms are met with in many places in Wakefield and Templeton. For localities in the latter township I would refer to Dr. Harrington's report, 1877-78. He says the finest crystals occur on lot 14, range 12, and on lot 23, range 13; crystals over one foot in length, although externally rough, are frequently met with. On lot 7, range 7, of the same township, a thick bed of grayish white scapolite was penetrated, enclosing patches of a lamellar dark green pyroxene and green apatite. On lot 10, range 10, a beautiful translucent variety occurs, and which assumes a pink color on exposure. In the township of Wakefield, on lot 17, range 1, fine square prisms, sometimes modified, of a grayish white color, occur, coating an outcrop of the massive variety. On the next lot, 18, range 2, a grayish translucent massive variety is interstratified with hornblende. On lot 7, range 1, doubly terminated prisms with rough exterior planes are liberated from a disintegrating limestone. On lot 6, range 2, a translucent canary yellow cleavable variety occurs, but how associated I did not ascertain.

Wilsonite.—This mineral is now generally believed to be an altered scapolite, and may often be observed forming a neucleus in masses of the latter mineral. Good illustrations occur at many of the scapolite localities.

Epidote.—Independent of the occurrence of this mineral in the stratified rocks of the neighborhood, we meet with it in crystals lining cavities, besides forming an ingredient in many mixed veins. On lot 18, range 2, of Wakefield, dark yellowish green crystals, from a sixteenth to an inch in length, line cavities in massive garnet. At Haldane's mine in Wakefield large quantities of a greenish crystalline epidote were extracted, associated with pyrite, &c. Occasionally terminated square prisms of a light yellowish green color, enclosing disseminated pyrites, are embedded in a grayish green granular apatite, and are apparently pseudomorphs after scapolite. In the township of Templeton this mineral occurs on lot 9, range 10 and lot 23, range 13.

Mica.—This name will be retained to include a number of doubtful minerals, all of which have one perfect basal cleavage. Besides being disseminated through the schistose and gneissic rocks it often constitutes large volumes in some of the phosphate veins, either distributed in small scales through extensive masses of apatite and pyroxene, or forming large aggregations, sometimes affording plates two feet square in a calcareous gangue.

The mica fever, so prevalent in all parts of the Dominion, does not seem any milder in this neighborhood. The unwavering enthusiasm after marketable mica, encouraged by flattering reports, of irresponsible persons, will always remain a source of dubious speculation with the far-seeing capitalists. We shall not attempt to deny that unlimited quantities of this mineral are found in the above townships, but with one or two exceptions I have rarely met with plates sufficiently transparent, or free from included minerals, or from contortion, as to be available for commercial purposes. On the south half of lot 10, range 10, of Templeton, plates two feet square were taken out during the development of an apatite deposit. These plates were perfectly free from folds or inclusions, transparent enough in thin laminæ, but yet unsaleable because they would not stand the so called New York fire test. Yet this same mica has been exposed to the heat of an ordinary

stove for the last two years, and although it became slightly discolored it nevertheless compares favorably with some grades of the commercial article. At Chitty's mine in Wakefield, great quantities of this mineral were met with, capable of supplying very large plates, although occasionally marred by lateral joints.

What this mineral lacks in a commercial point of view is more than counterbalanced by the magnificent prisms available to the scientific world. For symmetry of form the crystals lining the walls of fissures, or enclosed in limestone, are not rivalled in the Dominion.

At Moore's mine, in Wakefield, prisms over a foot in diameter with lateral planes varying from an inch to a foot or more, stand out in relief on the dissolved surfaces of the limestone. Thin plates of this mineral are remarkable for showing in a strong degree the asterism or radiating star when viewed through a transparent plate of it. This is due, according to G. Rose, to intersecting minute crystals of biotite, but considered by Tschermak to be some undetermined substance. More recent investigations have put forth rutile as the inclusion. This peculiarity does not extend to all our micas alike, as non-asteriated varieties are frequently associated with the asteriated. Neither is it confined to any particular color, as the pearly white and the black both exhibit these optical characters. Prisms of the black variety often exhibit lateral cleavages, which are easily obtained, breaking up into rhombic forms. On lot 7, range 1, in the same township, a pearly white sometimes tinged with a copper red color occurs in a bed of limestone often holding concretionary inclusions of calcite. These crystals, which are sometimes twinned, are peculiarly characterized by a phosphorescent light that glows momentarily when the plates are suddenly parted. Large aggregates of these crystals are sometimes met with, where one-half the prisms, laterally, are transformed in a slightly micaceous steatitic rock, the unaltered portion having thin films of carbonate of lime interpolated between the laminæ.

Oligoclase.—A mineral occuring in veins in a gray pyroxene rock on lot 16, range 12, of Hull, has been referred by Mr. Hoffmann to oligoclase. It is often beautifully crystallized, of a slightly translucent white color, weathering to an opaque milky white.

Albite.—This mineral is mentioned by Dr. Harrington as occurring at several places in Templeton. No locality being cited, it is

possible this name may be applied to many of our local feldspars, but until analysis shall have established their properties it will be better to refer to them under the general heading of feldspar.

Orthoclase.—The gneissic and granitic rocks, so extensively developed in these townships, consist for the most part of various colored feldspars, associated with quartz, mica, hornblende, &c. The strong structural resemblance of the various members of the feldspar family makes it difficult to discriminate between the several allied minerals. Neither do I think it possible (except in well crystallized specimens) to establish any member of this family without the assistance of the chemist or the microscope. I have no doubt that much of our feldspar belongs to the triclinic group, yet there is every reason to suppose the greatest bulk of the above bands is largely composed of the oblique potash variety (orthoclase). In the township of Hull large cleavable masses of a white, vitreous feldspar, enclosing a nucleus of a grey material, make up considerable proportions of one of the above bands, sometimes to the exclusions of the quartz altogether. Feldspar, in some form, is almost invariably present, in more or less quantity, in all the apatite veins, sometimes associated with hornblende, pyroxene, quartz, sphene, &c.

Fine crystals of orthoclase are said to occur in Wakefield. In the township of Hull on lot 7, range 12, beautiful flesh-red crystals occur in cavities in a massive variety, and on the south half of lot 6, in the same range, large cleavable masses of a green feldspar, associated with a yellowish banded variety and a white translucent quartz, make up large proportions of a band traversing this lot. Sometimes large, brittle, black crystals of tourmaline are interspersed through this pegmatite rock.

Titanite or Sphene.—This mineral may also be regarded as a common associate of the apatite veins. Sometimes occurring massive in lenticular patches in pyroxene rocks, at other times distributed in crystals through various vein-stones.

Rude crystals of a brownish color occur in many places in the township of Templeton. In Hull, lot 12, range 13, imperfect crystals of this mineral are so abundantly distributed through a pyroxene rock as to make up one-half its bulk. The finest crystals I have observed

in these townships, occur on lot 7, range 1, of Wakefield, in a band of limestone. They are clove brown in color, sometimes measuring two inches across. A little south of this locality, on the same lot, crystals of a light cinnamon brown color are profusely disseminated through a dark cleavable pyroxene. The latter rock is cut by quartz also thickly studded with these crystals. A few hundred yards northeast from the latter place lenticular patches of a crystalline titanite of a dark brownish black color are enclosed in pyroxene.

This mineral is also said, by Mr. Frank Adams, to occur in crystals in a disintegrating dyke in Hull.

Tourmaline.—This mineral, of a black color, may frequently be met with, either enclosed by or investing the rocks of the neighborhood. Black, lustrous crystals, variously modified, occur in a pinkish calcite at Wilson's mine, in Wakefield, and in apatite on the next lot 17, range 1. Large radiating and reticulating masses invest the surfaces of a syenite, on lot 18, range 2. The interstices formed by the crossing of the prisms are occasionally filled with crystals of white scapolite.

The finest crystals of this mineral observed in this neighborhood occur sparingly on lot 15, range 12, of Hull, investing a hard grey pyroxenite. They are generally less than an inch in length, exceedingly bright in lustre. Their form is hexagonal, capped with planes of the rhombohedron. This mineral has been observed at several places in Templeton.

Having now reached the end of the anhydrous silicates, I will briefly allude to hydrous compounds.

Talc.—A mineral having the aspect of talc, occurs in small foliated masses of a silky lustre, enclosing a nucleus of calcite at McLaurin's mine in Templeton.

Steatite.—A mineral of the nature of steatite has been observed in several places in the above townships, forming small bedded masses. One of these is on lot 7, range 12, of Hull. On lot 7, range 1, of Wakefield, crystals of a yellowish steatite (pseudomorphs after pyroxene) occur in a coarse disintegrating crystalline limestone.

Serpentine.—This mineral is more confined to the limestone bands, through which it is distributed in grains, bands and lenticular masses.

Its color varies from a light yellow to a dark green, often revealing a sharp conchoidal fracture. In the neighborhood of Chelsea, serpentine limestone is interstratified with other bands enclosing apatite crystals. In the same limestone bands of a semi-fibrous yellow variety occur, resembling the structure of hornblende, and possibly pseudomorph after that mineral. On lot 7, range 1, of Wakefield, large lenticular masses of a translucent green serpentine occur in limestone. It breaks with a sharp conchoidal fracture, and is occasionally marred as an ornamental stone by inclusions of a foliated graphite and large masses of a white micaceous-looking garnet.

Chrysotile, or Serpentine Asbestos.—This mineral occurs in the neighborhood of Chelsea, forming concentric veins in a serpentinous limestone. The fibres are sometimes an inch and a half in length, and rather too strongly coherent, I think, to be of any immediate commercial value. Other localities in the neighborhood of Templeton have afforded a similar mineral, the fibres, however, in this instance being more separable. A quantity was mined some years ago from one of the latter localities, but with what success I am unaware.

Ripidolite.—A greenish foliated mineral occurring on the west half of lot 18, range 9, of Templeton, is referred by Dr. Harrington to this variety.

Prehnite.—This mineral was noticed at Post's mine in Templeton, in greyish white, strongly coherent, mammillated groups; in cavities in pyroxene. It has also been noticed elsewhere in the same township.

Zeolite group.—Four representatives of this family have been noticed in the above townships, viz., stilbite, chabazite, natrolite and heulandite. The first mineral, stilbite, occurs in small, sheaf like aggregations of a yellowish or white color, associated with epidote, lining cavities in a massive garnet rock on lot 18, range 2, of Wakefield. A mineral in acicular tufts resembling natrolite is also often associated.

The mineral chabazite occurs at Haldane's Mine, in the same township, in transparent to translucent rhombohedral crystals, often a quarter of an inch across. Their color varies from colorless to wine-yellow, and frequently fine illustrations of penetration twins may be observed. I also noticed a similar mineral at Post's Mine, in Templeton.

Heulandite.—This mineral, in small, opaque, white, oblique rhombic prisms, invests the surfaces of a paroxenic rock on lot 7, range 1, of Wakefield.

We now come to the sulphates, of which we have but one representative, in the form of Barite, or sulphate of barytes. This mineral is used extensively for the adulteration of white-lead, which, by affording a white powder when ground, together with its high specific gravity and cheapness, is often made to replace 75 per cent. of the lead, and although the bulk may be increased, the body of the paint is impaired.

A vein of this mineral, often veined with green fluor, was worked some years ago in the township of Hull. Another deposit of this mineral is on lot 12, range 12, of Templeton. It occurs in white lamellar bedded masses in gneiss. The appearance or overlying portion is more or less colored by the oxidation of some furruginous mineral, and is greatly mixed with calcite.

Carbonates.—Of this group, like the sulphates, we have but one member in the form of limestone, or calcite, Independent of the extensive beds of amorphous and crystalline limestone that so characterize this neighborhood, more especially the western portion, we find bands of a more cleavable nature cutting through the pyroxenic strata, forming the gangue of apatite and other minerals.

On lot 7, range 1, of Wakefield, a beautiful dark-blue cleavable variety is associated with wollastonite, and on the same property a translucent, green, cleavable variety, often exhibiting large cleavage planes, enclose garnet and pyroxene. Numerous other localities in these townships have afforded forms of the dog-tooth spar and other combinations.

Flourids.—Fluorite, or fluor-spar, may frequently be noticed amongst the associated minerals of the apatite veins. On lot 13, range 13, of Hull, small semi-transparent greenish cubes occur in a limestone, and on lot 10, range 14, octahedrons of the same color have been found. It is also frequently met with in small quantities of a blue, violet or purple color.

Anhydrous Oxides.—Independent of those members of this group already mentioned under iron ores, we have spinel and rutile to notice. The former occurs in cubes, sometimes more than an inch

across, in a band of limestone, on lot 7, range 1, of Wakefield. These crystals vary from a dark-green to a light lavender blue, and may be more rarely observed in semi-transparent crystals of a pink color, constituting the spinel ruby. These crystals are built up of granular conchoidal fragments, which are often transparent. Some of these cubes when broken are found to contain a nucleus of a black, vitreous color, having the hardness of about four, and easily fusible before the blow-pipe. Another instance of the alteration of this mineral was observed in the same region where a group of these crystals were partly converted into a steatitic mineral. Crystals of spinel from the size of a pea to that of a bean are distributed through a grey pyroxene rock that extends over many acres.

Rutile.—Is found in small red geniculated crystals in barite on lot 12, range 12, of Templeton.

Silicon Group—Quartz.—This mineral, not only forms one of the commonest constituents of our rock masses, but fills many of the veins that traverse them. It sometimes encloses such minerals as apatite, pyroxene, titanite, &c. A vein of this nature occurs on lot 18, range 2, of Wakefield. Crystals of this mineral are by no means common; however, a few good forms have been met with in Templeton and Hull, of such shades of color as smoky-brown or amethystine, and colorless.

Jasper.—This mineral occurs in a bed 2 feet in thickness, overlain by gneiss, on lot 15, range 10, of Hull. It varies in color from a dark-red to a chocolate-brown, sometimes mottled with yellow, and is susceptible of receiving a high polish, comparing favourably with similar specimens from Lake Superior and Nova Scotia.

It is occasionally marred by inclusions of hard foliated masses of mica and crystalline specular iron.

Agate.—A yellowish-brown chalcedony alternating with bands of quartz may be referred to this mineral, occurring on lot 17, range 9, of Templeton.

Mr. W. L. Scott asked what Mr. Willimott's opinion was respecting the nature of caxoclasite, whether he agreed with Mr. Lewis as to its composition; also why the barite shaft on the road to King's mountain, which had been visited *en passant* on one of the club excursions had been abandoned?

The lecturer had never visited the locality of the barite shaft, and could not say why it had been abandoned. He did not agree with Prof. Lewis in thinking that caxoclasite contained phosphoric acid.

Mr. LAWSON had not caught the lecturer's idea respecting the rounding of the angles of pyroxene and apatite crystals. He combatted the theory of igneous action and favored that of solution, Mr. Lawson considered the objections to the igneous theory satifactory, and did not think the lecturer had made out his case against the theory of solution, which appeared to be, that, as rounded crystals of pyroxene were found with similarly rounded crystals of apatite, the modification in each being evidently due to the same cause, and as pyroxene was totally insoluble, the rounding could not have been effected by a solvent. Mr. Lawson thought that water at very high temperatures could dissolve almost anything.

Mr. W. P. ANDERSON understood that the mica of this locality was phlogopite, which contained a small quantity of water, and was in consequence less refractory than muscovite, the chief commercial variety. He had been informed that muscovite was found in the Mattawa district, and wished to know if such were the case. The lecturer had no doubt of it, as he had specimens probably referable to that variety.

In reply to Mr. Small, the lecturer stated that his apatite statistics were derived from the export returns, and consequently were exclusive of the quantity mined and awaiting shipment, as well as of the 800 tons used in the Brockville Chemical Works.

Mr. LAWSON asked what the New York fire test for mica was? Mr. Willimott was not certain, but thought it was merely resistance to a blow-pipe flame. It was recognized as the standard of value in Canada. Muscovite was untouched by the blow pipe flame.

In a discussion on apatite it was elicited that nothing less than 70% material paid, although arrangements were reported as being in progress for shipping 65% stuff to England for treatment by a new process. Members of the British Association had informed Prof. Macoun that the refuse of the Templeton mines was superior to anything worked in England, and that in the future middlings would be of great value.

Mr. LAWSON stated that untreated apatite was proving in the long run superior to superphosphate.

Mr. WILLIMOTT thought this probable because in its action it would resemble the valuable fertilizer ground bones.

In reply to Mr. Fletcher, who asked if there was any official statement on the point, Mr. Small cited the report of the Department of Agriculture on tests made at the Agricultural College, Guelph, showing that good effects followed its use in the third year after application when applied to root crops, but not to cereals. He found this opinion endorsed in leading Scotch agricultural papers, and stated there was a large demand for the ground, untreated apatite in Belgium to fertilize the sugar beet farms.

Mr. FLETCHER thought if this were true the farms in the apatite district should be particularly fertile, which, from what he had seen in this district, did not appear to be the case.

Rev. Mr. MARSAN instanced some particularly fertile patches on the upper Gatineau, which had been worked for thirty years without manuring and still remained fertile. This success he attributed to the vicinity of phosphate deposits. He thought the two theories as to the best means of using the phosphate reconcilable. Roots require little phosphate, while fruits must have it. In spring it is found that all the phosphorus in a plant is contained in the root, in July it is in the straw, while at harvest time it has found its way into the fruit; consequently cereals would require it in such a form as would favor rapid assimilation, while root crops could get it from the more slowly disintegrating ground apatite. In the reports of the French agricultural schools preference was given to the raw material, and the French newspapers were advising the same treatment.

The lecturer's remarks on all points he considered most exact. He (Father Marsau) had studied the neighborhood of the Desert, which was very similar to the formation at Chelsea. No tract is so uniform as the crystalline limestone band. The observations of the survey had extended 60 miles up the Gatineau; 90 miles farther up the river the same formation was found.

He had found gold on Trout Creek, which empties into Eagle River. Although the geological formation would lead one to expect its existence he had paid little attention to the first reports of its presence, because farmers often confused mica and pyrites with the precious

metal, and would show him finds of these glittering deceivers, but when he had an opportunity he brought a sample of sand to the College laboratory and found traces of gold in it; he had, however, been unable to obtain any sand since in consequence of the water being too high whenever he passed.

Respecting the apatite deposits he had reached the conclusion that they diminished in number and quantity as the Ottawa basin was left behind.

Prof. MACOUN said that from a botanical point of view there were advantages peculiar to each method of applying apatite, as annuals required phosphorous supplied rapidly and would benefit from superphosphate, while biennials would require it principally the second year as a constituent of their large crops of fruit.

OBSERVATIONS ON THE TERRESTRIAL MOLLUSCA OF OTTAWA AND VICINITY.

F. R. Latchford, B.A.

(*Read February 5th, 1885.*)

In a paper read before this Club on the 5th of March, 1880, Mr. G. C. Heron notes the occurrence in the vicinity of Ottawa of thirty-three species of terrestrial mollusks. While his list is remarkable not only as the record of a single year's work, but as the most extensive Canadian list previously published, it does not include many species which are now known to occur here. Some of these have been recorded from time to time in the reports of the conchological branch of the Club, and quite a number of others have been found for the first time during the past year. Owing to the importance of several of these additions, it has been thought advisable that a new list should be published, and the task of preparing it has been allotted to me. Recognizing that its value will depend wholly on its accuracy, I have been careful to include in it no species of whose identity I am not certain, and of whose occurrence here I am not personally aware. With a single exception, I have myself found every species mentioned. Chiefly for the benefit of members of the Club who may take up the study of this department of natural history, the localities in which the different shells now occur are pointed out, and such outlines of the form of certain species given as may, it is hoped, obviate the necessity of reference to publications not always readily accessible. In this connection, I would recommend as a most valuable work, Morse's Terrestrial Pulmonifera of Maine, a copy of which has been presented to the Club by the learned author.

In nomenclature I have often been at a loss what course to take. Following in the main Dr. Binney, I have in some instances adopted in preference, certain subgeneric names of Prof. Morse, which have not so far been generally accepted, but less on account of their propriety than because the shells to which they have been applied, being comparatively new to science and limited in their distribution, are very little known. As our shells in many cases do not agree in

size with the dimensions given for the same species in the monographs of the Smithsonian Institution and in other publications, accurate measurements are given of every species.

Macrocyclis concava, Say.—In 1883 I found this species in considerable abundance in a thicket of prickly ash, in an open space in the woods on the left shore of the Rideau, above Billings' Bridge. Elsewhere it does not occur in abundance, though two or three shells are not unfrequently found together in several localities. The shells found under the prickly ash were burrowing in a strong clay soil. Their preference for this situation may be owing to the fact that the moisture condensed by the leafy shrub would be as abundant as in the woods, and remain nearer the surface than where the mould was deep, while it would be as little or even less subject to rapid evaporation. *M. concava* is noted for its cannibalistic propensities, and a specimen kept with smaller species destroyed several before its operations were observed. Our shell is almost transparent and measures no more than 14·5 by 12·3 mm. in diameter. Shells of this species received from the distinguished field conchologist, Mrs. Andrews, of Knoxville, Tenn., are 22 by 18 mm. and though "living" shells, are white and opaque like the "dead" shells found here.

Zonites inornatus, Say.—This species was probably once common on the Ontario side near this city, but so far as I know is not found there now. On the Quebec side it is not rare. High up on the westerly slope of King's Mountain, I found ten or twelve examples on the occasion of the Club's excursion thither on May 22nd, 1884. My favorite collecting ground, and the only one apart from the Laurentides, where this species is at all common, is near Fairy Lake. If you follow in a northerly direction the ridge of the hill beyond the Aylmer Road toll gate, a scramble of a mile over rocks and through tangled woods will bring you to a small brook, so hidden beneath rank growths of moss and fern that but for its musical fall of a few feet into a pebbly basin its presence would be unnoticed. The vegetable mould in the vicinity is deep, loose and moist, and in it numerous species find a congenial home. I have taken in this locality, in the space of a few yards, all the large helices found near Ottawa, and many of the smaller ones. The animal of *Z. inornatus* is bold and very active, and is colored various shades of blue. Mature shells have an average greater diameter of 13 mm.

Hyalina nitida, Müller.—This is one of a number of species found here which occur also in Europe, but which are indigenous to America, and not imported. In low-lying places it is not uncommon. The woods near Billings' Bridge afford it in considerable numbers under logs and driftwood lying along the outlet of Dow's swamp. In July 1883, it was particularly abundant in company with *Succinea ovalis* on the verge of the brook flowing through the beaver meadow in Hull but both were absent on every occasion on which I visited the place during the past season. Owing to the moist nature of its habitat, it is able to venture abroad in the day time, and I have more than once observed it on warm, sunny days moving about actively early in the afternoon. In common with species which occupy localities subject to inundation, it is capable of living some time under water. Specimens kept forty-eight hours in an inverted test tube, immersed in an aquarium and containing no free air, were apparently lifeless when taken out, but soon recovered. If placed unconfined in the aquarium, they find their way to the sides and climb to the surface of the water as quickly as possible. *H. nitida* is the largest of our *hyalinæ*, measuring often 7 mm. in diameter by 4·3 mm. in height.

Hyalina arborea, Say.—This occurs in hardwood groves everywhere, and sometimes in the driest stations in open fields. Indifference to its surroundings leads it to frequent even pine woods, which other species always avoid. It often burrows to a considerable depth in the under side of rotting logs. A few of the shells found here have a greater diameter of 5·6 mm., but the average of twenty specimens is only 5·1 mm.

Hyalina viridula, Menke.—Like *H. nitida*, this shell has a wide distribution in Europe as well as in America. It manifests like that species, but not to the same extent, a preference for moist localities, and is almost as common as *H. arborea*. It may be found near the city on the left shore of the Rideau canal, immediately below the Bank street bridge. It greatly resembles *H. arborea*, but may be readily distinguished from that species, when viewed from above by the sudden enlargement and comparatively greater width of the body whorl. It is also smaller by a little than *H. arborea*, seldom attaining more than 5 mm. in greater diameter, and has one whorl less.

Hyalina indentata, Say.—This species is very rare here. I have taken occasional specimens in Billings' bush on this side of the Ottawa, but it is least rare in Hull, where it occurs with *Z. inornatus*. The shell is highly polished and transparent, and the lines radiating from the minute umbilicus distinguish it from allied species. The largest specimen taken measures 4·8 by 4·5 mm. Those usually met with are only a little smaller.

Hyalina binneyana, Morse.—In a letter to Mr. Fletcher, Mr. Heron stated that he had found this shell shortly before leaving Ottawa. It has not, however, appeared in the Club lists, nor in any list of Canadian shells. In looking over shells collected in Billings' bush I found several specimens which I thought at first were immature *H. viridula*, though remarking their difference in color. A careful examination of these shells and a comparison with typical specimens from Maine, kindly furnished by Mr. T. H. Aldrich, of Birmingham, Ala., prove them to be *H. binneyana*. It is pellucid and polished like *H. indentata*, but has an open umbilicus. Greater diameter 3·5, lesser 3, height 1·4 mm.

Pseudohyalina minuscula, Binney.—This was recorded from Eardley, Quebec, in the report of the conchological branch, published in Transactions No. 3 of this Club. I have since taken only two shells, but have no note of the locality where they were obtained. It seems very rare. The shells found have a greater diameter of 2·6 mm.

Pseudohyalina exigua, Stimpson.—In moss collected in Dow's swamp by Mr. Harrington in the fall of 1883, this species was found in considerable numbers. I have met with it in Billings' bush under bark and decaying leaves, and in similar situations in the hills northward. Many of our smaller shells appear to great advantage under the microscope, but in the delicacy and intricacy of its sculptured surface this is perhaps the most beautiful of all. It is very minute, its greater diameter being only 2 mm.

Striatura milium, Morse.—Mr. Heron records this shell in a foot note to his paper, and he informs me that he found it in Billings' Bush. I have searched for it there during several years and obtained only three specimens. In the moss from Dow's Swamp two others were found. It must be regarded as very rare in this vicinity. Under the

microscope it yields in beauty not even to *P. exigua*. It is even smaller than that minute species, the greater diameter of my largest specimen being only 1·2 mm.

Striatura ferrea, Morse.—The only specimen I have found was obtained in the hills near the iron mines in Hull on the 16th November, 1884, when several other interesting discoveries were made. It is a very distinct species; but to be absolutely certain of its identity, I sent the shell to Prof. Morse, to whom I am under many obligations, and he returned it as correctly determined. Like *S. milium* it has only three volutions, but is less transparent and of a dead steel-grey color. The specimen found measures 2·8 mm. in greater diameter.

Conulus fulvus, Drap.—This little shell is very common in moist stations in shady woods, and sometimes in open pastures, often occurring in company with *H. viridula*. It is more globose than any helix found here except *Strobila labyrinthica*, from which it differs externally in being highly polished. It is subject to great variation in size, the greater diameter ranging from 2·4 to 3·2 mm. and the height from 1·3 to 2·8 mm. Jeffreys states that in England specimens collected in dry situations are much larger than those found in wet moss, but my largest shells were taken in a very wet station north of Fairy Lake.

Gastrodonta multidentata, Binney.—From a notice of the first excursion of the Club to the King's Mountain, published in a city newspaper, it appears that Mr. Heron found this shell there on May 22nd, 1880. It seems a very rare species. Repeated and careful search for it was unsuccessful until my visit to the hills north of Hull in November last, when I obtained one specimen under a log in a moist, well-shaded locality. It is 2·7 mm. in greater diameter.

Patula alternata, Say.—This is the only ornamented species of land snail indigenous to Eastern North America, *H. varians*, and the banded variety of *H. hortensis*, being importations from the West Indies and Europe respectively. It is the commonest of our large species, frequenting the open more than others, though often found in the woods, and seems capable of enduring the driest situations. In the fall it assembles in particularly large numbers, but is at all times more or less gregarious. In April, 1882, I observed hundreds under flat rocks near the old lime kilns in Rochesterville. The marl beds east of

Hemlock Lake furnish it in great abundance. In the spring the animal secretes copiously a brownish fluid which stains the fingers, and which probably is the matter used to color the brown parts of the shell. In captivity it is not given to rambling, and if supplied with food will remain for days in the same place. The eggs are deposited in June and July, and measure 2·5 by 2·1 mm. I first noticed the young early in August, when they measured 2·6 mm. in greater diameter. They increased to 3·8 before hibernating in October. They had then and for the following summer a well-marked keel at the upper third of the last whorl. Mature shells measure 18·5 mm. in greater diameter by 16 mm. in lesser diameter, and have an average height of 10 mm. They are subject to considerable variation in elevation and depression and in the greater or less distinctness of the alternating color marks.

Patula striatella, Anth.—This is closely related to the last species in form, structure and habits, but appears to evince a greater love for the woods. The under side of a rotting hardwood log is its favorite resort, and in such stations in Billings' bush and elsewhere I have taken it in great numbers in late autumn and early spring, and, in less abundance, during the summer. It is usually light-brown in color, but is sometimes of a reddish tinge. Young shells, as in the case of *P. alternata*, are prominently keeled, and some specimens retain this peculiarity to maturity. The average greater diameter is 5 mm., but some specimens found measure 6·5 mm.

Planogyra asteriscus, Morse.—Mr. Harrington found this shell in moss gathered in Dow's swamp in 1883, and it was recorded from Ottawa for the first time in Transactions No. 5 of the Club. I find it also among shells collected in Eardley in 1881. It does not appear to be uncommon in moss in moist, well-shaded localities. Although less than two millimetres in greater diameter (its exact measurement is 1·8) it is easily distinguishable from other minute species by the numerous thin laminæ projecting at short intervals from the body whorl and giving the shell the appearance of an asterisk, after which it is very appropriately named.

Helicodiscus lineatus, Say.—This beautiful little shell is not uncommon in rich woods under moss and fallen trees, but does not occur anywhere in great numbers. Billings' bush or Dow's swamp may be

depended upon to furnish a dozen specimens any summer afternoon. The animal is long and slender, of a whitish color and very timid. Greater diameter 3·3, height 1·4 mm.

Strobila labyrinthica, Say.—The normal form of this shell resembles *C. fulvus* in size and color, but its surface is strongly marked with raised lines of growth, and the aperture armed with six ribs, three of which are thickly set with sharp projections pointing outward. The yielding tissues of the animal pass over these without catching, but an intruding insect or other enemy would find his progress effectually barred by them. The color of the shells is generally brown, but I have found several examples which are of a chalky white. These albinos were taken living under troughs used in catching sap in a grove of sugar maples in Hull. A favorite station for this shell is in mossy crevices in rocks, where it is sometimes found in large numbers. From between ledges in Brigham's quarry I have taken it in great abundance. Greater diameter 2·4, height 2 mm.

Stenotrema monodon, Rackett.—This species, which was first described from Canada, belongs to a small group of distinctively American shells. It is common here in or near woods, and often in very dry stations, but nowhere do more than a few occur together. While it loves company it seems always satisfied with one or at most two companions. Its constant occurrence in twos and threes under the one log or stone is perhaps something more than a mere coincidence. It varies considerably in elevation and slightly in diameter. I have not found any whose greater diameter is less than 9 or more than 12 mm. The umbilicus in some specimens is wide and open, and in others from the same localities is so narrow as to be concealed by the reflection of the peristome. This latter form has been called var. *fraterna*, but it is not, I think, deserving of recognition even as a variety. On the other hand, the small, globose form termed var. *leaii*, which is never found here, though common in the Manitoulin Islands, seems to me clearly entitled to specific rank. The young of *S. monodon* have a simple lip, are brown in color, strongly keeled, and always covered with a velvety growth of hair-like projections. With age the lip thickens and becomes reflected, one tooth is formed on the labium and another within the aperture between the upper and lower walls of the last whorl. Lastly,

the shell looses its keel and hirsute coat and becomes smooth and sometimes polished. The change thus produced between immature and mature shells is so great that it is at first difficult to realize that they are not altogether different species.

Mesodon albolabris, Say.—This our largest, and though not in point of numbers, our commonest land snail, is, on account of its size and color, the one most frequently noticed by an ordinary observer. Dead shells are often seen washed out by the rains from hillsides or lying in strong contrast with the blackened soil in the woods where fires have passed. Still, outside of a few localities I know of no place where an afternoon's diligent search would be rewarded with more than a dozen living and mature specimens. The marl beds east of Hemlock Lake can I find be always relied on to furnish this species in quantity. It would be hard to imagine conditions more favorable, the marl not only holding moisture well and producing grasses and mosses which, in growth or decay, afford rich supplies of food, but also furnishing in abundance, in what has once done duty for the same purpose, the very material required for the formation of shells. Another place where I found *M. albolabris* common in the summer of 1883, is a ravine in Hull, lying northward about a quarter of a mile from the house built and formerly occupied by Mr. Lindsay Russell. This locality, however, though visited often, afforded me very few shells during the past season, when my best find was made in an open pasture near the magnesian limestone quarries in Nepean.

M. albolabris varies in greater diameter from 20·5 mm. to 30·25 mm., representing in cubical capacity a ratio of 1 to $3\frac{1}{4}$. These are extremes, and though numerous examples approaching either limit may be found, the average size is nearer the maximum. The great majority vary between 24 and 28 mm., and fifty shells measured give a mean greater diameter of 26·2 mm. Very large or very small shells seem confined to no particular locality, but occur indifferently in all.

The shell of this species although sometimes of a light greenish color, is usually of a beautiful russet. The lip, broad and white in old specimens, is in the young comparatively narrow, and quite often of a delicate rosy tint, which unfortunately soon fades in the cabinet. The animal is generally of a pale grey color darkening towards the head.

Of a number kept in my garden last summer I found the eggs of only one, which were in a cluster loosely adhering to one another and buried half an inch beneath the surface of the mould. They were thirty-eight in number and measured approximately 3 by 3·5 mm. In twelve days after their discovery (which was made on June 4th) some, and in fifteen days all, had left the eggs, and had well formed but very thin shells of somewhat less than one and a-half whorls. They had added nearly two whorls by the first week in October when, with their parents, they went into winter quarters, the old shells burying themselves in the mould and the young in moss, which had been kept as a preserve for minute species.

While neither this nor any other species found in this country serves as an article of human food—though *H. aspersa* is said to have been imported into California for that purpose, I know of an instance in which *M. albolabris* was used as a remedy for tubercular consumption, but not with the result desired.

Mesodon thyroides, Say.—This fine shell does not seem to occur in the immediate vicinity of Ottawa, but forty miles to the south-east, at Casselman, it was found in considerable numbers by Mr. Harrington on the 21st of August last. This is the first record of its occurrence in Central Canada, and I can find no evidence of its having been ever taken in Quebec. Near Toronto, Dr. Brodie informs me, it is not uncommon. It is a smaller and more elegantly formed shell than *M. albolabris*, and differs otherwise in having, like *M. sayii*, a narrow lip, an open umbilicus and a tooth on the parietal wall. A variety of *M. albolabris*, has also a toothed labium, but it does not occur here, nor even so far as I can learn, in Western Canada, though it might be expected there, as it is found in Michigan. *M. thyroides* is more elevated than *M. sayii*, and is larger than any of that species found here, the average greater diameter of the five examples I received from Mr. Harrington being 23·2 mm. It also differs from that shell in having a narrower umbilicus, and in wanting the tooth on the lower margin of the peristome.

Mesodon sayii, Binney.—Although generally considered a rare species, here in certain localities at least, it is not altogether uncommon. Unlike Mr. Heron, I have not been successful in finding it alive on the

Ontario side of the Ottawa, though I have sometimes found dead shells. The nearest station to Ottawa where I have met with it is in Hull, on the northerly slopes of the hill beyond the Aylmer road toll-gate. A visit to this locality is usually rewarded with two or three mature living examples. Young shells are not nearly so rare. I took eleven in the afternoon of the 26th of April, 1884. They were from 13 to 16 mm. in diameter. Previously I used to leave immature shells of this, as of other species, where I found them, but having learned that helices were easily reared, determined to try the experiment with these young *M. sayii*. I placed them with mature shells of the same and other species in a glass-covered box, half filled with rich loose mould, moss and withered leaves well moistened; and kept them plentifully supplied with food in the form of lettuce, cabbage and flour paste, all of which they appeared to relish exceedingly. They grew rapidly, and by the 1st of July had begun to form a thick peristome. The tooth on the basal margin did not appear for some time. Still later the tooth on the parietal wall was formed, a thin transparent film at first, increasing in thickness and diminishing in length and breath as layer after layer was day by day deposited by the little artificer with as much precision as if the highest intelligence directed its operations. By September 1st, the shells were all fully formed, but quite thin. The addition made in captivity is lighter in color than the portion formed previously. It consists in no case of more than a whorl, but as this is the last and largest it increases the diameter of the shell more than a third and brings it to from 19 to 21·3 mm.

Whether from eggs deposited by these or the older specimens I cannot tell, but early in August I first noticed in the box a number of young shells a little more than two millimetres in diameter. They appeared to grow but slowly, yet by November had increased fully a whorl. On the 16th of that month, while collecting in the Laurentides, I found hibernating a dozen or more immature *M. sayii* precisely like those I had taken near the city the previous April. The lines of accretion formed immediately before hibernation were of a reddish colour. Between this dark band and apex, another band less prominent is distinguishable at the point reached in one season by the shells I had reared from the egg. From these facts I infer that *M. sayii* attains maturity in

two years. *M. albolabris* appears to mature in the same period. In every specimen I find on the body whorls, about one whorl from the aperture, lines of growth thicker or darker than the rest, and about two and a half whorls from the apex a second and fainter series of dark lines. Besides these hibernation marks there are other irregularities less prominent, which indicate dry periods in summer, when the animal was obliged to remain inactive and growth was retarded. When the sign of hibernation in the body whorl is preceded, as it sometimes is, at a distance of four or five millimeters by a mark less distinct, it may be inferred that the autumn of the second year of the shell's life was cold and that the animal went early into winter quarters, but fine weather following, it came forth again and was able to grow a little before the cold came to stay.

Although the Mesodons attain their full size in two years, the shell at the end of that time is quite thin. The occrrence of thick and thin shells in the same locality is due to the fact that some are old and others young.

Vallonia pulchella, Müller.—This is another of the helices found here which has a distribution both in America and Europe. It is also said, like *C. fulvus*, to inhabit Siberia and the Azores, and has accordingly not only a circumpolar range in three continents, but extends well to the south in a fourth. It is one of the smallest of helices, measuring only from 2 to 2·5 mm. in diameter. Although so small, its pearly whiteness renders it easily discernable, and it may be found in quantity almost anywhere here, under logs and stones near springs or the margins of streams. It manifests an especial preference for wet stations and is more common by far in open fields than in the woods. The animal is milk white in color, in part tinged with yellow, and is very timid. The slightest jar or movement made near by causes it to withdraw within its shell. The observer who places it on a slide and awaits its exit needs to be the possessor of great patience, but he will not be unrewarded for his pains though the little *habitant* refuses to come forth. The shell itself is a beautiful object under the microscope, and is sufficiently transparent to permit the beating of the animal's heart to be distinctly seen within it.

Punctum minutissimum, Lea.—This is one of the smallest land shells known, and if, as some think, identical with *P. pygmæum* of

Europe, also one of the most widely distributed. West of Billings' bridge it is not rare, but on account of its extreme minuteness is very hard to find. I have also obtained it in Hull, but on either side of the Ottawa it occurs only in moist, but not wet, places, in hardwood groves. The greater diameter of the largest shell found here is 1·1 mm., height 0·6 mm.

Vitrina limpida, Gould.—Large numbers of this beautiful shell assemble together in the fall, and continuing together during the winter and for some time in the spring, then disperse. Late in October, 1881, it was particularly abundant under wet leaves and grass in the upper end of the Hull beaver meadow. As might be inferred from its northern range, it is very hardy, being excelled in this respect not even by the *limaces*. On November 16th, 1884, I noted great numbers in Brigham's pasture, Hull, under cedar logs in light, sandy loam. Although the ground was covered with snow and frozen for some distance on each side, under the logs the shells were all moving about among numerous clusters of eggs apparently not long deposited, and numbering from eight to twenty-three, in each cluster that I counted. The large clusters seemed too bulky to be the produce of a single individual, but as the eggs are not fully inflated when in the body of the animal they then require much less space than that which they occupy when deposited. The eggs, less opaque than those of the *helices*, and less transparent than those of the *limaces*, measure 1·4 by 1·1 mm. The shell itself has usually a greater diameter of 6 mm., but often reaches 7 mm. Shells from Hull much exceed in size those found on the Ontario side of the Ottawa. The whole internal economy of this species may be viewed through its transparent shell. The heart of one specimen was observed to beat 130 times a minute.

Limax agrestis, L.—The presence of this mollusk here could scarcely have passed unnoticed by Mr. Heron, who recorded many very rare species. For my own part, I did not find it until 1882, when I met with a single specimen within the city limits. In the same locality, in the following year and since, it has been very abundant. It is an imported species, its advent here, I am inclined to think, being quite recent. It is marvellously prolific: the eggs observed under a strip of board last October literally covered the ground. They are pellucid,

nearly spherical, and 2·3 mm. in diameter. Leuch, a German, is quoted by Jeffreys as saying that a pair of these slugs have been known to lay 776 eggs. Some of them were dried eight times successively in a furnace and yet produced young. A number of this species placed in captivity early in November have been active all winter, although the storeroom in which I have kept them is often very cold, and their eggs have continued to be deposited apparently without intermission. As an instance of this hardiness of the mollusk, I may mention that one morning in January when the temperature of the room was 34° Far., or only two degrees above freezing point, I found a pair *in coitu* on the under surface of the glass cover of the box. On very cold days they remain contracted on the earth under a piece of basswood log, while the native species kept with them—*L. campestris*, under the same circumstances, cling to the log itself. *L. agrestis* attains a length of 55 mm. when fully extended, and is subject to great variation in color. Flesh tints prevail in the young, but in about fifty per cent. of the specimens observed they become in time replaced on the back and sides by dark blotches, more or less numerous, resulting sometimes in producing examples of a deep brown color. The rudimentary shell may be found beneath the posterior part of the mantle.

Limax campestris, Binney.—This is the species commonly met with in moist places in woods or open fields or along the banks of rivers—everywhere except on sandy soil. It is less than half the size of *L. agrestis*—27 mm. being about the average length—and is not so common in gardens as that species. I have found the two together only in one station, near McKay's Bay, New Edinburgh. At any period of their growth, even when of the same size, the two species are easily distinguishable by the usually lighter color, and greater opacity and apparent solidity of the foreigner. The foot of the native species also presents a more marked contrast between its centre and sides. While the mollusk is at rest the centre of the foot is bluish and semi-transparent, but when it begins to move, the muscles contracting form an opaque spot which advances towards the head and is quickly followed by another and another, presenting the appearance of a miniature torrent rushing with great rapidity from the posterior to the anterior end of the foot.

If either *L. campestris* or *L. agrestis* is suspended in the aquarium on a sheet of glass or other convenient support, it will descend by means of a thread of mucus to the bottom, and making its way across it and up the sides, rests only when its breathing pore has been brought above the surface of the water. In its progress the tentacles are almost wholly withdrawn within the head, and vision, which must be dim at best, becomes impossible.

Tebennophorus carolinensis, Bosc.—This large slug is not uncommon in this vicinity inside the loosening bark of decaying trees and in rotting logs. On the Club's excursion last July to the Chats, it was observed in abundance in the woods near Mohr's wharf under the bark of old beech and elm stumps. It is very variable in color, some specimens being of a uniform yellowish tinge, others with dusky spots sprinkled over the mantle usually in groups of two or three longitudinal rows. My largest alcoholic specimen is 34 mm. in length, 18 in height and 12 in diameter. When extended it would be from 80 to 100 mm. long.

Ferussacia subcylindrica, L. (*Bulimus lubricus, Gould.*)—Mr. Heron states that this shell is found in great numbers six miles from Ottawa along the line of the St. L. & O. Ry. Near the city it is not, to my knowledge, so abundant, though still far from rare. I have found it most plentiful in a rocky field in New Edinburgh, lying beyond and to the left of the main entrance to Rideau Hall, and solitary specimens will be met with in the woods everywhere. The only two shells found in Hull on November 16th differ very much from those usually occurring. Measurements of what may be called the typical form give an average length of 6 mm., diameter 2·5. The Hull shells measure 6·8 by 2.3 mm. Although the diameter is only 0.2 mm. less, yet as the shells are longer than the type, they appear much more slender. It remains to be determined whether these two shells represent merely accidental variations or a fixed variety peculiar to the Laurentides. They were hibernating when found and had formed their winter epiphragm which is altogether different from the thin transparent membrane used during aestivation. It is thick, strong and calcareous, like that formed for winter use by *Helix pomatia* of Europe. None other of our indigenous shells, nor even those which are common to

America and Europe, as *Hyalina nitida*, *Vallonia pulchella* or *Tachea hortensis*, form a calcareous epiphragm before hibernation, but I have observed a similar structure in *Aglaia fidelis* from British Columbia.

Pupa pentodon, *Say*.—In moss and around the roots of ferns and grasses this little shell may be found here rather abundant. I once took a large number in company with other pupas and many of the smaller helices, in the ravine at Upper Chelsea below the ruins of the old mill. It is smaller than any pupa found here, being only two mm. in length by one in diameter. The name *pentodon* is somewhat misleading, inasmuch as the shell has very frequently as many as nine teeth, though only five are prominent.

Pupa armifera, *Say*.—Although now added to our list for the first time, this species does not appear to be rare. My first specimens were taken in July, 1884, near the Hull abutment of the Pacific Railway bridge over the Ottawa. Previously, however, on the 6th October, 1882, five specimens had been found by Mr. Harrington on the cliffs above the Queen's Wharf in this city. It seems to manifest a preference for rocky situations. It is the largest pupa found here. If the measurements—$1\frac{2}{3}$ by $2\frac{2}{3}$ mm.—given by Binney and Bland in their monograph and repeated in Gould's Invetebrates of Massachusetts, are correct, this species does not here attain the size it reaches in the United States. Of the eighteen or twenty specimens taken at Hull the largest is only 4 mm. in length and the majority are only 3·6 mm. The disparity is still greater in diameter, which in our shells is not more in any case than 2 mm.

Pupa contracta, *Say*.—This is our commonest species. It occurs in moist situations under leaves and stones in woods and low pastures. One corner of the field on the opposite side of the railway from Dow's Swamp is very wet during the six months that the water remains in the canal near by. A number of cedar logs are in this corner, and under them *P. contracta* may be always obtained in abundance, accompanied by *Vallonia pulchella* and *Carychium exiguum*. All three are very minute shells, but owing to their color easy to find. This pupa is very much smaller than *armifera* and considerably larger than *pentodon* being 2·5 mm. in length by 1·3 in diameter. It has three and often four teeth, that on the transverse lip being very large and prominent.

Pupa corticaria, Say.—In a letter to me Mr. Heron states that this shell is common in Billings' Bush under logs and bark and in moss at the foot of trees; but I have succeeded in finding only a few specimens. Several, however, were found in the moss collected in Dow's Swamp by Mr. Harrington. It resembles *pentodon*, but is longer and more slender and has only one or at most two teeth. The number and arrangement of the teeth render it quite easy to determine the identity of these small shells.

Vertigo gouldii, Binney.—The *vertigos* are still more minute than the *pupas*, but the chief difference between the two genera is in the structure of the animals. In *vertigo* the lower tentacles are wanting, while in *pupa* they are, though short, always present. *V. gouldii* is not rare. I have found it sparsely distributed in a number of localities and in abundance in one. This is on the left bank of Brigham's creek, at the head of the rapids, below Washburn's axe factory. An embankment has been constructed from the railway to the creek, and under and on the sides of the stones that lie on the grass near the shore this species is sometimes so common that I have collected thirty or forty there in the course of half an hour. On other occasions I have been unable to obtain more than two or three specimens. Unlike our *pupas* and like our other *vertigos*, one excepted, this species is of a brownish color. Binney (Gould's Invt., 2nd Ed., 440) gives the number of whorls as "rather more than four." One shell has fully five, but otherwise agrees with the type. Its length is 1·9 mm., diameter 1 mm.

Vertigo bollesiana, Morse.—Like *Striatura ferrea*, this rare shell is now recorded from Canada for the first time. The only specimen obtained I found in the hills near Ironsides. I took it for *pupa pentodon*, but perceiving differences with a lens, placed it under the microscope, when its identity with *V. bollesiana*, to my great joy, at once became apparent. Prof. Morse, to whom I sent it for examination, has returned it as this species. *V. bollesiana* resembles *V. gouldii* in the number and arrangement of the teeth, and *P. pentodon* in color. It has, however, only four whorls, and is smaller than even the former species. My specimen is 1·6 mm. in length and 1 mm. in diameter. The diameter given by Morse, $\frac{65}{1000}$ of an inch, is a little less.

Vertigo ovata, Say—Is our commonest species. In moss from Dow's swamp it was very abundant, and I have taken it in great num-

bers under cedar logs in wet stations in the Hull beaver meadow. It has two teeth on the transverse lip, while the species above mentioned have only one. Compared with this, *V. bollesiana* is very small, and *V. gouldii* very slender. Its measurements are, length, 2 mm.; diameter, 1·2 mm. In Binney and Bland's monograph its size is given as much larger—3 mm. by 1·5, and in Gould's Invertebrates as slightly shorter and much less ventricose—"three-fortieths of an inch" by "one-twenty-fifth of an inch," or, expressed approximately in millimeters, 1·88 by 1.

Vertigo milium, Gould.—This species is still more minute than any yet referred to. It was first recorded from Canada in the report of the conchological branch of this Club in 1882, from a single specimen which I found in Billings' bush. I have since taken a few in the same locality, but none elsewhere. It seems to prefer the edges of bits of maple and elm bark. I have no doubt that it is not uncommon, but its extreme minuteness makes it hard to find. In fact it is by gathering pieces of bark and holding them up to the sun so as to catch the reflection of light on the polished shell that I have been able to procure specimens. Still it is not, at least here, as small as stated by the text writers. The length of the shells I have found is 1·1 mm., and the diameter 0·7 mm. In the description given in Binney and Bland its length is given as 0·8 mm.; diameter, 0·6. In all other respects our shell agrees with their description and the much better figures given in Morse and Gould.

Vertigo simplex, Gould.—Though larger, and therefore not so hard to find as *V. milium*, this shell is almost as rare. I have taken solitary specimens in Billings' bush, in Hull, and in a grove of young maples near Beechwood, but never met with a number at one time. It has more whorls than our other species, and the aperture differs also in being wholly unarmed with teeth. Here again my measurements differ from those I find given elsewhere. Mature shells of *V. simplex* found here attain, and sometimes slightly exceed a length, of 2 mm., while the diameter varies from 1 to 1·1 mm. According to the authors of the Smithsonian monograph its length is 1·6 mm., breadth 0·8 mm.

Succinea ovalis, Gould.—This, the most beautiful of our amber shells, is by far the commonest of the three species found here. It de-

lights to live in the immediate vicinity of water, but it is not, as some think, amphibious. If placed in an aquarium it lies motionless on the bottom for a time and then tries to reach the sides of the glass and climb above the water. On old logs in wet places it is often very common. In Nepean Bay, just beyond the Union Station, a great many large pieces of boom timber were lying in 1883, and doubtless from many years previous; and on this timber, just above the water line, in July and August of that year I observed *S. ovalis* in countless thousands of every size. They were conspicuously absent from sticks of square timber cut the preceding winter, and on which the *algæ* on which they feed had not then begun to grow. This locality is now almost completely destroyed, having been filled in with refuse from the mills, and in 1884 afforded me neither this shell nor that which I chiefly sought there—*Sphærium truncatum, Linsley*,—a species I have not found elsewhere. The muddy banks of the brook in the Hull beaver meadow are the most prolific collecting ground for *S. ovalis* in this vicinity, and the shells found there are large and of a rich amber color. When collecting there in 1883, Mr. Harrington, who was beating for insects in alders along the brook, was surprised to find in his net a number of young shells of this species, which had climbed the alders to a height of ten feet.

On June 1st, 1884, I observed this shell in considerable numbers —many in *coitu*—on moss in a swamp near Sparks' Mills. They were slightly smaller than the Hull shells, which average 11·5 mm. in length by 6 mm. in diameter. Near the same place, but on the banks of the Ottawa I found later in the same year two remarkably large shells, which I refer to this species. The larger measures 17·6 by 8·5 mm, and the smaller 15·3 by 8 mm.

While camping with a few friends on an Island in Heath's Bay, County Pontiac, I saw *S. ovalis* appear in great numbers under very peculiar circumstances. One of our party, to whom had fallen in turn the tedious lot of taking care of the camp in the absence of his companions, found that fishing alone in the bay was wretched sport, and paddling his canoe near to the shore, began, in order to while away the time, to splash the water inland as far as he could with the paddle. To his infinite surprise and wonder the shore was soon covered with these

living beads of amber, which moved slowly about, and as the stones became dry disappeared beneath them.

Succinea avara, Say.—This species is far from common here. Like *S. ovalis*, it inhabits moist places in the woods and open fields, but unlike that species, never congregates in large numbers. I have taken about a dozen examples in a space of five or six square yards in the locality which afforded me the very large *S. ovalis* just referred to. They are of much greater size than the shells usually found, averaging 8·5 by 5·6 mm. I have one shell still larger from Billings' Bush. It measures 10·4 by 6 mm.

There can scarcely be imagined a covering better adapted for protective purposes than that with which *S. avara* is provided. Overlapping the thin edge of the shell, the mantle secretes around the peristome a viscid substance to which particles of earth adhere and remain firmly attached. The shell closely resembles a speck of mud or fragment of bark; and as it is very slow in its movements, must often escape the searching eyes of enemies, whether bird or naturalist.

Succinea obliqua, Say.—This is the largest of the three species found here. It does not, like the others, frequent wet stations only, but is often met with in dry woods far removed from ponds and streams. It is quite a common shell, although not often seen except after warm showers in summer when they appear so suddenly and in such numbers that, like the young toads which sometimes accompany them, they might be thought to have fallen with the rain. The fact is that their dwellings being flooded they seek higher levels; and the wet ground being well suited for locomotion, make little expeditions on duty or pleasure until they find the earth becoming dry again, when they return to their hiding places in the grass or under stones They are unwilling to remain under water, but if confined there are, I find by experiment, able to live without free air for at least forty-eight hours. The largest shell found measures 18·5 by 10 mm., but the average is much less, being 14 by 8·5 mm. Shells a little smaller are very common in the marl beds, and specimens collected there hibernating on the 5th November, 1884, have since been subjected to cold far below the freezing point; and yet, if now placed in tepid water, they become active in a few minutes.

The forty-two species above noted constitute the number of terrestrial mollusks now known to occur in this vicinity. That others may be expected will appear from comparison with lists of the shells found in the Eastern States, where the molluscan fauna is most like our own, and with the few imperfect Canadian lists which preceded Mr. Heron's. In 1864 Morse catalogued from Maine forty-nine species. *Vertigo bollesiana*, found subsequently, increased the number to fifty. With the exception of *Z. inornatus*, *H. nitida*, *P. armifera* and *Succinea obliqua* (which is replaced there by *S. totteniana*) all the shells found here are recorded from that State. Two of the Maine species, *Alexia myosotis* and *Melamphus bidentatus*, inhabit salt marshes and cannot be expected inland. The remainder, with the exception of *Mesodon dentiferus* and *Zoögenites harpa*, are European species introduced by commerce. One of these, *Tachea hortensis*, is said by Mr. Heron to have been taken near Ottawa. It is, however, with another species mentioned by Morse—*Pupa muscorum*—more usually a resident of the sea coast, though it extends inland along the St. Lawrence at least as far as Quebec. The occurrence of *Pomatia aspersa* in Maine and of the slugs *Arion ater* and *Limax flavus* is merely accidental, and none of these species appear to have obtained a foothold here. *Hyalina cellaria*, on the other hand, has increased rapidly and has extended far inland. Dr. Brodie found it in Toronto last September, and about the same time it was discovered in Portland, Oregon, by Mr. H. E. Dore. It is certainly a species that may be looked for here. As to *Z. harpa*, it appears to pass north of Ottawa, being found at Gaspé, James' Bay, and on the north shore of Lake Superior. *M. dentiferus*, one of the rarest American helices, can be traced to nearer home. It appears in Adams' "Shells of Vermont," a list including thirty-six species, and in a more accurate and extended list kindly furnished me by Mr. E. M. Goodwin, of Hartland, in that State. Mr. Whiteaves recorded it from St. Lambert, Que., in 1861, and it may be the shell catalogued from the valley of the Rouge as *Helix exoleta** by D'Urban in the same year. Dr. Brodie found it last summer in Muskoka. It accordingly occurs both east and west of us. The

*D'Urban's *H. exoleta* is more likely to be the toothed variety of *albolabris*, which, since the above was written, I found in the valley of the Lievres, in the County of Ottawa, near the High Rock phosphate mines.—F.R.L.

hills along the right bank of the Gatineau, from Wright's Bridge to Gilmour's mills, presenting every variety of soil and hygrometric conditions, should furnish this shell if it is to be found here. *Pallifera dorsalis* is another species that we may soon add to our list.

In Adams' and Goodwin's catalogues appear three other species, which, though more southerly in their range than *M. dentiferus* and *P. dorsalis*, the presence of *M. thyroides* at Casselman leads me to hope will be found within the range of the club's operations. These are *Zonites fuliginosus*, *Triodopsis palliata* and *T. tridentata*. All occur in the Adirondacs and at Toronto—*T. tridentata* coming east at least as far as Belleville.

There is a record of *Pupa fallax*, under the name of *Bulimus marginatus*, in D'Urban's list, and also of *Hyalina capsella* from Montreal, but these species I should not expect to find near Ottawa.

Not more than six possible additions to our list remain to be made. But a record of the occurrence of species, with remarks on their habits and relative abundance or scarcity, are only the first though necessary steps towards a satisfactory knowledge of our terrestrial mollusca. Their life history is still unwritten and opens up to the student a wide and fruitful field of observation.

WHEAT, WITH SPECIAL REFERENCE TO THAT GROWN IN THE OTTAWA DISTRICT.

WILLIAM SCOTT.

(Read 19th February, 1885)

The wheat plant having been brought to us from other countries and not being (as far as we know) a native of America, it becomes necessary to speak of it first in a general way. It has not been found growing wild in any country, but is a plant of cultivation.

As an escape, it shows no persistency, and were its cultivation to cease, it would speedily die out and vanish from the earth. Its origin is still an unsolved problem. The grasses coming nearest to it are *Triticum repens* (the creeping couch grass) of Great Britain, and the *Ægilops ovata*, a grass found growing wild in southern Europe. This latter is accepted by some botanists as the parent of our cultivated wheat.

Grant Allen claims that wheat ranks by descent as a degenerate and degraded lily. That it was at first a simple plant, without flowers. After ages, it acquired those bright colours and beauty that rivalled "Solomon in all his glory." Then it fell from its high estate and became a rush, with dry, brownish flowers, then a wood-rush, and finally a grass, when it had to toil for a living, and begun storing up starch and gluten.

De Condelle says that the bulk of evidence goes to show that the home of the wheat plant is in the country lying between the Persian Gulf, the Mediterranean, Black and Caspian Seas.

We know that wheat has been cultivated as far back as there are records of man. The monuments of ancient Egypt, of an age previous to the Shepherd Kings, whose rule ended about 1600 B.C., and the ancient books of the Hebrews show that in those days it was already well established, and whenever the ancient Egyptians or Greeks allude to the introduction of wheat, they attribute it to some fabulous personage.

The lake dwellers of Switzerland cultivated a small variety of wheat, a specimen of which, dug up at Backs, shows this prehistoric variety to have been cultivated down to the time of the Roman Conquest.

Another variety less common during the Stone age, has been found in Western Switzerland and Italy, and still another variety in Hungary, grown apparently during the same period. A grain of this type of wheat has been found in a brick belonging to the pyramid of Dashur, to which is ascribed the date 3359 B.C. None of these varieties are identical with any now grown.

The Chinese claim to have grown it 2700 B.C. It is said to have been introduced into America by a slave of Cortez, who found a few grains in some rice brought from Spain. It reached Massachusetts in 1602, Virginia in 1611, and the Mississippi valley about 1718.

Botanists classify the wheat plant in its various forms under the name Triticum vulgare. Some apply the name Triticum hybernum to the bearded, and Triticum pestivium to the beardless form, while others give these names to the winter and summer varieties, respectively.

A number of varieties, on account of their compact spikes, have been classified under the name of Triticum compactum. Other varieties with a long, loose, nodding spike and glumes long and bearded, are known by the name of Triticum polonicum. The stems of this plant have been known to grow to the length of six feet. Triticum durum, or horn wheat, is a flinty variety. It is cultivated extensively in the vicinity of the Mediterranean, and yields a good crop in a very poor soil. This variety is identical with the goose or rice wheat largely grown in Canada to-day, and is almost worthless as a flouring wheat.

Mummy wheat is called Triticum compositum, probably on account of the ears being composed of branches sometimes to the number of ten or twelve. A single ear of this wheat frequently contains as many as 150 grains, and as it naturally follows, the quality is very poor. It has been grown in Canada under the name of Egyptian wheat.

A variety closely resembling mummy wheat is known in England under the name of Clog wheat, a peculiarity of which is that the stem contains a light pith.

With reference to the wheat found in the tombs of Egypt there is no evidence to show that a single grain of it has ever sprouted.

The varieties of wheat are now practically countless, one French investigator having produced over 300. They differ in size, shape and in the physical character of the berry; some are long, some short; some

have thick bran, and some thin; some are brown, red, amber or white; some are soft and starchy, others hard and flinty. Fall-wheat may be changed into spring-wheat and spring-wheat into fall-wheat by repeated sowing in about three (3) years.

A grain of wheat is not a seed but an entire fruit, and roughly speaking consists of three main elements: the husk or bran, the flour and the germ.

The husk or bran consists of four layers of cells, the two outside ones being called fruit coats, and the two inside ones being called seed coats. In the first layer the cells run lengthways along the berry and become shorter as they approach the ends. The cells of the second layer are across and round the berry. From the first of these layers, at the end opposite the germ, springs a mass of vegetable hairs forming what millers call the "fuzz," and which they remove as much as possible with scouring machines, before the wheat is ground.

In wheat the walls of these hairs are thicker than the width of the canal. In the fuzz of rye the canal is wider than the thickness of the wall. This furnishes one mode of detecting a mixture of rye in wheaten flour. Underneath the fruit coats we find the seed coats called the dermis or covering of the germ; the cells of these coats cross each other almost at right angles. The upper one is called the transparent layer and the lower one the color layer. It is the coloring matter in this layer that gives the peculiar hue to the wheat berry which we term red, brown, amber or white. The only exception to this is a variety called violet wheat found by the African traveller Hildebrand on the shores of the Red Sea, the coloring matter in this variety being found in the transverse cells of the outside coat.

The inside seed coats contain a peculiar kind of ferment which acts upon the gluten and liquefies it. This ferment is insoluble in water. Boiling water destroys its activity, a lower temperature retards its action, a dry heat of 212 degrees Farenheit does not effect it. Moisture and warmth are necessary for its development and a temperature of about 75 degrees Farenheit is most favorable.

Underneath these inside coats there is a thin film which botanists tell us is the remains of the seed bud.

Situated in the end of the berry, opposite the fuzz end, is the germ with its shield furnished with small straight tubes through which it absorbs the fluid starch. The germ contains fatty matter and it is stated that one pound of oil can be extracted from 100 pounds of germ. The miller therefore carefully excludes from the flour, the bran with its ferment and the germ with its oil, for were these allowed to remain in the flour it would not keep but would spoil in a short time. This ferment in the bran is the cause of the miller's bran pile heating in warm weather.

Starch, which is more used by the human race than any other chemical compound, except water, and which is found in every plant that has been examined for it, constitutes about from 55 to 75 per cent. of the wheat berry.

Its granules consist of granulose encased in cellulose, which is a covering of the same chemical composition as granulose, but so dense as to render the starch granules insoluble in cold water. Treated with boiling water they swell and burst and the starch then becomes soluble.

Starches differ in the size and density of their granules, the largest being found in a kind of arrowroot called *Tous les mois*, next to this comes the potato, then sago, the bean, pea, wheat and maize. Although maize gives the largest percentage of starch, yet the potato surpasses any known product in the quantity produced from an acre. It is owing to the density of the starch granules in maize that bakers scald cornmeal with boi ing water before mixing it with flour when making cornbread.

Starch submitted to a high temperature with some moisture forms dextrine or British gum which is used for stiffening goods, for sizing paper, and for adhesive purposes, and therefore when the tongue is applied to an envelope or postage stamp the only danger incurred is the absorption of a little modified starch. Egyptian wheats being poor in gluten and consequently of low value for bread-making are largely used in Great Britain in the manufacture of British gum.

Although starch occupies such a large portion of the wheat berry, yet (taking its nutritive value and the part it plays in the mechanical process of breadmaking) the gluten is by far the most important constituent.

If a piece of dough is kneeded in water the starch will wash out and leave in the hand an elastic, sticky, grey or yellowish substance called crude gluten. As nitrogen is not found in starch but in the other constituents of the wheat berry, these are called the nitrogenous parts, and as the chemical composition is similar to animal albumen they are called the albuminoids—sometimes divided into soluble and insoluble albuminoids—under which latter name gluten (being a compound substance) is often designated. Some say that gluten is found throughout the wheat berry in sacs along with the starch granules. It was formerly supposed to be in one layer of cells next the bran and as it was thought impossible to remove the bran without taking some of this layer with it, the conclusion was jumped at that the best portion of the wheat was thus lost, and some people under this delusion still habitually or periodically rasp their digestive surfaces with indigestible branny foods.

It is on the quantity and quality of the gluten that the goodness of the wheat and consequently the quality of the flour depends, and as the percentage of gluten varies from about four (4) in poor wheats, to about thirty (30) in good hard wheats, there is ample room for the almost innumerable grades of flour.

Wheat with a small percentage of gluten is termed "soft" wheat, and wheat with a large percentage of elastic gluten is termed "hard" wheat.

Some varieties of wheat, notably red winter varieties, contain a large percentage of inferior gluten which millers and bakers term "short" in contradistinction to "long" gluten which is more elastic and which is characteristic of our Canadian fyfe wheat.

Wheat is sometimes injured in the harvest field by continuous wet weather. Heat and moisture start the ferment in the bran, the gluten begins to dissolve and the germ to sprout, and when the flour is made into dough, the chemical action continues, and the baker says the flour runs, the result being dark, heavy bread, caused by the gluten being too weak to retain the gas generated by the yeast or leaven.

Bakers counteract this chemical action with lime-water or alum, but as our climate is comparatively a dry one alum is seldom used in this country.

The variety alone does not give us a high gluten value.

Soil, fertilizers and weather influence the grain favourably or unfavourably to a great degree. A high, dry temperature is also necessary during the ripening and harvesting periods. A fine looking sample of Oregon wheat, grown west of the Cascade Mountains, gave only 7 per cent. of gluten, owing to the excessive rainfall and damp climate of that portion of the country. For the same reason, and also because of a partially exhausted soil, the wheats of Great Britain are soft, some Scotch wheats giving only 5 per cent. of gluten. That the yield of wheat in Great Britain is about 30 bushels to the acre, may be accounted for not only by the use of fertilizers, but also by the product being soft, that is, having a small per centage of gluten. If in Great Britain it were possible to grow hard wheat, that is, wheat with a large percentage of gluten, the product per acre would be much smaller. Millers in Great Britain require to import hard wheat to mix with their soft wheat, in order to make strong flour.

Turning to Hungary, which may be termed the home of hard wheat, as it is the home of the new process of grinding it, called the Hungarian or roller process system, we find it described as a country of extraordinary fertility, in the form of a basin or plain at the foot of the Carpathian Mountains. The driest months are July and August. Soon after sunrise the temperature during these months rises to about 74 and in the course of the day attains to from 95 to 100, remaining at that until nearly sunset, while during this time there is little or no rain and the nights are dewless. This same characteristic of climate during the ripening period, belongs to the Vistula country of Poland and the famous black soil country of Southern Russia, although the winters there are much more severe than in Hungary. An analysis of Hungarian flour of different grades, gave from 35 to 42 of moist gluten. Hungarian wheat, sown in England or in Scotland, becomes soft; and English or Scotch wheat, sown in Hungary, becomes, to a certain extent, hard.

The macaroni and vermicelli of Italy consists of a dough made from hard wheat pressed into the shape of tubes. Italy, after having exhausted her own lands, has drawn on the hard wheat provinces of the South of France and the North of Spain, and also on the North of

Africa, one African variety yielding as much as 26 per cent. of gluten. The manufacture of macaroni is now carried on in other countries, notably at Odessa, on the Black Sea, and also in New York.

When the riches of a virgin soil become exhausted a lower, though more enduring level, appears to be reached, which precedes its final exhaustion for wheat growing.

The product of this lower level is soft. This may be seen to day in old Canada and the United States, where fall wheat constitutes about three-fourths of the entire crop. Fall wheat contains a lower average of gluten than spring wheat, and therefore its cultivation has extended into the North-Western States, where it was formerly supposed that it could not be grown.

Returning to the Eastern Coast, we find that the New England States now grow wheat enough to last their population only about three weeks.

Clifford Richardson, in his report to the United States Department of Agriculture, shows that the wheat and flour of the Eastern States are low in albuminoids, and that the percentage gradually increases as you go westward, until the Rocky Mountains are reached, when it again declines to the Pacific Slope.

Minnesota, long known as a hard wheat State, is gradually turning into one of soft wheat, a large proportion of her crop last year being soft, and the millers of Minneapolis have accordingly drawn a large portion of their hard wheat from Dakota Territory. In a few years more they will, without doubt, be compelled to draw on our North-West country for their supplies of gluten. Dakota wheat contains about 25 per cent. of gluten and Manitoba wheat about the same or perhaps more.

Coming nearer home we find that the Province of Quebec is about exhausted for wheat growing, and that Ontario is now in process of exhaustion. A short review of the varieties of wheat grown in this vicinity may serve to bring this out more clearly, and I may say that although the quantity grown is limited, yet in no part of Canada, that I know of, are there more varieties of wheat grown than in the vicinity of Ottawa. Beginning with spring wheat, a variety called Black Sea, is about the oldest known here. It is a bearded wheat. The berry is

small and of a dark-red color. The straw is fine and slender, so much so, that if the weather is wet during the ripening period, it is sure to lodge. A peculiarity of this variety is its tendency to shoot out or throw up a number of stocks. It was formerly extensively grown in the Province of Quebec and in this vicinity on both sides of the Ottawa, but is now grown only by a few farmers who have good soil, principally heavy clay. I am not aware that it has been grown in any other part of Canada. Its name suggests whence it came to us.

Fyfe, or as it is sometimes called Scotch wheat, is said by tradition to have taken its name from a man named Fyfe, who got some out of a cargo shipped from the Black Sea to Glasgow, and who brought it to Canada. Others say it came to us from Fyfeshire, in Scotland. However, there is little doubt that originally it was a Russian wheat. It corresponds very closely with a celebrated variety of Poland known as Sandomir wheat, as the Black Sea does with another called Szkalmirka, both being native wheats of the Vistula country of Russian Poland. Fyfe wheat is dark in color, so also are the native wheats of Hungary and Russia. Fyfe is a bald wheat, with strong straw and small berry; and as the bran is very thin, it consequently yields a high percentage of flour. It varies in color from light to dark-red. It is therefore called Red Fyfe, in contradistinction to White Fyfe, a very much inferior milling wheat, its only point of resemblance being the shape of the berry. It is hardly necessary to state that the Red Fyfe contains a larger percentage of gluten than any other known variety. I think the line of species might be drawn between the bearded Black Sea and this Fyfe wheat, and if they are not direct descendants of prehistoric wheat, they are at least not far removed from the parent stock.

Red Fyfe wheat spread from Old Canada to the Western States and thence to our North-West, the land of hard wheat. It is now fast dying out in Ontario, being grown only in spots where the land is new, or where the land, if old, is rich and deep. We have a few such spots in the vicinity of Ottawa, one notably in the township of Eardly, where, in a strip of land lying between the mountain and the river, this wheat has been grown for the past twenty years or more, and is still grown in all its purity.

With regard to the other varieties grown here it is difficult to get their proper names, as some of them have different names in different localities. Thus "Lost Nation," which is also called "Parry Sound and McCarlem," is a variety somewhat resembling Fyfe, but with a larger, longer and coarser berry. It is an average milling wheat, containing from 12 to 15 per cent. of gluten. It may be seen in some of the North-West samples, where it passes for Fyfe wheat. One sample that I saw from Duluth was all pure "Lost Nation," and was graded as No. 1 hard Fyfe.

"Club" and "Golden Drop," two varieties resembling each other have small, short, light colored berries. They are grown principally in light soils, and average from 8 to 10 per cent. of gluten. "China' or "Rio Grande," having a large, coarse, wedge shaped, dark colored berry, ranks as a milling wheat about the same as "Club Wheat."

"Red Fern" has a small dark colored berry resembling Black Sea wheat, and its milling value is about the same. It is grown principally on heavy clay land, and contains from 10 to 15 per cent. of gluten.

"Red Chaff" (so called from the col ur of its glumes) is an utterly worthless wheat for milling purposes, and the berry so much resembles Fyfe wheat that only an expert can tell the difference.

Goose, Arnectka, Rice, or Garibaldi wheat, was known in this part of the country some twenty years ago under the name of "Midge Proof." It is a dense, light colored, almost transparent wheat, and ranks about the same as Red Chaff for milling purposes—that is, almost worthless.

From Fyfe we have descended through these and other varieties that have come and gone, each one with less gluten (or, as we say, softer) than its predecessor, until now we are down to a thick skinned, soft, starchy wheat, called White Russian. This variety (known in the United States under the name of "Lost Nation") constitutes, along with Goose wheat, the bulk of the spring wheat grown in Canada. Its percentage of gluten is very low, probably from 6 to 7 per cent., and consequently by itself it does not make a strong flour.

In the white fall wheats we have had the same degeneration. The Deihl, Soules and Treadwell, wheats rich in gluten, have vanished, and

in their place we have thick skinned, soft starchy wheat, called Clawson.

Red and Amber, winter wheats introduced into Western Ontario some five or six years ago on lands not completely exhausted have given a satisfactory yield, producing good grades of flour with high percentage of short gluten. The strength of these varieties, however, is on the decline, and in a year or two more they will in all probability have run their course.

It has now become evident that a variety of wheat with a large percentage of gluten requires a new, rich, deep soil; also that a variety with a smaller percentage of gluten will yield a larger crop on the same soil; also that a partially exhausted soil which will not grow a wheat with a high percentage of gluten may give an abundant crop of a softer variety; also that the softer the variety of wheat the thicker is the husk or bran; consequently not only is the quality of the flour poor, but the quantity is also less. This gives rise to contention between millers and farmers, the former asking for quality, and the latter growing the variety of which his land will produce most.

Gilbert and Lawes say that season comes before fertilizers. This statement applies especially to Great Britain, where they seldom have a good season. The season of 1884 was probably the best, the world over, that this generation has seen. Wheat growing countries (Canada included) brought forth bountifully, and the present low prices are the direct result of the unusually large yield.

Yet with plenty of wheat, we have been importing flour from the United States at the rate of six or seven hundred thousand barrels per year, simply because the strength of our land is being exhausted and our wheat is soft or deficient in gluten. It has been repeatedly proved that the percentage of gluten can be increased by fertilizers, Prof. Mark in one instance increasing it 8 per cent. Clifford Richardson in his report says (alluding to Gilbert and Lawes' experiments): "This seems to show that the application of mineral manures to our Eastern lands should bring up the yield of grain and the quality as far as we are able to judge and profit by these experiments abroad.

Yet Canada is allowing thousands of tons of phosphate to leave her shores every year, which, if manufactured and spread over her ex-

hausted fields, would in future years more than repay the temporary gain she is now getting from the sale of it.

Turning now to a country which in the marketing of its first million bushels of wheat may be said to have just passed its first birthday (our Canadian Northwest), we find a land whose extent and richness it is difficult to comprehend, and whose capabilities for wheat growing are as yet comparatively unknown.

It is only necessary to examine the samples of our North-west wheat to know that they are the product of a wonderfully rich soil.

It is true that, owing to the rush with which the country was opened up, and to the consequent difficulty in getting good seed (settlers being obliged to take whatever they could get), some of the samples are mixed, but the fact that some of these mixed samples have passed for hard wheat only further proves the capability of the soil, by its hardening soft wheat, that is, increasing its natural percentage of gluten.

Gilbert and Lawes, in a report of an analysis of the soil of the North-west, say: "These proved to be nearly twice as rich in nitrogen (or plant food) as the average of arable soils in Great Britain—probably about as rich as the average of the surface soils of English permanent pasture." And again: "All these soils showed an exceedingly high percentage of available plant food."

Prof. Macoun from botanical evidence maintains that the wheat fields of the future will be found further west on the now so called barren plains, and I may say that in comparing these lands with other hard wheat countries I, in a less scientific way, arrived at the same conclusion, yet this conclusion was arrived at before I had the pleasure of hearing Prof. Macoun express his decision. And further, taking the wheat growing plains at the foot of the mountain ranges in Europe, taking the State of California, a State in which some years ago the growing of wheat was thought impossible, but which last season led the States and Territories of the Union with a crop of over fifty million bushels, I feel sure that the great plains, now called grazing country, lying at the base of the Rocky Mountains, will in future years become an immense wheat field, capable of supplying not only the wants of Canada, but also a large portion of the wants of outside importing countries.

The country importing the largest quantity of foreign wheat is Great Britain. In 1861 Russia supplied 41 per cent. of this quantity, and the United States 21 per cent. By 1874 the United States had taken Russia's place, and by 1884 Russia had been shoved aside by India, with Australia pushing hard for third place.

The United States' wheat crop for 1884 amounted to over five hundred millions of bushels, but it is not likely that it will ever again have so large a surplus for export. On the contrary, owing to the unprofitableness of wheat growing in the Middle and Southern States, the increase of population, and the gradual and inevitable exhaustion of the soil, there is every probability that the quantity exported will show a decrease each succeeding year.

Great Britain's colonies and dependencies are now rising from a position of dependence to one of support; and before another decade has passed away the country we call our home will, by the production of wheat in its great North-west, occupy the foremost place in that Greater Britain that is to be.

NOTES ON OUR SAW-FLIES AND HORN-TAILS.

W. Hague Harrington.

Read 4th March, 1885.

Tenthredinidæ.—When asked by our Soirée Committee to prepare a short paper for this evening I furnished them with the above title, thinking that I would be able to prepare a list of our local Tenthredinidæ and Uroceridæ and to preface it with a few remarks on some of the genera and species. A more careful examination of the material in my collection convinces me that it would be injudicious to attempt the preparation of a list this year, and that by deferring it until after another season's collecting it may be very much more complete. It may then even be possible to publish one of all our Hymenopetra.

To show how incomplete our knowledge of the species still is I may mention that of seventy-two species of saw-flies which I have determined there are only fifteen in which both sexes are represented. Of the remaining fifty-seven there are forty-eight represented by females and nine by males. It will thus be seen that as regards the male insect only one-third of my species is complete. This scarcity of the males seems to hold throughout the order (hymenoptera). My remarks this evening will therefore be very brief, and confined to a few of the more important species.

Cimbex Americana, Leach.—This, our largest saw-fly, is not uncommon some seasons, the larvæ being frequently found on elms, although, not being gregarious like many species, they do no noticeable injury.

Trichiosoma triangularum, Kirby.—At first sight this might be mistaken for one of the varieties of the last-named species, but it is smaller, more hairy, and differs in several points of structure. I have only taken one male, but have found large green, cimbex like larvæ which were apparently those of this insect.

Abia Kennicotti, Nort.—Mr. Guignard has kindly given me specimens of this bee-like species, which were, I believe, taken by Mr. Fletcher last spring.

Acordulecera dorsalis, Say.—This species is not uncommon upon the bitter hickory (*Carya amara*) in June and August. My specimens are all females of *var. b.* of Norton. Abbé Provancher has described, from a single specimen, *A. saginata*, which seems to me to be identical with this variety of *dorsalis*.

Hylotoma.—We have three species, all of which appear to be rare.

Cladius isomeria, Harris. The larvæ of this species are yellowish, black-spotted grubs, occurring plentifully on willows in June. They spin a light, transparent yellowish cocoon, and the flies emerge toward the end of July. Specimens bred by me last year were all females, and I am indebted to Mr. Fletcher for the male.

Nematus.—Of this destructive genus we have several species, including the universally known *ventricosus*, or currant saw-fly. Another species which has attracted much attention recently by its ravages on the larches in Quebec, New Brunswick and portions of the United States, has apparently reached this locality, and will be found here next summer, viz., *N. Erichsonii*.

Messa hyalina, Nort.—Mr. Guignard has captured a number of this species, which has not hitherto been recorded from Canada. He informs me that they were obtained in his yard in July, and had probably been carried thither by easterly winds from some large poplar trees on Waller street.

Emphytus.—Four or five species of this genus occur, including *E. maculatus*, a well-known foe to strawberry plants.

Dolerus.—Of our six species of this genus, *aprilis* is the most common, and is the only one which has yielded both sexes; *unicolor* and *arvensis* are probably sexual varieties of one species, as specimens of the former are all males and of the latter all females. My specimens of *arvensis* were obtained early in May upon stumps covered with fermenting sap, which attracts many insects.

Dinuera Americana, Prov.—I have captured one specimen of this rare species, which has the venation of the wings very irregular, the cross nervure between the marginal cells being almost obsolete, and there being only three sub-marginals instead of four.

Selandria.—This genus contains several very injurious species, of which *rubi*, the raspberry saw-fly, is perhaps the most obnoxious. Its

larvæ were very abundant during the summer, both on cultivated and wild raspberries.

Allantus basilaris, Say.—A large saw-fly common on golden-rod in August. Larvæ unknown.

Macrophya.—Five species of these rather handsome saw-flies have been taken, chiefly upon alders, or the plants growing in their vicinity, but I have not succeeded in identifying the larvæ of any species.

Strongylogaster and *Taxonus* contain a number of species which it is somewhat difficult to distinguish satisfactorily, especially as the majority of my specimens are males.

Tenthredo.—This genus has furnished a dozen species, all of considerable size and variety of colouring. They are chiefly found in moist localities where there is a profusion of herbaceous plants; such a locality may be found in the beaver meadow near Hull.

Lophyrus.—A genus not hitherto included in Canadian lists. Abbé Provancher, in his admirable treatise on hymenoptera, states that he had never met with specimens. We have, however, at least three species occurring on evergreens. *L. abietis* is not rare on spruce, nor *L. Abbottii* on pine. *L. fulvus* is remarkable for having only 13-jointed antennæ, and was originally described from a specimen from Texas.

Lyda.—The species of this genus are very numerous in America, and are separated on very small differences of form and colouring, so that the determination of species is difficult. We have five species, generally found on pines, upon which the larvæ of one or more have been found feeding.

Uroceridæ.—There are but six species to record in this family, belonging to four genera, and only two of the six can be said to be numerous.

Oryssus occidentalis, Cress.—A male of this species (hitherto recorded from the Western States) was captured by Mr. Fletcher, and is now, through the kindness of Mr. Guignard, in my collection.

Uroceros albicornis, Harris.—These insects are sometimes found flying about our streets, having apparently emerged from telegraph poles. Last August males were observed on larches at Stewarton. One of these, when disturbed, flew off some distance in an angry or excited manner and returned to the precise spot on the small branch upon

which he had been resting. This he repeated several times until captured, although no reason could be discovered for his attraction to the spot except a small wound in the bark from which a drop of resin exuded. These males I then supposed to be those of *U. flavicornis*, but further examination seems to prove them *albicornis*. In 1882, *U. cyaneus* was abundant in September and the beginning of October, during which period I captured ten females and five males. These were all taken about the city, and I was then of the opinion that they came from the maples, which are by far the commonest shade trees along our street. As the insects have since been rare it seems probable that they also came from the telegraph poles. Perhaps the large number of new poles that are at present being put up may furnish us with some interesting insects during the approaching season.

Tremex columba, Fabr.—This is by far the commonest of our Uroceridæ, and is also the largest. It attacks principally maple and beech which have been wounded, or which from old age have commenced to decay, but it also occasionally lives in other trees. It may be found in the autumn emerging from, or ovipositing in, the trees just mentioned, and the bodies of those which have perished in the latter act are frequently seen fastened to the trunks. The males are very rare.

Xiphydria albicornis, Harris.—In the summer of 1883 this species was very plentiful in the city and neighbouring woods, infesting young or medium sized maples, to which they are apparently very injurious, as they riddle the wood with holes similar to those of tremex, except that they are smaller. During the past season this insect was rare and only a few specimens were observed. *X. attenuata* is a very rare insect, of which only two males have yet been captured.

TWO NEW SPECIES OF CRINOIDS.

WALTER R. BILLINGS.

(*Read 4th March, 1885.*)

GENUS EUSPIROCRINUS, ANGELIN.

EUSPIROCRINUS OBCONICUS, n.sp.

Cup obconical, about $\frac{1}{3}$ wider than high; tapering from 0·75 inch at top to 0·25 inch at the column.

Underbasals, five in number; pentagonal; subequal; about $\frac{1}{5}$ wider than high.

Basals, five; three hexagonal and two—those adjacent to the anals—heptagonal.

Radials, five; wider than high; subpentagonal; alternating with the basals; the middle third of their uppermost side slightly excavated for the attachment of the brachials.

Brachials, variable in number; of the anterior arm, four; left posterior arm, three; right anterior and right posterior, five; and the right anterior either three or four, I am unable to say which, the specimen not being sufficiently perfect. Above this the arms dichotomize frequently one branch after leaving the bracial dividing on the fourth plate, the divisions of which bifurcating on the fifth plate, and at least once again higher up. The secondary and tertiary bracials seem to vary from five to six, the quaternary to be five, the quinary eight.

No pinnulæ.

Anals three, within the calyx; the lowest one pentagonal having its two lower faces resting against the sloping sides of the posterior and the right posterior basals, the second resting on the upper side of the posterior basal, having on its right the first and third anals and on its left one of the radial plates. Above these is a ventral tube of large pieces of which but three series of three plates each were fully observed.

Column of a 5-foil section, with a canal of corresponding shape and a width about one-half that of column. The portion of column collected is three and one-half inches long; 0·25 wide at base of cup,

tapering to 0·15 inch at 0·35 inch from base of cup, from whence downward no taper or expansion is visible. Joints of column about 0.25 inch thick, slightly gibbous in centre; each joint consisting of five pieces as in some species of *Heterocrinus*.

This species agrees with Angelin's genus *Euspirocrinus* in the arrangement of the cup-plates, anal area, ventral tube and arms. The brachial plates differ from those of the typical species in number, which is only a specific difference. The author of the genus considers, as also does Mr. C. Wachsmuth, that the coiling of the arms, such as is shown on plate 4, fig. 7*a* of Angelin's beautiful *Iconographia*, as characteristic and notable from a generic point of view; but as 7*a* of the same plate does not indicate this peculiarity, I look upon the failure of my specimens to show anything beyond a tendency (such as is to be seen in *Carabocrinus*) to curl inward as not affecting the generic relations of this species.

This species is the first described from American rocks. Belonging to a genus resembling *Poteriocrinus*, excepting in its lack of pinnulæ and differing from *Dendrocrinus* in its anal area, it is an interesting addition to our list.

Trenton Formation.—One of the two specimens collected was obtained on Division Street, Rochesterville, and the other at Hull, P.Q., in the C.P.R. cutting adjacent to the Aylmer Road crossing. —Collector W. R. Billings.

Genus ARCHÆOCRINUS.—Wachsmuth & Springer.

Archæocrinus Desideratus.—n.sp.

Cup subglobose; the breadth once and a-half the height.

Basals, once and a-half to nearly twice as long as wide; five in number; hexagonal; bent to an angle of 90° at about $\frac{2}{3}$ of their length from the column, the united basal plates forming for the first portion of their length a cone surrounding the column, and their distal sides supporting the primary radials.

Primary radials 3 × 5; the lowest series pentagonal; the second hexagonal; the third pentagonal, each supporting two rows of secondary radials four plates to each row. Each row of secondary radials supports two rows of tertiary radials having each two or three plates all of which are included within the cup. The quaternary series are free

arm-plates, six rows to each ray, of which the inner rows of tertiary plates each support two and the outer one; so that there are thirty arms, which are robust and fringed with stout pinnulæ. The arm-pieces are first single and sub-cuneiform, but change gradually until about the fifth or sixth plate they consist of two rows of interlocking and alternating cuneiform plates.

In each interradial area the proximal series consists of one plate, resting directly on one of the basals, succeeded by two plates in four of the areas and three plates in the azygous; above which the plates are much smaller. As stated above, the radials are connected with the interradials, as high as the top of the tertiary radials, which is the base of the arms; at this point four or five of the last inter radial plates connecting with each tertiary radial form part of a flexible fold, which is continued onward four or five plates further into a cornu, the point of which approximates to that having its rise on the opposite side of the same interradius; these folds and cornua were, at first sight, supposed by me to be arms.

When Mr. Wachsmuth defined this genus the arms and the vault were unknown. The specimens figured show these features in a very satisfactory manner. The vault is seen to be composed of very small plates, and with an anal opening near the ambulacral centre. There is no proboscis and the vault and arms approximate to those of *Glyptocrinus*.

The cup-plates are smooth and gibbous. The radial plates have obtuse ridges, following the longitudinal axes of the rays, much elevated at the sutures but almost obsolete in the middle of the plates.

Trenton Formation.—All the specimens collected by the author on Division street, Rochesterville.

ADDITIONAL NOTES ON THE GEOLOGY AND PALÆONTOLOGY OF OTTAWA AND VICINITY.

BY HENRY M. AMI, B.A., ASST. PALÆONTOLOGIST GEOL. SURV. OF CANADA.

Read 4th March, 1885.

Further enquiry into the varied and interesting as well as extensive series of strata exhibited in the Ottawa valley, both above and below the city, has added not a little to the sum of our knowledge already recorded in the transactions of this society and elsewhere. Both in palæontology and stratigraphy, much new to the locality, to Canada, and in some instances to science, has been discovered.

The field of research is vast and important, but fortunately a decided increase in the interest taken in geological science has marked the season just closed. No less than sixteen members of the geological section took advantage of the sub-excursions, a number of whom made collections whilst others took only a partial yet appreciative interest in the subject.

The beautiful sequence of the fossiliferous sedimentary strata, ranging from the Upper Potsdam to the Hudson River inclusive, is here well defined and may be studied to great advantage not only from a mere chronological standpoint but also in comparison with rocks considered to be synchronous with these, and deposited under rather different conditions in other portions of this continent. To trace out accurately and ascertain the degree of submergence and elevation which at different times are known to have occurred in this neighbourhood during the palæozoic period; and likewise to note the sequence of life during this same period as evinced from the *palæontological data* already obtained and still coming in, the changes in the *flora* and *fauna* corresponding to the changes of water-level, are indeed tasks worthy of a Murchison, of a Sedgwick, a Barrande, a Logan, or a Billings. Without going into details as to the result of a number of sections which have been studied from exposures in this neighbourhood, the general results obtained in the field during the past summer may be summed up as follows, the notes on each formation being given separately.

Potsdam Formation.—At Montebello, Mr. Louis J. Papineau has been carrying on extensive operations in this formation and has discovered numerous tracks of marine animals upon the sandstones which once formed an ancient sea-shore. Some beautiful slabs have been extracted.

Chazy Formation.—As has already been noticed in former transactions, the measures of this formation are clearly divisible into these series in the following ascending order: (*a*) *Sandstones*, with flags and shales; (*b*) *Shales;* (*c*) *Limestones*. The sandstones are very poor in fossils. Aylmer town and Pointe des Chenes, however, have yielded a few species, whilst a specimen of *Lingula*, as yet undetermined, but probably new, was found in the shaly division at Hemlock Lake, New Edinburgh; at Hog's Back, Nepean, some very fossiliferous beds occur, one especially noteworthy containing abundance of *Lingula Belli, (Billings)*, a Lamellibranchiate shell also undetermined and *Cyrtodonta breviuscula, (Billings.)* Numerous black phosphatic nodules, probably coprolites, are frequently associated with these.

On the occasion of the Club's visit to Moore's Landing, opposite Quyon, about 40 miles west of Ottawa, the *geological branch* had a splendid opportunity afforded them of examining a fine section of the Chazy formation. The measures at this place are exposed from the river margin to the top of the hill (with a few places of concealment) a thickness of 135 feet. This exposure can be traced down the Ottawa in an undoubted continuous series as far to the east as Skead's Mills, near Ottawa, along the Ontario shore, outcrops of which are almost everywhere to be seen, but especially about Berry's brewery and along the lake shore and at Brittania. This tract of country was geologically coloured as Calciferous in the 1866 map published by Sir Wm. Logan, but from conclusive palæontological evidence obtained at this excursion it can be positively asserted that these measures are of the Chazy formation. Deposited horizontally and even now quite undisturbed, the beds at Moore's Landing hold an abundance of organic remains in the uppermost or limestone portion of the section. The characteristic band of impure limestone teeming with remains of *Entomostraca* may also be seen here in its normal position—as at Aylmer, Hog's Back, L'Orignal, etc., from which places it has been recorded.

The species most abundant is probably the *Leperditia Canadensis, var Louckiana* (Jones.)

The associated bed of limestone exhibiting numerous and large concentric patches of rock supposed to repesent the *Stromatocerium rugosum* of Hall, is exposed along the road a considerable distance, and fine specimens have been collected of what appears to be the above species. A doubt still exists in the mind of the writer as to whether or not this bed, which is almost if not entirely composed of this organism, may not be merely the result of concretionary action. Microscopic sections of specimens prepared by Mr. Weston have not given any characteristic structure. Besides the above there were collected: *Columnaria incerta* (Billings), a fossil coral; a *Pleurotomaria* like *P. pauper* (Bill.), an *Orthoceras sp.* and *Leperditiæ* already referred to. There is but little doubt that the strip of country lying between this place and Ottawa, now occupied by the Ottawa River, and extending some distance on either bank, presented at one time a perfectly flat and continuous aspect.

Denuding agencies have evidently been at work in forming the bed of the Ottawa River and also to a certain extent Lake Des Chénes —agencies which during the "glacial epoch" must have been much more active than the present slow but sure denuding action of subaerial or atmospheric erosion.

Another very typical exposure of the Chazy formation was observed and examined to the eastward of the Rideau Hall grounds close to where the measures of the Trenton formation, characterized by the abundance of fossils peculiar to that horizon, and considerably disturbed owing to a local fault, come in contact with it.

The characteristic bed of concretionary (?) or laminated limestone is well exposed over a considerable area in the country lying between Mr. Matheson's property and the Rideau Hall grounds, occupying the superior portion of the measures throughout the greater part. This area, as at present known, presents an irregular contour bounded on almost every side by faults and dislocations of purely local origin, bringing the measures of the Chazy in contact with those of the Black River, Trenton, and Utica (?) formations—showing how intricate and at the same time interesting the geology of Ottawa is.

Besides affording good sandstone and limestone for building purposes and also flagstones for paving; the Chazy formation about Ottawa affords good hydraulic cement. On lot 34, Con. A, Nepean, Mr. C. B. Wright has opened a large quarry in three be ls lying close to one another in the uppermost part of this formation, and for years past has obtained a large quantity of a magnesian limestone having a marked conchoidal fracture and often containing small cavities lined with pink calcite crystals. Higher up the river and on the line of strike of the above mentioned exposure the same beds were noticed at several places, whilst in the "Geol. of Canada," 1863, page 806, it is stated that they are continuous from Allumette Island to Hawkesbury, a distance of over 100 miles. The cement, known commercially as the "Hull Cement" and manufactured by calcining this rock with an admixture of clay as the argillaceous constituent required in certain definite proportions, has been characterized as "a strong and lasting cement"—(see descriptive catalogue of the minerals of Canada—Dr. Selwyn, 1876.) The clays used belong to the post tertiary epoch and are of marine origin, being known as the "Leda Clays."

There has been a considerable demand for "Hull Cement" in foreign as well as home markets during the past year, upwards of 8,000 barrels of hydraulic cement having been shipped from this port whilst there have already been extracted 1,750 loads of cement-stone this winter for calcination during the coming season. The cement belongs to that class known as "slow-setting."

Bird's Eye and Black River Formation.—The measures of this formation about the Petite Chaudiere on the north and south shores of the Ottawa River were visited and a number of the characteristic species of fossils collected, e. g. : *Columnaria Halli*, (Nicholson), *Tetradium fibratum* (Safford), etc.

Notes were taken on the much faulted and disturbed strata at this locality which assumes its peculiar orographic aspect on account of faults cutting the measures in a parallel series of steps—whence the rapids.

It is very difficult to ascertain in many instances the exact amount of faulting, yet the exposures are most interesting and deserve close study.

Proceeding eastward from the city we find another interesting exposure of this formation occurring at the branching of the road leading to Beechwood cemetery, close to the swamp. Here a very interesting section may be seen showing the contact of this formation with the Utica, indicating the presence of a local fault or dislocation apparently causing a downthrow on the west side of the fault of at least 200 feet. This fault is a remarkable one, and can be traced to a distance of two miles on the Ontario side, traversing the country in an approximate north and south direction, crossing the swamp above referred to, and may be seen bringing the measures of the Trenton at a high angle to the horizon on the east side of Mackay's Bay. The Black River formation here, as in other places about Ottawa, is characterised by beds of dark blue and grey impure limestone affording good building stone, almost throughout its whole measures. At this exposure the lower measures of the formation are tilted at an angle of 90° where they come in contact with the Utica formation, then proceeding eastward the beds are seen to dip at various angles to the east, the angle gradually decreasing until the summit of the bluff and the cemetery are reached, where they are practically horizontal, dipping but slightly to the east.

Amongst the organic remains found here may be mentioned *Tetradium fibratum* (Safford), *Helicotoma planulata* (Salter), *Pleurotomaria lapicida* (Salter), besides lamellibranchiata and bivalve entomostraca in great numbers requiring further study.

Trenton Formation.—In this tolerably well known and interesting formation some points of interest are always sure to come up, both as regards its palæontological record and local stratigraphical significance At Ottawa and vicinity the Trenton, like its closely related formations, is affected by a number of faults, and it has been pretty conclusively ascertained from flexures in the strata, accompanied by faults, exhibiting what is generally termed a monoclinal structure, or simply a "monocline"—that there has been in most instances a downthrow on the west side of the faults, which have a general north and south bearing at right angles to the course of the Ottawa River. The Trenton formation, as exposed at Nepean Point and old "Barrack," or now "Parliament Hill," presents many interesting faults and flexures.

Among the fossil remains worthy of note collected at the foot of Parliament Hill may be mentioned a large sponge referred by Mr. Whiteaves to the genus *Brachiospongia* (Marsh.) This beautiful specimen was obtained by the writer above low water mark in a bed of limestone six inches in thickness, and immediately overlying that containing tracks or trails of marine animals, at one of the geological sub-excursions of the Club, Dr. Baptie being present. It is the first time that the genus has been recognized as occurring in Canada. This Ottawa specimen measures 10 inches or 24·5 centimetres in diameter, and presents seven "brachia," or "arms"—so called. These lobes, more properly speaking, are seen to radiate from a broad circular central portion. There appear between these, in the intermediate spaces, lobes slightly elevated above the general level of the others; whether these are structural or not has not yet been ascertained. The specific reference is still doubtful as microscopic sections carefully prepared by Mr. Weston, of the Geological Survey, have not given definite structure. In certain minor details our specimen differs from either of the three species described by Profs. Owen and Marsh, from the Cincinnati group of Ohio, and whether they are all the same or different species, still remains to be settled.

Associated with it was discovered a series of tracks, probably made by mollusca, resembling in miniature those described by Billings as *Scrichnites*, from the Cambro-Silurian deposits of Anticosti. That they are not referable to Billing's species, *S. abruptus*, is at once evident by comparing the specimens with the description.

The Ottawa specimens are often tortuous in their course, the marks or pits are arranged in an alternating manner, and about three-eighths of an inch is the greatest width of these tracks, there being about twelve steps or series of footprints in the space of twenty-four lines. Ichnites like these are generally supposed to have been molluscan in origin. Amongst the other species of interest collected at the same sub-excursion may be mentioned as of more especial interest, *Ophileta Ottawaënsis* (Billings), *Strophomena deltoidea* (Conrad), *Bucania bidorsata* (Hall), &c. Besides the above, the Trenton formation has also yielded *Amplexopora Canadensis* (Foord), *Pholidops subtruncatus* (Hall), *Illœnus trentonensis* (Emmons), a *beyrichia* very difficult to distinguish

from some of the Cincinnati group species described by Prof. S. A. Miller, as well as a number of species awaiting identification.

A very interesting sub-excursion of the club was held at a short distance from the city in July last, when the writer, in company with Messrs. Craig, Summerby and Dr. Loux, all enthusiastic members and devotees to science, visited a number of interesting exposures in the county of Russell. The Trenton was observed to crop out on the 10th lot of con. 10, Russell, and lot 30 of con. 5 of Cambridge, forming a ridge or elevation above the general level of the country, the measures dipping at an angle of about 15° to the north. There may be a dislocation here, but the exposures were too limited to ascertain. The strike is almost due east and west. Farther up, at Cook's Rapids, on the River Castor, lot 8, con. 9 of Russell, was found a splendid exposure of the Trenton formation for a distance of at least one mile, characterized by abundance of fossils, over twenty species having been collected and recorded from that place, amongst which may be mentioned the *Brachiospongia* referred to already, *Protarea vetusta*, *H. Prasopora Selwyni* (Nich), *Bellerophon sulcatinus* (Billings).

The Utica Formation.—To sum up briefly the results obtained in the very interesting series of bituminous schists and associated impure limestones, it may be said that in the exposures on the Rideau Hall grounds the perfectly conformable position of the Utica on the Trenton, or else the gradual passing of the Trenton measures into those of this formation is very evident. That an unconformability has been assigned to the Utica by many authors is a well-known fact. The measures at Rideau Hall immediately set at rest this question upon examining them. Not only the stratigraphy agrees, but also the mass of palæontological evidence which has already been gathered from this formation, enables one to satisfy himself of the truths of the above statement. There is no discordance of stratification whatever, and, further, there are species and genera which pass from one into the other gradually. In fact it is very difficult, nay, impossible, to give the precise bed which is first characteristic of the Utica.

The uppermost measures of the Trenton have shales between the layers of limestones; the sediment having assumed a more argillaceous

nature, owing, no doubt, to a depression of the continent and consequent greater depth of the seas in the Utica times.

An important fact has been ascertained with regard to the distribution of the Utica at Ottawa, viz., that it occurs on Bank street, just west of the fault, which runs by the "Supreme Court" building. The Utica was further ascertained to occur on Albert street, from the corner of Kent, 175 feet in an easterly direction, having had to be blasted by the men employed in laying drains, &c. From these shales some beautiful specimens were obtained. The rocks here present a striking resemblance to those of a similar horizon at such a remote distance as Collingwood, on the Georgian Bay. The association of the trilobites, mollusks and bivalve shells, and entomostroca is strikingly the same. *Lyrodesma pulchellum*, *Leperditia cylindrica*, *Asaphus Canadensis*, *Triarthrus becki*, *Lingula Progne*, *Leptobolus insignis* and *Endocerus proteiformis*, all occurring together in same beds both here and at Collingwood in Western Ontario. Amongst the additions to the list of Utica species may be mentioned a new species of monticuliporid—*Batostoma erratica*, Ulrich, MSS. From beautiful sections of this interesting branching polyzoary prepared by Mr. Weston and from drawings excecuted by the same gentlemen, together with Mr. Ulrich's authority, the writer has had an opportunity of identifying the species in question. Prof. Ulrich will soon describe it, and therefore no description is here given of it. It has further been ascertained that the graptolites referred to as *Didymograptus flaccidus* and *annectans* are both referrable to the genus *Leptograptus*.

Hudson River Formation.—Here we have to hail a new era in our geological nomenclature, having to add this formation to the eight others already known about Ottawa, and with which the Club's work has dealt. That the shales and arenaceous beds found on a cutting on the Canada Atlantic railway are of this age may be ascertained from the following list of species found. The cutting is three miles from Ottawa. *Zygospira headi*, *B.* (*O. Erratica*, *H.*), *Orthis testudinaria*, and *opertrinella*, *Modiolopsis modiolaris*, Conrad (*large*), *Modiolopsis pholadiformis* (Hall), *Ambonychia radiata* (Hall) &c., *Cyrtolites ornatus* (Conrad), *Bellerophon bilobatus*—G. B.

In the post tertiary deposits of Green's creek the writer, in company with Mr. F. A. Dixon, found an interesting coleopterous insect, which is now in the hands of Prof. S. H. Scudder, of Boston, and awaits identification.

REPORT OF THE PALÆONTOLOGICAL BRANCH.

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

I was unable to attend last summer's Club excursions, but during the autumn I paid some attention to a rich outcrop covering the western portions of lots 3 and 4, concession 3, R. F., Gloucester, County of Carleton. In 1878 Mr. H. O. Wood, P.L.S., pointed out this outcrop to Mr. G. C. Heron, C.E., and myself, and I trust that some enterprising member of this club will visit the locality and work up the exposures thoroughly. The following species, together with many others yet undetermined, are now in my cabinet:

1. Stromatocerium rugosum.
2. Tetradium fibratum.
3. Ptilodictya acuta.
4. Orthis tricenaria.
5. Rhynchonella increbescens.
6. Streptorynchus subtentum.
7. Bucania expansa.
8. B. punctifrons.
9. B. bidorsata.
10. Ophileta ottawensis.
11. Ecculiomphalus trentonensis.
12. Helicotoma planulata.
13. Raphistoma progne.
14. Pleurotomaria subconica.
15. Subulites subfusiformis.
16. S. elongata.
17. Cyclonema halliana.
18. Murchisonia milleri and M. milleri var. perangulata.
19. M. helicteres.
20. Endoceras annulatum.
21. Orthoceras bilineatum.
22. O. multicameratum.
23. O. amplicameratum.

24. Lituites convolans.
25. Cyrtodonta canadensis.
26. C. obtusa.
27. C. huronensis.
28. C. subtruncata.
29. C. subcarinata.
30. Ambonychia orbicularis.
31. Modiolopsis trentonensis.
32. M. modiolaris.
33. M. meyeri.
34. M. gesneri.
35. Illænus ovatus.
36. I. milleri.
37. Bathyurus extans.
38. Ceraurus pleurexanthemus.

Thirty-eight species and one variety.

I think it is high time that the attention of the club was called to the fact that very little work worthy of mention has been done during the past twenty years in Ottawa Trenton group paleontology. Looking over Canadian scientific pamphlets and periodicals I find but two notable lists of Trenton fossils, one by Mr. J. F. Whiteaves, published in the Canadian Naturalist for 1865, and the other Mr. Ami's list, published in your Transactions No. 5. Mr. Whiteaves' list was of 66 species from the Trenton formation (excluding the Birdseye and Black River) of the Island of Montreal. Mr. Ami's list includes Chazy, Birdseye and Black River, Trenton, Utica and two divisions of the Post Tertiary. Omitting the Post Tertiary, and excluding varieties where their species are also given, we find that Mr. Ami has given us 202 distinct species from the Cambro-Silurian rocks of this locality, as follows :—

Chazy	10	species.
Birdseye and Black River	22	"
Trenton	154	"
Utica	45	"
	231	"
Less 10 marked doubtful and 19 names repeated under two or more formations	29	"
Total number of Cambro-Silurian species.	202	

With reference to the Trenton group I may mention that this list does not include all the Ottawa fossils described and recorded from that group by E. Billings and others, which fact Mr. Ami mentions in his introduction. These neglected names, which I propose to record are as follows :—

Glyptocrinus ornatus, Report G. S. C. 1853-4-5-6.
Dendrocrinus conjugans, " " "
Carabocrinus radiatus, " " "
Orthis gibbosa, " " "
Cyrtoceras simplex, " " "
Vanuxemia inconstans, Report G. S. C. 1857.
Cyrtodonta subangulata, " "
C. obtusa, " "
C. Canadensis, " "
C. subcarinata, " "
C. rugosa, " "
Bellerophon (Bucania) disculus, Report G.S.C., 1863, pages 166-7.
Eunema strigillata, " " "
Helicotoma planulata, " " "
Matheria brevis, " " "
M. obtusa, " " "
Modiolopsis meyeri, Palæozoic Fos., Vol. I, G. S. C.
Ctenodonta abrupta, " " "
Orthis porcata, " " "
O. retrosa, " " "
Illænus angusticollis, Canadian Nat. and Geol., 1st series, Vol. 4.
Strophomena (Streptorynchus) fluctuosa, " " Vol. 5.
S. camerata, " " "
Pleurotomaria progne, " " "
P. americana, " " "
Gomphoceras præmaturum, " " "
Calapœcia canadensis, Canadian Nat. and Geol., 2nd series, Vol. 2.

All the above were recorded by E. Billings, and the following by Prof. Nicholson :—

Ptilodictya fenestelliformis, Report Paleontology of Ontario, 1875.
Strophomena rhomboidalis, " " "

Twenty-seven species recorded by E. Billings and two by Prof. Nicholson, in all twenty-nine.

Of species observed by myself in this neighbourhood, not occurring in Mr. Ami's list and unrecorded by E. Billings or Prof. Nicholson, I may mention the following :—

1. Lingula elongata.
2. Discina pelopea.

3. Crania setigera.
4. Streptorynchus subtentum.
5. Bucania expansa.
6. B. punctifrons.
7. Subulites elongata.
8. Cyclonema halliana.
9. C. bilix.
10. Holopea paludiniformis.
11. Murchisonia helicteres.
12. Endoceras annulatum.
13. Orthoceras multicameratum.
14. Lituites convolans.
15. Ctenodonta astarteiformis.
16. Cyrtodonta huronensis.
17. Ambonychia orbicularis.
18. Modiolopsis trentonensis.
19. M. modiolaris.
20. Bathyurus extans.
21. Lichas trentonensis.

Twenty-one species.

19th February, 1885. WALTER R. BILLINGS.

ADDENDUM.

In the Transactions published last year (No. 5, Vol. II, No. 2) certain geological notes by Mr. Walter R. Billings, which were intended by him to appear separately, in a different form, were inadvertently incorporated in the report of the Geological Branch (Page 121).

REPORT OF THE BOTANICAL BRANCH.

This report has unfortunately been mislaid since it was read at the Club Soirée held on 18th Dec., 1884, and as the printing of these Transactions cannot be delayed, its appearance has been postponed to the next number.

REPORT OF THE CONCHOLOGICAL BRANCH.

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

GENTLEMEN,—During the past year this section of the club has made gratifying progress in the work assigned to it. In conjunction with the botanical branch, three sub-excursions were held in the early part of the season. The first, to the marl beds east of Hemlock Lake, afforded many of the commoner land shells, such as *Mesodon albolabris*, Say, *Patula alternata*, Say, *Patula striatella*, Anth., *Stenotrema monodon*, Rackett, and *Succinea obliqua*, Say. *Macrocylis concava*, Say, *Hyalina arborea*, Say, *H. viridula*, Mke., and *Conulus fulvus*, Drap., were obtained in less numbers, together with two bleached specimens of *Mesodon sayii*, Binney, and one of *Zonites inornatus*, Say. Both the latter species probably lived in this locality within a very recent period. It is not likely that they long survived the destruction of the forest which once favoured them by equalizing the temperature, preventing rapid evaporation and condensing at night generous supplies of moisture from the atmosphere.

On the way homeward *Campeloma decisum*, Say, *Limnæa desidiosa*, Say, and *Planorbis campanulatus*, Say, were collected in the lake. *Anodonta fluviatilis*, Dillw., was observed in quantity in muskrat heaps at the west end of the lake, but no perfect shells were found, one valve being invariably broken. In one specimen of the *P. campanulatus*, the bell shaped mouth after being fully formed had contracted and continued growing for half a whorl, when another enlarged aperture was formed. The result is *P.* (*Adula*) *multivolvis*, Case, in every particular but one. The shell from Hemlock Lake has only four and a half whorls, instead of the "seven whorls" of Case's somewhat mythical species, which in fact seems to have been nothing more than *P. campanulatus* with the aperture duplicated.

The next expedition was to Dow's Swamp. A halt was made *en route* at the Bank street bridge, where *Valvata tricarinata*, Say, *Limnæa stagnalis*, L., *Physa ancillaria*, Say, *Planorbis trivolvis*, Say, and *P. campanulatus* were collected. Very fine specimens of *L. stagnalis* occur at many points along the Rideau Canal, but nowhere of more graceful proportions and beautiful lustre than in the dead water ex-

tending from the canal in a westerly direction immediately above the swing bridge. *P. ancillaria* found there is also very beautiful, but except in colour it differs little from the form of *P. heterostropha*, Say, commonly met with. Both species are found in company in a depauperate form around the islands at the foot of the Little Chaudière.

On arriving at the swamp no time was spent in searching for the minute land shells—many very rare—which it produces, but our party at once repaired to the lake in its centre. *Valvata sincera*, Say *Limnæa palustris*, Müll, were present in great abundance, with not a few *Planorbis deflectus*, Say, and *P. exacutus*, Say. The only bivalve previously taken in the lake was *Pisidium abditum*, Hald., but on this occasion, in addition to that species, were found *P. ventricosum*, Prime, and *Sphærium securis*, Say—the former rare and the latter common and more inflated than the shells occurring in the canal.

Later in the season, in the ditch on the opposite side of the railway from Dow's swamp, a small form of *Physa gyrina*, Say, was taken in large numbers.

The third sub-excursion, which took place to Hull, was not attended with very satisfactory results. Along the eastern slopes of the hill overlooking the beaver meadow a few specimens of *Mesodon sayii* were found. *Limnæa emarginata*, Say, and *Physa heterostropha* were taken in Scott's Creek; and in dried up pools beside the railway we noticed myriads of shells of *Limnæa palustris*.

On the general excursion of the club to Kingsmere we obtained *Mesodon sayii*, *Zonites inornatus*, a slug which is probably *Pallifera dorsalis*, Binney, and a great many of the smaller helices. No locality near Ottawa affords so many species of land shells as King's Mountain and the ravines which climb around its sides, but neither the coronal lake near its summit, nor Kingsmere far below, appears to contain a single shell. Many larger lakes in the Laurentides are equally unproductive.

At Mohr's wharf, on the occasion of the excursion to the Chats, *Unio complanatus*, Sol., *U. radiatus*, Lamk., *Limnæa catascopium*, Say, *L. caperata*, Say, and *Planorbis trivolvis* were observed along the shore; and the woods to the south afforded *Mesodon albolobris*, *Patula striatella*, *Hyalina arborea*, *H. viridula*, *H. indentata*, Say, *Conulus*

fulvus, *Strobila labyrinthica*, *Pupa contracta*, Say, *Succinea ovalis*, and *Tebennophorus carolinensis*, Bosc.

We were absent from the city when the excursions were held to Buckingham and Casselman, but on these occasions the branch was represented by Mr. Harrington. Little worthy of particular mention was observed at Buckingham, but at Casselman an important addition was made to our lists in the large and handsome *Mesodon thyroides*, Say.

Considerable independent work was done by individual members of this section when business cares permitted. On the 3rd and 4th of September a tour was made along La Pêche River, in the County of Ottawa, from its mouth to its source. As far back as Masham post office, the stream, flowing in a gravelly bed, often strewn with boulders, appears to contain only two shells, *Unio complanatus* and *Physa heterostropha*, the latter very large. Before reaching Masham a visit was made to a small and in part shallow lake on the right of the road leading up the valley. It is locally known as Gauvreau's Lake, being named, as is customary in the Laurentides, after a neighbouring settler. It fairly teems with molluscan life. Four species, however, found common there on July 11, 1881 : *Annicola porata*, Say, *Limnæa desidiosa*, Say (a small but beautiful variety), *Planorbis deflectus*, and *Spærium sulcatum*, Lamk., had almost entirely disappeared. *Campeloma decisum* was rare as on the occasion of the former visit to the lake, and a large fine variety of *Planorbis trivolvis* very common. *Unio complanatus*, *U. luteolus*, Lamk., *Anodonta fragilis*, Lamk., and *A. lacustris*, Lea, occurred in the shallows in great abundance, notwithstanding the immense numbers destroyed by muskrats, as bore witness the large heaps of empty shells at short intervals along the shore. In this and other lakes the muskrats tear off one valve of the fragile anodontas, but the thick shelled species, as well as margaritanas and unios, they treat in a different manner, breaking off invariably a small portion of the lower third of the posterior margin. It is not improbable that they then extract the juices of the animal by suction, and when the adductor muscles relax and the valves open the firmer parts become easily accessible. Where thin andontas are rare and occur in company with numerous unios, as at several points along the Ottawa, they are treated

exactly like the thicker shells. The rats in such places have apparently not learned to distinguish the two genera.

Beyond Masham mills, where the mill dam was undergoing repairs, the muddy river bed was almost dry. The same shells were found here as lower down, and in addition *Campeloma decisum rufum*, *Planorbis trivolvis*, *P. bicarinatus*, Say, *Unio complanatus*, and *Sphaerium sulcatum*. Higher up, the river became rapid and narrow, with a pebbly bottom—a mere mountain brook—and no shells were found in it.

Later in September the outlet from Leamy's Lake was explored. Where it joins the Ottawa a single fine specimen of *Anodonta benedicti*, Lea, was collected. In the same vicinity, and especially at the mouth of Brigham's Creek, the surface of the water near the shore was one warm evening observed almost covered by innumerable univalves floating foot upward. *Physa heterostropha* was the species most abundant. Scarcely less common were *Planorbis bicarinatus* and *P. albus*, Müll., while *P. trivolvis*—a medium sized, robust, dark brown form—and *Limnæa catascopium* were sparingly represented.

As the polyzoa are classed under the mollusca, it may not be outside the *métier* of this branch to mention the occurrence of numerous large colonies of *Pectinatella magnifica* in the bay into which the outlet from Leamy's Lake flows.

With a view to preparing a complete list of the terrestrial mollusks of this vicinity a special effort was made by visiting new localities to collect all the species which occur here. The results, in part successful, have been set forth in a paper recently read before the club.

F. R. LATCHFORD.
PASCAL S. POIRIER.

4th March, 1885.

ADDENDUM.

Correction by Mr. J. F. Whiteaves of Remarks Attributed to him on page 133 (Transactions No. 5).

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

Dear Sir,—On page 133 of vol. 2 of the Transactions of the Ottawa Field-Naturalists' Club some remarks are attributed to me in which my meaning has been misunderstood on two points.

In reference to the first, what I intended to say, and what I believe I did say was, that, as Dr. Lea pointed out long ago, the rivers flowing immediately west from the Alleghanies, such as the Ohio and other tributaries of the Mississippi, contain a different set of Unionidæ to those which inhabit the streams of New England and the more northern Atlantic States which flow eastward from that mountain range. That to the north, in Canada, where no such mountain barrier exists, there is often no such marked distinction between these faunæ, and that this co- mingling may to some extent have been brought about by such artificial means as the construction of canals, like the Welland. At the time the remarks were made it did not occur to me that some of the members present might not be aware of the fact that the Unionidæ of the Pacific slope belong to quite a different fauna to the two already indicated.

Secondly, in regard to the North American species of *Anodonta*, it never entered into my mind to suppose that all the species that have been described from this continent could be regarded as one. My remarks were to the effect that *some* of the so-called species which have so far have been recorded as occurring in Canada (and especially those from the Province of Quebec) have been thought by naturalists of experience to be possibly only polymorphic varieties of the European (and possibly circumpolar) *Anodonta cygnea*.

J. F. Whiteaves.

August 18th, 1885.

REPORT OF THE ENTOMOLOGICAL BRANCH FOR THE SEASON OF 1884.

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

As predicted in the report submitted last year, the depth of snow which covered the ground was followed by a great abundance of insects, the hibernated forms of which had been well protected from harm. Although the spring was rather backward and the snow slow in disappearing, the season was earlier than in 1883, and hibernated insects were observed in the beginning of April. The summer was unusually cold and wet, and tended, doubtless, to check in some degree the increase of many species, although, perhaps, favorable to others; the influence of such seasons being yet uncertain. The unusually severe frost of 28th May, which, especially on the north side of the river, was such as to destroy the new wood of many native trees and shrubs, must have destroyed immense numbers of insects, either directly or indirectly. One instance of its effects may be noted. Mr. Pellissier, who lives about three miles from the Wakefield cave, informed us that the failure of the flowers of the raspberry (*Rubus strigosus*), from which his bees gather the greater part of their spring honey, was so complete that he was afraid he would have to sacrifice many of his colonies. The same cause must have been very disadvantageous to our native bees.

While the entomological branch remains deplorably weak in numbers we are able to record the addition to its ranks of two or three members who will doubtless be of great assistance in its work.

During the last session of Parliament the Committee on Agriculture summoned us to give evidence as to the injurious effects of insects, and also as to the advisability of a practical entomologist being appointed by the Government to investigate their ravages. The committee has since published its report, and having recommended that entomological investigations should be made under the control of the Department of Agriculture, one of your leaders has been appointed Entomologist to that department.

HYMENOPTERA.—The collections in this order have been largely increased, and a paper on one section of the species injurious to vegetables is announced on the programme of our soirées. A considerable

number of species in other families has been determined by Mr. Guignard, who has made a fine collection of these very interesting insects during the past two or three years.

LEPIDOPTERA.—In this attractive order a considerable amount of work has been done, chiefly amongst the diurnals, although the nocturnals have not been altogether neglected, and many new and rare species have been added to our collections. A collection is exhibited this evening of specimens of diurnal lepidoptera, all taken during the year in this locality or bred from the eggs. The leaders cannot do better than urge the members of the Club to take up the study of rearing insects from the egg. The eggs of many species can be obtained with comparative ease; yet hardly anything has been done in this line, and a fruitful field is open for workers. During the past year a commencement has been made, and the results are exhibited to you to-night. The exquisite specimen of *Colias Eurytheme*, winter form *Keewaydin*, in the case was bred from an egg laid by a specimen of the summer form *Eurytheme* so battered that it was hardly recognizable. At the same time a family of twelve specimens of the common Clouded Sulphur butterfly, *Colias Philodice*, were bred with this specimen for the sake of comparison, and were compared daily with important results. This family was chiefly of interest, because it showed conclusively that the white form of female, occasionally found flying with the yellow specimens, is merely a chance variety. Three of the twelve were very fine albinos. This result of obtaining white females from a yellow female had not, we believe, been previously obtained. Other interesting points as to the extent of variation were also demonstrated.

Although an almost complete series has been collected we consider it wiser to postpone for a time the publication of a list of our diurnals, so that additional information may be acquired regarding some of the species.

Among the larger, or rarer, lepidoptera which have occurred during the past season, either in the preparatory or perfect states, mention must be made of the following species. *Actias Luna* was exceedingly abundant in the larval stage near Hull, over thirty caterpillars having been collected in one afternoon, chiefly from the bitter hickory (*Carya amara*). On oaks the larvæ of *Ceratocampa pellucida* were abundant.

From the white pine about a dozen larvæ of *Ellema Harrisii* were taken, and at the same time three of the curious larvæ of *Platycerura furcilla*. These species feed in a remarkable manner, well worth mentioning. Clasping a twig with their prolegs they pull down a leaf by means of their thoracic feet until the tip is reached, when they feed on it until it is eaten quite down; they then take the next, and so on. Another rare species, to be for the first time recorded in this locality, is *Callosamia Columbia*, of which no less than nine larvæ were found on tamarack (larch) at Stewarton.

The most injurious insect of this order which occurred during the season was the velvety black cutworm (*Agrotis fennica*). The larvæ of this moth attracted attention by their depredations early in May, when they appeared in countless numbers, devouring nearly everything that came in their way, and especially destroying peas and clover. This species, although so numerous this year, had previously been an exceedingly rare insect, and it is probable, judging from the mortality among those kept for study by us, that it will be very scarce again next year. Thousands of the larvæ were killed off by parasites and a fungous disease before reaching maturity.

As leaders of the Entomological Branch we are much pleased to announce that Dr. Selwyn instructed Prof. Macoun to collect lepidoptera when examining the Nipegon district during the past summer, and that the collection made there, although small, was of a most important character, several very rare species having been taken, two of which were new to science.

COLEOPTERA.—The list of coleoptera published in the last number of the Transactions contained, as you are aware, all the species which had been determined up to its publication. During the summer, however, a number of additional species were captured, and some of the unidentified ones have been determined,* so that about one hundred additional species are known. Mention may be made of an enormous congregation of beetles (with which were many other insects) which was observed by us on 4th May at the foot of the slide which brings down sawed lumber from the mills at Chelsea to the piling grounds at

* Chiefly through the kindness of Mr. J. B. Smith and Mr. E. A. Schwarz.

Ironsides. The slide was not in use on the day in question, and all the insects which fell into it throughout its length of four miles and were carried down by its swift current were arrested at the piling grounds by the boards left floating in the trough. The accumulation numbered many thousands and contained a great number of species, including some very rare ones, but the larger part consisted of various species of Scolytidæ, or bark-boring beetles (chiefly of the pine), Aphodii and Staphylinidæ being next in abundance.

In the remaining orders a number of species have been captured and a certain number named, while steps will be taken to have the remaining insects determined by competent specialists. Mr. T. J. MacLaughlin has commenced the study of our dragon-flies, and if others of our members would only take up the collection and investigation of one or more of the many groups which remain untouched valuable work could be done for the Club and for entomology.

It is suggested that members could find an agreeable task in rearing say a single species, as a complete investigation of the life history of the most common insect would be of much interest and value. The number of species of which a complete history has been gained is small, and new facts would be sure to reward even the beginner in this path of science. To show what important work could be accomplished we may state that one of the leaders has been able to provide Mr. W. H. Edwards with a drawing of the chrysalis of a butterfly (*Neonympha Canthus*) which he had not before been able to obtain, and which rendered complete his illustrations of the various stages of all the Atlantic species of the genus.

W. HAGUE HARRINGTON,
JAMES FLETCHER,
Leaders.

4th December, 1884.

REPORT OF THE ORNITHOLOGICAL BRANCH.

To the Council of the Ottawa Field Naturalists' Club :

The work in this branch during the past season has been very satisfactory, and the leaders are able to report no less than nine additions to the already large list of Ottawa birds published by the Club, bringing the total number of species recorded from this locality up to two hundred and six. Interesting notes were taken at some of the Club excursions and working parties, but, as usual, the great bulk of the work was accomplished individually.

Early in the year, circulars were received announcing the fact that the American Ornithologists' Union had taken upon itself the difficult task of collecting material for the more systematic study of the great problem of bird migration, and requesting those willing to assist, to take careful notes on the movements of the birds, and report to the superintendents appointed for the various districts. Both of the leaders agreed to become observers, and reported individually, at stated intervals during the season, embodying in their reports the observations of other members of the Club. The most important part of the information required was the dates of arrival and departure of the different birds, distinguishing between the movements of the bulk of the species and of mere stragglers. The work will be continued during the coming year, and it is hoped that every member of the Club will contribute his mite towards making the reports from this station as full as possible.

The following are the additions made to the list of the birds of this locality already published by the Club. The numbers refer to Cones' "Check List of North American Birds" 1882 edition :

136. *Siurus nævius* (Bodd) Coues. Water Thrush. A young bird of this species was shot by Mr. W. L. Scott, on the Club excursion to the Chats Fall, held on July 24th. When shot it was running along the side of the steep, rocky bank, which skirts the Ottawa River a few miles below the falls. The locality is distant about thirty miles from Ottawa. Mr. Scott observed another individual at Gallway's Lake, in the Laurentian Hills, on July 9th ; and a third was noted by Mr. F. R. Latchford at the Little Chaudiere early in August.

188. *Lanius ludovicianus excubitorides* (Sw) Coues. White-rumped Shrike. A pair of these birds, both young of the year, were shot on June 28th by Mr. Scott, some four miles from the city, on the Quebec side of the river. There were, in all, a family of five, but the other three escaped. The stomachs of the two obtained were kindly examined by Mr. W. H. Harrington, with the following result:

"Young Shrike (male). Full of insect remains, including portions of a beetle, *Harpalus* (*Pennsylvanicus ?*) and of a large, black cricket.

"Young Shrike (female). Contents less, and more finely ground up. Apparently all insects, including abdomen of weevil, *Otiorhynchus ligneus*, head of large black wood ant (worker or soldier) and head of some large ichneumon (*Hymenoptera*)."

242. *Melospiza lincoini* (And.) BJ. Lincoln's Song Sparrow. A male of this species was shot by Mr. Geo. R. White, on the 16th May, near the east end of the city.

388. *Empidonax flaviventris* Bd. Yellow-bellied Flycatcher. One shot in a poplar tree, at the eastern extremity of the city, on May 26th, by our indefaticable junior ornithologist, Master Ted White.

482. *Nyctala tegmalmi richardsoni* (Bp.) Ridg. Richardson's Owl. Two specimens were secured by Mr. Geo. R. White; the first on Jan. 1st, 1884, and the second on Nov. 29th, 1884.

495. *Accipiter cooperi*, Bp. Cooper's Hawk; Chicken Hawk. Master Ted White shot one of these hawks towards the latter part of August, 1882. A specimen was also obtained on April 14th, 1884, by Mr. Geo. R. White.

516. *Buteo borealis* (Gm.) V. Red-tailed Buzzard Hawk; Hen Hawk. A young example of this hawk was caught alive in a barn, by Mr. Freeman, of Bowsville, Nepean, on Dec. 31st. The bird had entered the barn in pursuit of some hens. The specimen was subsequently killed and was mounted by Mr. Coleman.

695. *Chen hyperboreus* (Pall.) Boie. Snow Goose. On Nov. 1st., a bird of this species was "put up" from a stubble field on the Ontario side of the Ottawa, by Mr. Herring, the taxidermist to the Canadian Geological and Natural History Survey. Although he did not succeed in obtaining the bird, Mr. Herring is quite positive as to

its identity. A specimen is also said to have been shot just above the falls, some eighteen years ago, by the late Dr. Van Courtland. The head and wings were preserved, and remained in the museum of the Ottawa Literary and Scientific Society, until destroyed by moths.

847. *Podiceps griseigena holbœlli* (Reinh.) Coues. American Red-necked Grebe. In October, 1881, Mr. Whitcher shot a young male of this species, out of a flock of 8, on Campbell's Bay, some twenty-eight miles below the city. The specimen was mounted, and is at present in the office of the Deputy Minister of Fisheries.

The following birds, rare in this locality, or recently added to our local list, were noted during the season :

13. *Turdus ustulatus swainsoni* (Cab.) Coues. Olive-backed Thrush. Master Ted White shot 4 of these birds, in a swamp near Beechwood, on May 24th ; and Mr. Geo. R. White shot one near the same place on Sept. 24th.

134. *Dendræca pinus* (Bartr) Bd. Pine-creeping Warbler. Although far north of what is usually considered the northern limit of this species, it seems a not very uncommon bird with us. Master Ted White shot a specimen on the 8th of May last, making the fifth recorded from this locality.

142. *Geothlypis philadelphia* (Wils.) Bd. Mourning Warbler. On July 21st, an adult female of this rare warbler was obtained by Mr. Scott. It was shot in a small beaver meadow near Pelissier, in the Laurentian Hills, twenty-four miles north of Ottawa. The stomach was kindly examined by Mr. Fletcher, who reports as follows :

"The contents of the Mourning Warbler's stomach were—

1. Three of the large jumping legs and several parts of the wings of a Tettix.
2. Fifteen thoraces of some small Hemipterous insect, probably *Neides spinosus*. I am sorry to have to record that this is a beneficial insect.
3. One wing of a Hemipterous insect, showing the characteristic end of the hemelytron.
4. Four curved *ova*, about one line in length, of a deep yellow colour, probably of the above mentioned tettix.
5. Part of a blue elytron of some small Coleopterous insect.

The rest of the contents of the stomach was made up of parts of legs and bodies of insects, quite undistinguishable from partial decomposition."

173. *Vireo philadelphicus*, Cass. Brotherly-love Vireo. Master Ted White secured one of these vireos—apparently very rare with us—in his father's garden, on Sept. 4th.

176. *Vireo flavifrons*, V. Yellow-throated Vireo. A pair shot by Mr. Geo. R. White, near Beechwood, on May 15th. Mr. Scott shot a young female, near Pelissier, on July 21st. There were two of them, chasing each other from tree to tree, but only one was obtained. The stomach, as examined by Mr. Harrington, contained "a large striped caterpillar, several smaller caterpillars, and some small fragments, probably of coleoptera."

177. *Vireo solitarius*, V. Blue-headed Vireo. These birds appear to have been rather common last autumn. Mr. Geo. R. White shot two on the 28th of September, and Master Ted White obtained a pair on the 30th of the same month. Mr. Scott noted them on September 6th and 14th, and shot one on September 15th, and another on September 19th. Mr. Harrington examined the stomachs of the last two, with the following result:

"Solitary Vireo (shot Sept. 15th). Contents small. One caterpillar skin, and remains of *Hemiptera* (?)

"Solitary Vireo (shot Sept. 19th). Hemipterous remains chiefly. Fragments of a species of *Podisus*."

212. *Chrysomitris pinus* (Bartr.) Bp. Pine Linnet. Mr. Geo. R. White noted these birds as late as May 15th last spring, and again on August 15th. A pair were shot by Mr. Galpin of Rideau Hall, on October 6th.

227. *Passerculus sandvicensis savana* (Wils.) Ridg. Common Savanna Sparrow. This sparrow, although overlooked until last year, appears to be quite common. At Casselman, 30 miles south of us, it is apparently the commonest sparrow, and is very abundant.

282. *Passerella iliaca* (Merr.) Sw. Fox Sparrow. Master Ted White succeeded in securing two of these handsome sparrows, the first on May 2nd, in his father's garden, and the second beyond Beechwood, on the 3rd September.

524. *Buteo pennsylvanicus* (Wils.) Bp. Broad-winged Hawk. Although so long overlooked, this species appears to be one of our commonest hawks, and quite a number were obtained during the year. Mr. Harrington examined the stomach of a female of this species, shot on July 16th by Mr. Scott, and found it to contain "a mass of hair (mouse ?) with a number of seeds intermixed. Also the skin (almost entire) of a large *sphinx* caterpillar, and remains of a large beetle, *Osmoderma scabra* (Scarabaeidæ)." The presence of the seeds is very extraordinary, unless, as may have been the case, they were originally in the stomach of the mouse.

617. *Actodromas bonapartii* (Schl.) Coues. White-rumped Sand piper. On October 27th, Mr. Herring noted a number of these birds, on the Rideau, near the rifle range. He secured two, which are now mounted, and in the collection of the Survey. Master Ted White also shot two on the 8th of October, and one on the 18th.

788. *Chröicocephalus philadelphia* (Ord.) Lawr. Bonaparte's Rosy Gull. Three specimens were shot on May 31st, at Kettle Island, by Mr. Bruté. There is only one other recorded instance of the occurrence of this gull in the vicinity of Ottawa.

The following is a list of birds giving the dates on which they were first observed in the spring of 1884 :

Feb'ry 20—*Eremophila alpestris*, Shore Lark (a pair).
March 14—*Turdus migratorius*, Robin (one).
" 15—*Astragalinus tristis*, Goldfinch (a flock).
" 15—*Eremophila alpestris*, Shore Lark (abundant).
" 22—*Turdus migratorius*, Robin (abundant).
" 23—*Junco hiemalis*, Junco.
" 24—*Quiscalus purpureus æneus*, Bronzed Crow Blackbird.
" 24—*Melospiza fasciata*, Song Sparrow (several).
" 25—*Sialia sialis*, Bluebird.
" 25—*Agelæus phœniceus*, Red-winged Blackbird.
" 27—*Sayiornis fusca*, Peewee or Phœbe.
" 27—*Clangula glaucium*, Golden-eye.
" 28—*Spizella socialis*, Chipping Sparrow (one).
" 29—*Carpodacus purpureus*, Purple Finch.
" 29—*Accipiter fuscus*, Sharp-shinned Hawk.
April 1—*Sturnella magna*, Meadow Lark.
" 1—*Molothrus ater*, Cowbird.
" 7—*Larus argentatus smithsonionus*, Herring Gull.
" 9—*Iridoprocne bicolor*, White-bellied Swallow.

April 9—*Contopus virens*, Wood Peewee.
" 14—*Poœcetes grammineus*, Grass Finch.
" 14—*Accipiter cooperi*, Cooper's Hawk.
" 14—*Anas obscura*, Black Duck.
" 15—*Ceryle alcyon*, Belted Kingfisher.
" 15—*Pandion haliaëtus*, Osprey, Fish Hawk.
" 16—*Spizella monticola*, Tree Sparrow.
" 16—*Tringoïdes macularius*, Spotted Sandpiper.
" 17—*Mergus cucullatus*, Hooded Merganser.
" 17—*Passerculus sandvicensis savana*, Savanna Sparrow.
" 19—*Colaptes auratus*, Golden-winged Woodpecker.
" 19—*Hirundo erythrogastra horreorum*, Barn Swallow.
" 20—*Melospiza palustris*, Swamp Sparrow.
" 23—*Turdus unalascæ nanus*, Hermit Thrush.
" 24—*Petrochelidon lunifrons*, Cliff Swallow.
" 24—*Bernicla canadensis*, Canada Goose.
" 24—*Progne subis*, Purple Martin.
" 24—*Sphyropicus varius*, Yellow-bellied Woodpecker.
" 25—*Colymbus torquatus*, Loon.
" 26—*Spizella socialis*, Chipping Sparrow (abundant).
" 26—*Dendrœca coronata*, Yellow-rump Warbler.
" 26—*Totanus flavipes*, Yellowshanks.
" 27—*Regulus calendula*, Ruby-crowned Kinglet.
" 27—*Scolecophagus ferrugineus*, Rusty Grackle.
" 28—*Regulus satrapa*, Golden-crested Kinglet.
" 30—*Zonotrichia leucophrys*, White-crowned Sparrow.
" 30—*Certhia familiaris*, Brown Creeper.
" 30—*Gallinago wilsoni*, Wilson's Snipe.
May 1—*Ardea herodias*, Great Blue Heron.
" 1—*Chætura pelasgica*, Chimney Swift (one or two).
" 2—*Passerella iliaca*, Fox Sparrow.
" 2—*Chaetura pelasgica*, Chimney Swift (thousands).
" 3—*Dendrœca palmarum*, Yellow Red poll Warbler.
" 3—*Buteo pennsylvanicus*, Broad-winged Hawk.
" 3—*Circus cyaneus hudsonius*, Marsh Hawk.
" 3—*Falco sparverius*, Sparrow Hawk.
" 3—*Cotile riparia*, Bank Swallow.
" 6—*Troglodytes domesticus*, House Wren.
" 7—*Dendrœca cærulescens*, Black-throated Blue Warbler.
" 8—*Dendrœca pinus*, Pine creeping Warbler.
" 9—*Anthus ludovicianus*, Brown Lark.
" 9—*Dendrœca æstiva*, Summer Yellowbird.
" 10—*Antrosomus vociferus*, Whip-poor-will (heard).
" 12—*Tyrannus carolinensis*, Kingbird.
" 13—*Icterus galbula*, Baltimore Oriole.
" 13—*Harporhynchus rufus*, Brown Thrush.

May 13—*Geothlypis trichas*, Maryland Yellow-throat.
" 15—*Dolichonyx oryzivorus*, Bobolink.
" 15—*Vireo flavifrons*, Yellow-throated Vireo.
" 15—*Rhyacophilus solitarius*, Solitary Sandpiper.
" 15—*Mimus carolinensis*, Cat-bird.
" 16—*Myiarchus crinitus*, Great-crested Fly-catcher.
" 16—*Melanerpes erythrocephalus*, Red-headed Woodpecker.
" 16—*Melospiza linconi*, Lincoln's Finch.
" 16—*Dendræca maculosa*, Black-and-Yellow Warbler.
" 17—*Chordediles propetue*, Night Hawk.
" 17—*Zameloida ludoviciana*, Rose-breasted Grosbeak.
" 17—*Siurus auricapillus*, Golden-crowned Thrush.
" 18—*Turdus fuscescens*, Wilson's Thrush.
" 18—*Trochilus colubris*, Ruby-throated Humming-bird.
" 19—*Myiodioctes pusillus*, Green Blackcapped Flycatching Warbler
" 19—*Dendræca blackburnæ*, Blackburn's Warbler.
" 19—*Setophaga ruticilla*, American Redstart.
" 19—*Vireo olivaceus*, Red-eyed Vireo.
" 20—*Dendræca pennsylvanica*, Chestnut-sided Warbler.
" 20—*Dendræca virens*, Black-throated Green Warbler.
" 21—*Dendræca striata*, Black-poll Warbler.
" 21—*Ampelis cedrorum*, Cedar Bird.
" 22—*Vireo gilvus*, Warbling Vireo.
" 23—*Dendræca castanea*, Bay-breasted Warbler.
" 24—*Pyranga rubra*, Scarlet Tanager.
" 24—*Turdus ustulatus swainsoni*, Olive-backed Thrush.
" 24—*Coccygus erythrophthalmus*, Black-billed Cuckoo.
" 25—*Passerina cyanea*, Indigo-bird.
" 26—*Empidonax flaviventris*, Yellow-bellied Fly-catcher.
" 31—*Actodromas minutilla*, Least Sandpiper.
June 1—*Mniotilta varia*, Black-and-White Creeper.

The winter birds were last seen on the following dates:

March 16—*Plectrophanes nivalis*, Snow Bunting.
April 10—*Pinicola enucleator*, Pine Grosbeak (one).
" 14—*Ægiothus linaria*, Common Red-poll (a flock).
" 18—*Lanius borealis*, Great Northern Shrike.
May 11—*Chrysomitris pinus*, Pine Finch.
June 14—*Loxia curvirostra americana*, Red Crossbill.
July 1— *do* *do* do
" 4— *do* *do* do

Last fall the summer birds were last noted on the following dates:

August 25—*Dendræca æstiva*, Summer Yellowbird.
Sept. 3—*Passerella iliaca*, Fox Sparrow.
" 4—*Dendræca pennsylvanica*, Chestnut-sided Warbler.
" 4—*Vireo philadelphicus*, Brotherly-love Vireo.

Sept. 5—*Mniotilta varia*, Black-and-White Creeper.
" 5—*Myiodioctes pusillus*, Green Black-capped Fly-catching Warbler.
" 6—*Vireo solitarius*, Blue-headed Vireo (first seen).
" 13—*Turdus fuscescens*, Wilson's Thrush.
" 14—*Parula americana*, Blue Yellow-backed Warbler.
" 14—*Zonotrichia leucophrys*, White-Crowned Sparrow (first seen).
" 14—*Geothlypis trichas*, Maryland Yellowthroat.
" 16—*Mimus carolinensis*, Cat-bird.
" 18—*Colaptes auratus*, Golden-winged Woodpecker.
" 19—*Ardea herodias*, Great Blue Heron.
" 24—*Turdus ustulatus swainsoni*, Olive-backed Thrush.
" 26—*Passerina cyanea*, Indigo-bird.
" 26—*Dendræca coronata*, Yellow-rump Warbler (first).
" 27—*Quiscalus purpureus æneus*, Bronzed Crow Blackbird.
" 28—*Pyranga rubra*, Scarlet Tanager.
" 30—*Vireo solitarius*, Blue-headed Vireo (last seen).
October 2—*Vireo olivaceus*, Red-eyed Vireo.
" 5—*Zonotrichia leucophrys*, White-crowned Sparrow (last).
" 6—*Turdus unalascæ nanus*, Hermit Thrush.
" 7—*Spizella socialis*, Chipping Sparrow.
" 7—*Poœcetes grammineus*, Grass Finch.
" 8—*Rhyacophilus solitarus*, Solitary Sandpiper.
" 9—*Carpodacus purpureus*, Purple Finch.
" 16—*Melospiza fasciata*, Song Sparrow.
" 16—*Zonotrichia albicollis*, White-throated Sparrow.
" 18—*Sialia sialis*, Blue-bird.
" 18—*Dendræca coronata*, Yellow-rump Warbler (last).
" 19—*Spizella monticola*, Tree Sparrow (first seen).
" 26—*Scolecophagus ferrugineus*, Rusty Grackle.
" 26—*Turdus migratorius*, Robin.
" 26—*Junco hiemalis*, Junco (bulk left).
" 27—*Actodromas bonapartii*, White-rumped Sandpiper.
Nov'br 1—*Ceryle alcyon*, Belted Kingfisher.
" 1—*Chen hyperboreus*, Snow Goose.
" 6—*Sturnella magna*, Meadow Lark.
" 8—*Eremophila alpestris*, Shore Lark.
" 10—*Spizella monticola*, Tree Sparrow (last seen).
" 10—*Junco hiemalis*, Junco (last).
" 11—*Astur atricapillus*, Goshawk (male).
Dec'br 3—*Corvus americanus*, Crow (individuals are resident).
" 17—*Hylotomus pileatus*, Pileated Woodpecker (probably resident—two were shot early in February, 1884).
" 22—*Accipiter fuscus*, Sharp-shinned Hawk.
" 26—*Certhia familiaris*, Brown Creeper (probably resident).

The winter birds were first noticed on the following dates :

August 15—*Chrysomitris pinus*, Pine Finch.
October 20—*Plectrophanes nivialis*, Snow Bunting.
Nov'br 8—*Pinicola enucleator*, Pine Grosbeak (one).
" 29—*Ægiothus linaria*, Common Redpoll.

W. L. SCOTT.
GEO. R. WHITE.

14th January, 1885.

REPORT OF THE ZOOLOGICAL BRANCH.

To the Council of the Ottawa Field Naturalists' Club :

In making up the report of the proceedings and researches of this branch during the past season, the same fact presents itself, which was alluded to in our previous report, viz. : What is left for us to report when the various sub-branches of zoology have been so ably dealt with by their respective leaders? But it affords us much pleasure to state that the appeal made by us last year for members of the Club to note down any interesting facts, has been partially responded to, and it is to such notes that this report mainly owes its appearance. We again request that all observations of any interest whatever be recorded this year for further use.

Whilst the various branches of animal life, birds, insects, molluscs, &c., have occupied the attention of the Club, very little notice has been paid to mammals. We had hoped to be able to prepare, as an appendix to this report, a complete list of the mammals met with in this vicinity, but as several data are not verified, we have deemed it more expedient to delay till next year this list, which we then hope to lay before you verified and as complete as possible.

The remark in our president's inaugural address that it would astonish an ordinary observer, as well as many of our members, if they only knew the close proximity of many mammals in their daily walks, which are invisible from various causes is quite correct. One of the chief of these is the fact that many are nocturnal in their habits, and lie concealed by day, whilst the passer by their retreat little dreams of their nearness. How many of us, during our rambles, ever saw a

racoon, for instance, or a porcupine, and yet the former are not uncommon, and the latter not excessively rare. The weasel family are seldom visible, and the ground-hog is too wary to expose itself to every passer by.

To Mr. R. J. Devlin, of this city, who, from practical experience, is perhaps the best authority on the subject, your leaders are indebted for the subjoined list of fur-bearing animals of this district. He reports the beaver, (found in the Blanche and Lievre tributaries), the black-bear, otter, mink, muskrat, racoon, red fox, silver-grey fox, (rare) cross-fox (a cross between the grey and red), marten, skunk, weasel, fisher, lynx, and in rare instances the wolf. The latter is becoming very rare in this district. There is great doubt if the wild-cat is found here at all. Settlers have a habit of confounding the lynx, wild-cat and wolverine, although the latter does not exist here. One specimen some years ago was obtained and brought here from the Desert River, but apparently it was a rarity.

We noticed an unusually large number of racoons offered on our market last autumn, and the carcases of some we examined were remarkably fat. Enquiry showed that they were all taken near here, and Mr. Devlin's experience convinces him that this animal does not disappear before civilization, but rather becomes more numerous, especially where corn is grown in any quantity in the neighbourhood of woods or swampy thickets where hollow trees and stumps abound.

Reference was made in the last report to the probability of the jumping mouse *(Zapus hudsonius)* being found here, as it was recorded existing at Prescott. This probability has become a fact, as Professor Macoun reports these little creatures being seen in Major's Hill Park last season.

Field mice *(Arvicola)* are reported to have committed unusual devastation last winter. Mr. W. L. Scott states that in some places he noticed the underbrush totally destroyed for a distance of 25 or 30 yards, and that trees six inches in diameter were in some instances girdled and killed by them, and in the early spring the grass was literally a network of their runways. Mr. Harrington also states that near Hemlock Lake mice committed great ravages, and numbers of maples from two to eight inches in diameter were barked to the height

of one or two, and even more feet, and that acres of saplings and shrubs were destroyed. It will be a matter of interest to notice if the same conditions prevail this winter, and if so, to ascertain the cause of the increase of these pests. The wholesale destruction of birds of prey may have much to do with it, as disturbing the balance of nature, but there may be other causes at work.

Mr. Scott, who has closely watched the bats during the past season reports that out of fifteen specimens he secured, all but one were the common bat *(Vespertilio subulatus)*. During the Club excursion to Casselman, Mr. Fletcher obtained a specimen of *V. noctivagans*, and Mr. Gustavus Wickstead, on the 16th December last, found between the windows of his office, in the Parliament Buildings, a specimen of the Carolina bat *(V. serotinus fuscus)*. This specimen was referred to Dr. Merriam, of Locust Grove, N.Y., who pronounced on its identity, and added that it was a southern species, rarely reaching as far north as New York.

A seal is reported to have been seen quite recently off Gatineau Point. Two years ago a seal was shot by Mr. Askwith opposite to New Edinburgh, and solitary individuals have been from time to time seen in former years about the openings in that vicinity formed by the currents of the Ottawa River. It is a matter for enquiry what induces these marine animals to come thus far in our inland waters; whether driven up from tide water by storms they lose themselves, or whether they follow the migration of any particular species of fish. If the latter, it might throw some light on the winter movements of our fresh water fish.

Allusion was made in the last report to experiments being carried on by Mr. Scott, with two wood frogs *(Rana temporaria sylvatica)*. He now reports that his specimens lived some ten weeks, but refused all food during captivity. He attributes their death, not to want of food, but to placing them too suddenly in the sun, as they began to show great liveliness with the approach of spring. From experiments continued with other frogs, Mr. Scott found they would never eat anything already dead, as they absolutely refused anything that did not move. Living insects and butterflies they took greedily. The pickerel frog. *(R. palustris)*, reported to have been found by him in Patterson's

Creek, and mentioned in last years' report, is now supposed to have been the young of *Rana clamitans*, and no genuine specimen of *R. palustris* has yet been found in this vicinity. The 9th of April is the earliest date recorded last year, as far as we can ascertain, when the first frog was seen, and by the 13th their croaking was heard commonly On the 1st May toads were observed making their way to the water in great numbers to spawn, and on the 13th April tree toads were heard piping in ponds.

The first snakes were seen unusually early, two garter snakes *(Eutænia sirtalis)* having been observed by Mr. Harrington on the 14th April, before the snow was out of the woods. A fine specimen of the milk snake *(Ophibolus doliatus triangulus)* was captured by Mr. Latchford, on the Club excursion to Kingsmere, 22nd May. This species appears to be rare in this district.

On 20th April Mr. Latchford found a large spotted salamander *(Amblyostoma punctatum)* under a log, on frozen ground, almost liteless. This is only the second specimen recorded as taken here. On the same day Mr. Harrington found Jefferson's salamander under stones on a wooded slope near the Hull Cemetry. On 22nd May, Mr. D'Arcy Scott took the first specimen ever recorded in this locality of the two-striped salamander *(Spelerpes bilineatus)*. It was found near Kingsmere, and was identified by Dr. Merriam, who was present on that occasion.

On the 21st August Mr. Harrington procured two specimens of the spotted triton *(Diemyctylus viridescens)* during the Club excursion to Casselman.

No fresh observations have come under our notice with respect to fish during the past year, except the fact that the number of sheepshead *(Hoploidonotus grunniens)* offered for sale on our market is increasing. The reappearance of this species in the Ottawa was alluded to in last year's report.

Before closing this report we again call attention to the valuable aid afforded by recording the dates of the first appearance of various animals. Every note made at the time, however insignificant, may have some bearing on facts connected with zoological research.

The whole respectfully submitted,

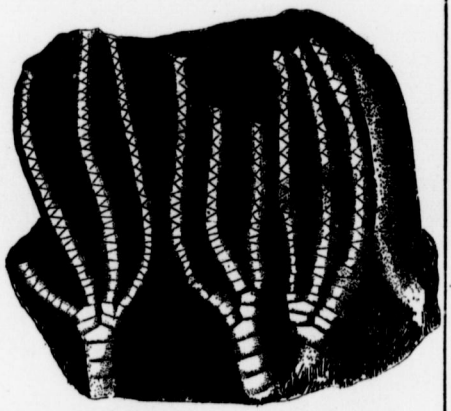
H. B. SMALL.
WM. P. LETT.
Leaders.

5th February, 1885.

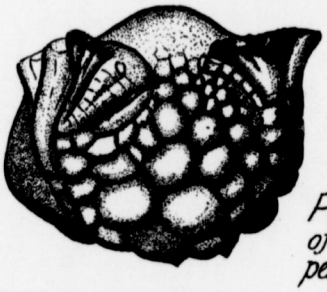
Abstract of Meteorological Statistics at Ottawa, June 1884 to May 1885, inclusive, by A. McGill, M.A.

	Months.												
	1884.							1885.					
	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Mrch	April	May.	Year.
Average height of barometer at 32° and reduced to sea level	30·047	29·776	29·973	29·995	30·063	29·984	30·094	29·997	29·967	29·987	30 007	29·925	29·9846
Highest barometer	30·540	30·032	30·356	30·534	30·606	30·472	30·790	30·723	30·463	30·449	30·511	30·242	30·790
Lowest barometer	29·660	29·478	29·542	29·470	29·555	29·242	29·148	29 136	29·074	29·364	29·329	29·475	29·074
Monthly and annual ranges	0·880	0·554	0·814	1·064	1·051	1·230	1·642	1·587	1·389	1·095	1·182	0·767	1·716
	°	°	°	°	°	°	°	°	°	°	°	°	°
Average temperature of the air	69·14	66·12	68·85	61.98	44 77	30 16	16·28	11·99	4·40	12·25	36·16	55·27	39·78
Difference from average (9 years)	+2·91	—4·00	+0·95	+3·97	—3·56	—1·41	+0·08	+1 18	—7·95	-10·65	—1·48	—0·23	—1·68
Highest temperature	93 9	93·3	94·2	89·0	73·6	50·8	47·2	44·0	32·4	35·7	75·0	82·2	94·2
Lowest temperature	36·6	42·1	34·1	29·2	20·7	8·0	—28·3	—21 4	—26·9	—20·6	4·3	24·0	—28 3
Monthly range	57·3	51·2	60·1	59·8	52·9	42·8	75·5	65·4	59·3	56·3	70·7	58·2	122·5
Average maximum temperature	82·9	77·1	80·0	72·5	53 0	36·8	23·6	20·8	14·1	22·2	44·2	65·5	..
" minimum temperature	51·2	54·1	53·0	47·9	35·8	21·9	7·8	2·3	— 7·0	0·7	24·4	42·5	..
" daily range	31·7	23·0	27·0	24·6	17·2	14·9	15·8	18·5	21·1	21 5	19·8	23·0	21·51
Average pressure of vapour	0 500	0·504	0·543	0·467	0·253	0·153	0·109	0·078	0·054	0·077	0·186	0·326	0·271
Average humidity of the air	70	79	81	84	80	88	91	86	89	83	82	73	82
" temperature of the dew point	59·0	59·2	61·3	57·1	40·6	28·0	20·2	13·0	4·7	12·7	32·7	47·2	..
Amount of rain in inches	1·83	3·72	2·82	3·75	2·73	1·16	2·70	0·19	0	R	3·32	1·53	23.75
Difference from average (9 years)	—0·25	+1·82	+1·01	+0·94	+0·20	—0·09	+2·18	—0·44	—0·68	—0·99	+2·38	—1·26	+4·82
Number of days of rain	8	13	9	17	16	7	5	1	0	1	5	9	91
Amount of snow in inches	..	..	.	..	8	7·5	16·0	7·3	22·5	20·9	46·5	8	120·7
Difference from average (9 years)	..	..	..	..	—2·0	—3·0	—11·9	—14·5	+ 4·1	+ 0·6	+42·8	—0·1	+16·0
Number of days of snow	.	..	..	..	2	5	8	9	10	11	6	1	52
Percentage of sky clouded	28	58	34	44	70	65	68	59	41	43	45	45	50
Average velocity of wind (in miles.)	2·80	2·98	2·38	2·76	4·52	8·46	7·21	9·03	7·85	8·26	7·06	6·42	5·81
Auroras not observed.													

Archæocrinus desideratus *n. sp.*



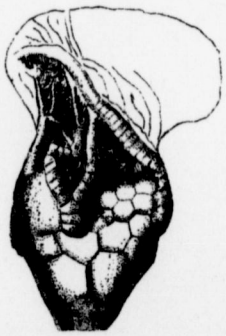
A flattened specimen showing portions of arms, one of which has four tertiary radials - an abnormal number.



Posterior view of an almost perfect cup.

Specimen from Hull, P.Q.

Euspirocrinus obconicus *n. sp.*



Specimen from Division Street, Ottawa.

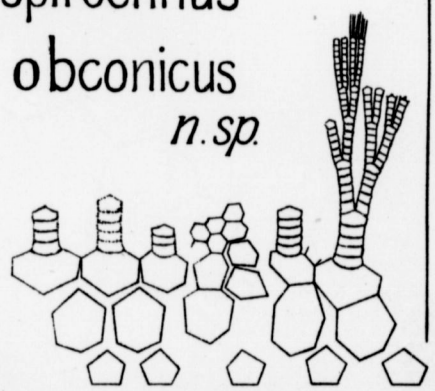
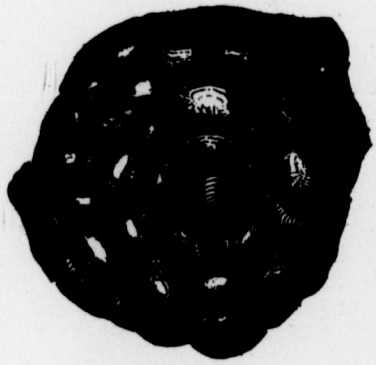


Diagram of Ottawa specs.

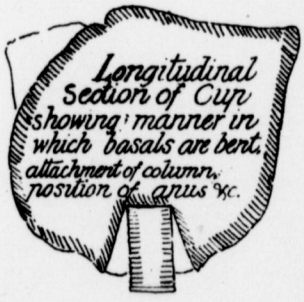
B.B. ET W.R.B. DEL.

S.C. McLAUGHLIN. PHOTO-LITHO.

Archæocrinus desideratus *n. sp.*



Basal view of an almost perfect cup.



Longitudinal Section of Cup showing manner in which basals are bent, attachment of column, position of anus &c.

Diagram of a large specimen. Owing to the spec.ns not being sufficiently cleaned to allow of the underbasals being seen, they are omitted here and in the description, although probably present.

B. B. ET W. R. B. DEL.ᵉ

S. C. McLAUGHLIN PHOTO-LITHO