1893 VOL. VII. 1894

THE OTTAWA NATURALIST.

BEING VOL. IX OF THE

TRANSACTIONS

OF THE

OTTAWA FIELD-NATURALISTS' CLUB.

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

OTTAWA:
PAYNTER & CO., PRINTERS, 48 RIDEAU STREET.

1893.

Patron:

HIS EXCELLENCY THE LORD STANLEY OF PRESTON
GOVERNOR GENERAL OF CANADA.

President: DR. GEORGE M. DAWSON.

Vice-Presidents:

1ST, FRANK T. SHUTT, | 2ND, DR. R. W. ELLS.

Secretary: DR. HENRY M. AMI, Geological Survey Dept.
Treasurer: A. G. KINGSTON, Dept. Public Works.
Librarian: WILLIAM SCOTT, Normal School.
Committee: {JAMES FLETCHER, W. H. HARRINGTON, W. F. FERRIER, MISS A. SHENICK, MISS G. HARMER, MISS A. M. LIVING.

Standing Committees of Council:

Publishing—A. G. KINGSTON, WILLIAM SCOTT, JAMES FLETCHER, W. H. HARRINGTON.
Excursions—F. T. SHUTT, DR. AMI, A. G. KINGSTON, MISS SHENICK, MISS HARMER, MISS LIVING.
Soirées.—F. T. SHUTT, DR. ELLS, DR. AMI, W. F. FERRIER.

Leaders:

Geology and Mineralogy—DR. ELLS, DR. AMI, W. F. FERRIER.
Botany—R. B. WHYTE, J. CRAIG, R. H. COWLEY.
Conchology—F. R. LATCHFORD, J. F. WHITEAVES, J. FLETCHER.
Entomology—J. FLETCHER, W. H. HARRINGTON, T. J. MACLAUGHLIN.
Ornithology—A. G. KINGSTON, W. A. D. LEES, MISS BOLTON.
Zoology—FRANK T. SHUTT, PROF. MACOUN, H. B. SMALL.

Editorial Staff:

Editor—W. H. HARRINGTON.

Sub-Editors:— *Geology*, DR. AMI; *Mineralogy*, W. F. FERRIER; *Botany*, WILLIAM SCOTT; *Conchology*, F. R. LATCHFORD; *Entomology*, J. FLETCHER; *Ornithology*, A. G. KINGSTON; *Zoology*, F. T. SHUTT.

The Librarian will furnish the Publications of the Club at the following rates:—

TRANSACTIONS,—

Part 1, Not sold singly.		
" 2, 25 cts.; to members,	15 cts.	$1.00 for Vol. I.
" 3, 25 " "	15 "	To members, 70 cts.
" 4, 25 " "	15 "	
" 5, 30 " "	20 "	$1.00 for Vol. II
" 6, 40 " "	25 "	To members, 50 cts.
" 7, 30 " "	20 "	

The OTTAWA NATURALIST, $1.00 per annum.
Monthly parts, 10 cents; to members, 5 cents.
Quarterly parts, 25 cents each; to members, 15 cents.

EXTRAS — BILLINGS, W. R. Palæontology. An elementary lecture, pp. 11, 5c.
ELLS, R. W. Asbestus; its history, mode of occurrence and uses. pp. 24, 10c.

LIST OF MEMBERS.

Allan, Hon. Geo. W. (Toronto.)
Allan, W. A.
Ami, H. M., *D.Sc.*, *F.G.S.* *F.G.S.A.*
Anderson, *Lieut.-Col.* W. P., *C. E.*, *M. I. C. E.*
Anderson, Mrs. W. P.
Archibald, Miss E.
Armstrong, John R.
Bailey, *Prof.* L. W. *M. A.*, *Ph. D.*, *F.R.S.C.* (Fredericton, N. B.)
Baldwin, Miss H. A.
Ballantyne, Miss I. M.
Ballantyne, J.
Baptie, George, *M.A.*, *M.D.*
Barlow, A. E., *M.A.*
Barlow, Scott.
Bate, H. Gerald.
Bate, H. N.
Beddoe, Chas. H.
Bell, E. B.
Bell, Robert, *B.App.Sc.*, *M.D.*, *L.L.D.*, *F.R.S.C.*, *F.G.S.A.*
Bethune, *Rev.* C. J. S., *M.A.*, *D.C.L.*, *F. R. S. C.*, (Port Hope, Ont.)
Billings, W. R.
Blanchet, W. H.
Boardman, Wm. F.
Bolton, *Rev.* C. E. (Paris, Ont.)
Bolton, Miss Eliza.
Borden, F. W., *M.D.*, *M.P.* (Canning, N. S.)
Boville, T. C., *B.A.*
Bowen, Miss Alice (Quebec.)
Bowerman, J. T., *B. A.*
Brewster, W. (Cambridge, Mass., U. S.)
Broadbent, Ralph L.
Brodie, R. J., *B.App.Sc.* (Smith's Falls Ont.)
Brown, Mrs. R. D.
Brumell, H. Peareth, *F.G.S.A.*
Burgess, T. J. W., *M. D.*, *F. R. S. C.* (Montreal.)
Burland, J. H., *B.App.Sc.*, *F.G.S.*
Butterworth, Miss Maria E.
Campbell, A. M. (Perth, Ont.)
Campbell, Miss C.
Campbell, R. H.
Carey, G. T.
Casey, M. W.
Chamberlin, Mrs. B.
Chubbock, C. E. D.
Cochrane, A. S., *C. E.*
Cornu, Felix, *M.D.* (Montreal.)
Cousens, W. C., *M.D.*
Cowley, R. H., *B.A.*
Craig, *Prof.* J. A. (Madison, Wis.
Craig, John.
Craig, Wm. (Russell, Ont.)
Coughlin, Mrs. M. A.
Cowan, Miss M. E.
Cowan, Mrs. R. W.
Dawson, G. M., *C.M.G.*, *LL.D.*, *F.R.S.*, *DSc.*, *Assoc. R.S.M.*, *F.G.S.*, *F.R.S.C.*
Dawson, Miss M.
Dawson, S. E. *L.D.*
Dawson, Miss W.
Deeks, W. E., *B.A.* (North Williamsburg, Ont.)
Dimock, W. D., *B.A.* (Truro, N. S.)
Dixon, F. A.
Dowling, D. B., *B.A.Sc.*
Doyon, J. A.
Dulau & Co., (London.)
Dwight, Jonathan J. (New York.)
Eaton, D. I. V.
Elkins, A. W., *C.E.*, *P.L.S.* (Lennoxville, Que.)
Ells, R. W., *LL.D.*, *F.G.S.A.*
Ells, Mrs. R. W.
Empey, Miss M.
Evans, Jno. D., *C.E.* (Copper Cliff, Ont.)
Ewart, D.
Fedarb, F. J.
Ferrier, W. F. *B.A.Sc.*
Fleming, Sandford, *C. M. G.*, *C. E.*, *F.R.C.I.*, *F.R.S.C.*
Fletcher, Miss C. F. S.
Fletcher, James, *F.L.S.*, *F.R.S.C.*
Fletcher, Mrs. J.
Fortescue, L.
Fortescue, Mrs. L.
Fraser, Basil H. *C.E.*
Fuller, Thos., *R.C.A.*
Gallup, A. H.
Gemmell, R. E.
Gilmour, T.
Giroux, N. J., *C.E.*, *F.G.S.A.*
Glashan, J. C.
Gobeil, A.
Goodwillie, *Rev.* J. M., *M.A.* (Vernon, Ont.)
Grant, *Sir* J. A. *K.C.M.G.*, *M.D.*, *F.R.C.S.*, *Edin.*, *F.R.S.C.*, *F.G.S.*
Grist, Henry.
Grist, Miss Mary L.
Hardie, John.

Hardie, Miss Jessie.
Harmer, Miss G. (Hintonburgh, Ont.)
Harmon, Miss A. Maria.
Harrington, W. Hague.
Harrington, Mrs. W. H.
Harrison, Edward.
Hay, George, Sr.
Hay, W. H.
Hayter, F., *B.A.*
Herridge, *Rev.* W. T. *B. A., B. D.*
Hodgins, John.
Hope, James.
Howell, H. M., *Q. C.*, (Winnipeg.)
Hughes, Chas. (Wakefield, Que.)
Jenkins, S. J., *B.A.*
Johnson, E. V., *C.E.*
Johnson, J. F. E.
Johnston, Robt. A. A.
Jones, C. J.
Kearns, J. C.
Keefer, Thos. C., *C.E.*
Keeley, D. H.
Kingston, A. G.
Laflamme, *Rev.* J.C.K., *D.D., F.R.S.C.* (Quebec.)
Lambart, *Hon.* O. H.
Lambart, *Hon.* Mrs. O. H.
Lambe, L. M. *F.G.S., F.G.S.A.,*
Latchford, F. R., *B.A.*
Law, John.
Lawson, *Prof.* G., *LL. D., Ph. D., F.R.C.I., F.R.S.C.* (Halifax.)
Lee, Miss Katharine.
Lees, Miss Jessie.
Lees, Miss V.
Lees, W. A. D.
Lehmann, A. *B.S.A.*, (Baton Rouge, La., U. S.)
LeSueur, W. D., *B.A.*
LeSueur, Mrs. W. D.
Library of Parliament.
Lindsay, A.
Living, Miss A. Marion.
Lovick, Miss G.
Lowe, John.
MacCabe, J. A., *LL.D.*
McConnell, R. G., *B.A., F.G.S.A.*
MacCraken, John I., *B.A.*
McDougall, A. H.
McDougall, P. A., *M.D.*
MacDougall, R. (Ormstown, Que.)
McElhinney, M. P.
McEvoy, Jas., *B.A.Sc.*
MacFarlane, T., *M.E., F.R.S.C.*
McGill, A., *B.A., B. Sc.*
McInnes, Wm., *B.A., F.G.S.A.*
McLaughlin, S.
McLaughlin, Mrs. S.
MacLaughlin, T. J.
McLean, J. D.
MacLean, Miss. S.
McMinn, W. J. R., *B.A.*
McNab, Chas.
McNaughton, H. F.
Macoun, *Prof.* John, *M.A., F.L.S., F.R.S.C.*
Macoun, J. M.
Mather, Miss J.
Matheson, D.
Matheson, W. M.
Mearns, *Capt.* E. A. (Fort Snelling, Minn)
Meneilly, W. J.
Mills, Miss Margaret A.
Moore, H. R.
Nelson, F., *B.A.*
Nicholls, William.
Nicholls, Rupert W.
O'Brien, S. E.
Odell, W. S.
Oxley, J. M., *B.A., B.C.L.*
Panet, Maurice.
Paquet, F. X.
Perley, *Major* Henry F., *C.E.*
Perkins, Miss E.
Poirier, *Hon.* P. S. (Shediac, N. B.)
Pratt, H. O. E.
Prevost, L. C., *M.D.*
Robert, J. A., *B.A.Sc.* (Montreal.)
Robertson, *Prof.* J. A.
Robertson, N.
Robins, R. N. (Sherbrooke, Que.)
Rondeau, *Rev.* S., *B.A.* (Sudbury).
Ross, Niles G.
Ross, W. A., *J.C.C.*
Rothwell, Miss Lina.
Saint-Cyr, D. N. (Quebec).
Saunders, Fredk.
Saunders, *Prof.* W., *F.L.S., F.R.S.C., F.C.S.*
Saunders, W. E., (London, Ont.)
Scott, Duncan C.
Scott, Fred.
Scott, P., *M.D.* (Southampton, Ont.)
Scott, W.
Scott, W. *B.A.*
Scott, W. L., *B.A.*
Selwyn, A.R.C., *C.M.G., LL.D. F.R.S., F.R.S.C., F.G.S., F.G.S.A.*
Senate, The.
Senecal, C.O., *C.E.*
Shenick, Miss A., *B. Sc.*
Shutt, F. T. *M. A., F.I.C., F.C.S.*
Simpson, Willibert.
Small, H. B.
Small, H. Beaumont, *M.D.*
Smith, Miss Eloise.

Smith, Miss Ethel M.
Steacy, Miss Isabel.
Steckel, R., *C.E.*
Summerby, Wm. J., *M.A.* (Russell, Ont.)
Surtees, Robert, *C.E.*
Sutherland, Miss C. F. S.
Sutherland, J. C. (Richmond, Que.)
Sweetland, John, *M.D.*
Symes, Miss E.
Symes, P. B., *A.K.C.*
Taylor, *Rev.* G. W. (Victoria, B.C.)
Thayne, E. Stewart.
Thompson, T. W.
Thorburn, John, *M.A.*, *LL.D.*
Topley, H. N.
Topley, Mrs. H. N.
Topley, Mrs. W. J.
Treadwell, C. W., *B.A.*, *B.C.L.*
Twidale, A. P., (High Rock, Que.)
Tyndall, Miss. A., (Cummings Bridge.)
Tyrrell, J. B., *B.A.*, *B.Sc.*, *F.G.S.* *F.G.S.A.*
Waghorne, *Rev.* A. C., (New Harbour, Nfld.)
Wait, F. G., *B.A.*
Walker, T. L., *M.A.* (Kingston, Ont.)
Wallace, J. W., *M.D.*, (Buckingham, Que)
Walsh, A. R.
Warwick, F. W., *B.Sc.*, (Buckingham, Que.)
Watters, Henry.
Watts, J. W. H., *R.C.A.*
Weldon, *Prof.* R. C., *M.P.* (Halifax.)
Weston, T. C.
White, George R.
White, *Lieut.-Col.* Wm.
White, W. R. (Pembroke, Ont.)
Whiteaves, J. F., *F.G.S.*, *F.R.S.C.* *F.G.S.A.*
Whyte, Miss Isabella.
Whyte, J. G.
Whyte, Miss Ethel.
Whyte, Miss Marion.
Whyte, R. B.
Whyte, Mrs. R. B.
Willimott, Charles W.
Willing, T. N. (Calgary, N. W. T.)
Wills, J. Lainson, *M.E.*, *F.C.S.*
Wilson, W. J.
Wintle, E. D. (Montreal.)
Wood, Josiah, *M.P.*, (Sackville, N. B.)
Wright, W. R.
Young, *Rev.* C. J., *M.A.*, (Lansdowne, Ont.)

———:o:———

CORRESPONDING MEMBERS.

HILL, ALBERT J., *M.A.*, *C.E.*, New Westminister, B.C.

MERRIAM, DR. C. HART, Department of Agriculture, Washington, U.S.

ORMEROD, MISS E. A., *F. R. Met. Soc.*, Torrington House, Holywell Hill, St. Albans, England.

SMITH, PROF. JOHN B., Rutger's College, New Brunswick, N. J.

CONSTITUTION.

OF THE

OTTAWA FIELD NATURALISTS' CLUB.

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

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

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

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

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

6. *Treasurer.*—The Treasurer shall be charged with the collection and custody of the funds of the Club, and keep a regular account thereof, which shall always be open to the inspection of the Council.

He shall also submit at each annual meeting a statement showing the financial condition of the Club.

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

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

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

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

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

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

13. *Members.*—Any lady or gentleman desiring to join the Club shall send a written application, signed by the applicant and endorsed

by the recommendation of two members, to the Secretary, and if approved shall be elected at the next meeting of the Council. Members desiring to leave the Club must previously settle all dues and signify their intention in writing to the Secretary.

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

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

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

EDITORIAL.

At the Annual Meeting, held on Tuesday, March 21st, Dr. Geo. Dawson was re-elected President of the Club. During the past year his connection with the important Behring Sea Arbitration caused him to be absent from Ottawa for much of the time, but as a satisfactory termination of this question may soon be expected, his presence with us this year will be more assured, and his interest in the success of the Club is such that he will be able to materially promote its welfare. All the old officers were re-elected except three, who are replaced by Mr. W. F. Ferrier, Miss A. Shenick and Miss A. M Living. The attention of members is requested to the announcement on a previous page, of the Standing Committees, Editorial Staff and Leaders, whom the Council has appointed for the carrying on of the various departments of the Club's work. The former Editor, Mr. Fletcher, has been forced through pressure of work, and the distance from the city of his office, to resign his post, but he has promised his assistance to the incomer, and the Council has granted further aid by the appointment of Sub-Editors for the several branches of the scientific work of the Club. The start made in this direction during the past year, and the notes so published have proved acceptable to the members, but they should bear in mind that to make this section of the magazine really valuable and interesting, it will be necessary for each to make records and furnish notes to the sub-editors. The Council, in response to frequent enquiries, has authorized the re-printing of the Constitution, the only amendment to which, since its adoption at the Special Meeting, held March 28th, 1884, was made at the Annual Meeting in March, 1890, when the number of members in the Committee of Council was enlarged from three to six, in order to specially provide for three ladies. Although the scope of the Club's work has been gradually widened to receive the benefits of investigations made by its members wherever they may be located, the special work for which it was organized must still merit the chief attention, and although much has been observed and recorded of the Natural History of Ottawa, there still remains vastly more to be done. The season for out-door work and study is here; the snow and ice are melting, the birds are arriving, the

sap is commencing to revivify vegetation, the insects are crawling from their hibernating crevices ; a few days more and all nature will feel the rapid throbs of a new season of growth and development. Let us take every advantage of this finest season of the year, and leave cabinet and book-study to be true Field-Naturalists.

ANNUAL REPORT OF THE COUNCIL, 1892-93.

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

In presenting this, the *fourteenth* Annual Report of the work of the Club, your Council has much pleasure in stating that continued interest exists, and a large amount of valuable work has been accomplished. The growing interest which the public of Ottawa is taking in the excursions and soireés of the Club is very manifest, judging from the attendance on these occasions, as also from requests for admission to our membership.

One of the first duties of your Council after election was to appoint the various standing committees and leaders in the various branches, to give aid and information to members, and keep records of the season's work. *Fourteen* Council meetings were held during the year at which the routine and executive work of the Club was carried on.

Twenty-nine new members were elected during the past year, whilst a few of our membership have gone, some out of the city to other portions of the country, while others we mourn. Amongst the latter are the following :—

Rev. Abbé Provancher, of Cap Rouge, Quebec. This zealous and relentless student of Botany and Entomology was elected a *Corresponding member* of our Club in 1886. For many years he edited and wrote extensively for " *Le Naturaliste Canadien*," published in Quebec. The Abbé was the author of several interesting volumes on Natural History in the Province of Quebec.

William Pittman Lett. For upwards of *nine* years our late lamented City Clerk was an active member of the Club, and occupied the post of Leader in Zoology on several occasions. No one who had the pleasure to listen to Mr. Lett's graphic descriptions of the life and habits of the higher mammalia of Ottawa will ever forget them.

His love for the chivalrous in the glowing scenes of a huntsman's career, together with his narratives of personal encounters with the larger game of the district, are still and will long be fresh in the memories of even the youngest one in our midst. Mr. Lett has contributed several important and reliable papers on his favorite subject, which were published in the "Transactions" of the Club.

W. H. C. SMITH, of the Geological Survey of Canada has also passed away from our sphere of activity. Prematurely, right in harness, engaged at his favourite work and study, Mr. Smith was taken away. He was to have given the Club an evening's entertainment on the "Geology of the Rainy Lake region" in which he had a number of interesting observations to record.

Besides being a Fellow of the Geological Society of America and Secretary of the Logan Club of Ottawa at the time of his death, Mr. Smith was a member of a number of societies and organizations, amongst which he was universally held in high repute.

R. J. TANNER, late Principal of one of our educational institutions, also passed away. His quiet and gentle unobtrusive manner, as well as his courtesy and other personal qualities, had won for him a very large circle of friends.

In his capacity as teacher and student of nature, Mr. Tanner took a deep interest in the welfare of the Club, whilst the city has lost in him a useful and worthy citizen.

The total membership of the Club to-day, amounts to two hundred and seventy-five.

Four general excursions were held during the year and it can safely be said that never heretofore have these been more successful or better patronized.

The opening of the Ottawa and Gatineau Valley Railway has done much to increase the interest and attendance at the excursions held, as the region traversed is beautiful and attractive to students of Botany, Geology, Entomology, &c.

Five Soirées were held during the winter, at which the average attendance was larger than in previous years.

Additions to the Library are coming in steadily from exchanges a home and abroad.

In his report, our energetic Librarian will give you a résumé of the duties devolving upon him and a list of the additions to our Library during the year.

The Treasurer is able to show a balance on hand of $34.20 which is very creditable as we receive no outside help to enable us to publish the OTTAWA NATURALIST or "Transactions" of the Club. A new departure has been deemed advisable in the publication of the NATURALIST, and Sub-editors were appointed to give notes of observations made in the different branches of the Club's work. This method has met with general approval and satisfaction and added interest to the reading matter in the volume.

The NATURALIST has been published regularly every month, and as near the beginning of the month as possible. It is distributed to the members and exchange list free of charge, whilst a number of copies of the volumes of the Transactions were sold during the year, showing the esteem in which its pages are held by outsiders.

In conclusion, the Council hopes that the new year which will soon begin for the Club will be one marked by increased activity in all branches of the Club's work.

All of which is respectfully submitted,

HENRY M. AMI,

Ottawa, March 21st, 1893. *Secretary.*

OTTAWA FIELD-NATURALISTS' CLUB.

TREASURER'S BALANCE SHEET FOR 1892-'93.

RECEIPTS.

Balance on hand from last year		$ 28 72
Subscriptions received—		
Arrears of previous years	52 00	
Subscriptions of 1892-93	143 40	
Paid in advance for 1893-94	50	
		195 90
"Naturalists" sold by Librarian		25 30
Received for "Authors Extras"		19 25
" " Advertisements		25 50
Net proceeds of Excursions		36 24
		$ 330 91

EXPENDITURE.

Cost of Printing "Naturalist" Vov. VI	$222 03	
Postage on same	27 13	
		249 16
General Postage		12 86
" Printing		1 90
Printing "Author's Extras"		17 59
Gratuity to Janitor Normal School		5 00
Balance cost of binding periodicals of 1891		20
Appropriated for " " 1892		10 00
Balance on hand		34 20
		$ 330 91

A. G. KINGSTON,
Treasurer.

OTTAWA, 21st March, 1893.

J. BALLANTYNE,
WM. A. D. LEES. } Auditors.

REPORT OF THE ENTOMOLOGICAL BRANCH.

To the Council of the Ottawa Field Naturalists' Club:

The leaders of the Entomological Branch have much pleasure in reporting that satisfactory work was done during the past season. This consisted largely in the exact identification of species in the least worked and more difficult orders. This study has resulted in the addition of many species of beetles to the list of local species published in the Transactions of the Club for 1883-84. The advisability is therefore suggested of publishing at an early date a more complete record of the species found in this district. The occurrence of some of the rarer species has already been recorded in the OTTAWA NATURALIST under the head of Entomology, and it is proposed for the future to continue this method, instead of lengthening the Annual Reports.

A complete list of the Hemiptera was published in our June number, and additions will be recorded from time to time as identified.

In Lepidoptera a considerable amount of work has been done, particularly in the breeding of species. Some rare insects were obtained, of which mention may be made of *Chionobas jutta*, a rare satyrid, concerning the breeding of which at Ottawa some doubt has arisen. This butterfly was taken in the Mer Bleu on the 23rd June. On the same date a specimen of the rare little moth *Exyra Rowlandiana* was found at rest inside one of the cup-like leaves of the pitcher plant, *Saracenia purpurea*. Prof. Riley kindly identified the specimen; he stated that it is an uncommon insect. In the December number of the NATURALIST an account is published of some remarkable feather felting, resulting from the work of the carpet moth caterpillars which infested the contents of a pillow. A specimen of this felting is shown to-night. Some most interesting experiments have been carried out during the past year in transmitting by mail to England pupæ of the Camberwell Beauty butterfly. This journey on two occasions had the effect of producing the remarkable and extremely rare variety known as *Lintneri*, in varying degrees of definition. One particular specimen had all four wings different. A detailed account of this experiment will be published on a future occasion.

In the order Hymenoptera numerous additions have been made to collections, including some of great interest. A feature of the year has been the abundance of parasitic species. Mention may be made of two which did good service in destroying the eggs of two very injurious pests of the garden, viz., the imported current sawfly (*Nematus ribesii*) and the zebra caterpillar of the cabbage and other plants (*Mamestra picta*). An extended notice of these will be found in the forthcoming report of the Experimental Farms. A list of our Phytophagus Hymenoptera is now ready for publication when space permits in the NATURALIST.

Several collecting expeditions were made during the summer, the most interesting of which was a visit of two of the leaders to Sudbury, where in company with Mr. J. D. Evans, a member of the club and an energetic entomologist, they spent three days collecting. Although the weather for a portion of the time was not propitious, a large number of rare and interesting forms were secured.

(Signed), W. H. HARRINGTON, J. FLETCHER, T. J. MACLAUGHLIN, *Leaders.*

Jan. 19th, 1893.

BOOK NOTICE.

Report of Observations of Injurious Insects and Common Farm Pests, during the year 1892, with Methods of Prevention and Remedy.

The Sixteenth Annual Report, on the pests injurious to the British farmer and gardener, by Miss Eleanor A. Ormerod (a corresponding member of our Club), indicates that this talented lady is still indefatigably prosecuting the useful investigations which have made her famous in the field of economic entomology. The present report attains a length of 163 pages, and treats of a score or so of interesting subjects, of which a few only can be here indicated. The Sawfly, whose injuries to the apple were noted in the previous report, has been bred through its several stages and has proved to be *Hoplocampa* (*Teuthredo*) ***testudinea***, Klug. This Sawfly inserts its egg in the embryo apple, when the fruit is setting, and the larva, when hatched, feeds in the interior of the fruit and destroys it. Several European sawflies have already reached Canada, and inflicted a great deal of injury, and it is

sincerely to be hoped that the above pest may not also be introduced. Some insects well known to American agriculturalists are treated of in relation to various plants. Among these are the Asparagus Beetle, which has been to some extent injurious in the Atlantic States, but which has not yet reached Canada. We have, however, the Cabbage Aphis, Corn Aphis, Hessian Fly, Mangold Leaf-blister Maggot, Onion Fly and Diamond-back Moth of the Turnip. Pea-weevils are mentioned, but these are not the *Bruchus pisi* which occurs here, but beetles which belong to the genus Sitones (true Curculionids,) and which attack the foliage. Several pages of the report are devoted to the serious attacks upon tomato of the *Heterodera radicola*, a small nematode worm (such are popularly known as eel-worms,) which causes the growth of knots, or galls, on the roots of this plant, and on others, such as the cucumber, potato, parsnip, etc. This pest appears to be especially injurious to the crops grown under glass, and has caused great loss to some of the extensive growers. Several insect enemies of the turnip and cabbage are noticed, and considerable space is given to a discussion of the disease known as Finger-and-toe, the cause of which is the Slime Fungus, *Plasmodiophora brassicæ*. This fungus is also injurious here, and has been treated by Mr. Fletcher in his reports, as the Club-root of the Cabbage. Miss Ormerod's report is conveniently arranged under appropriate headings, and in connection with each infestation the most suitable remedies are carefully considered. The mechanical part of the work is well in keeping with the contents, and, besides numerous wood-cuts of the various pests, there are four excellent photo-gravure plates, illustrating the root diseases to which reference has been made.

W. H. H.

NOTES ON CANADIAN BRYOLOGY.

By DR. N. C. KINDBERG, Linkoeping, Sweden.

(Communicated by John Macoun. M.A., F.L.S., F.R.S.C.)

ANDRÆA SPARSIFOLIA, Zett. *Var.* SUBLÆVIS, Kindb. (N. var.)

Leaves generally smooth, rarely faintly papillose; the perichetial ones subobtuse.

Near Cape Beale, Vancouver Island, May 9th, 1892. (J. M. Macoun.)

DICRANOWEISIA OBLIQUA, Kindb. (N. sp.)

Differs from *D. crispula*, principally in the capsule being asymmetric, curved, substrumose in a dry state; the perichetial leaves being acuminate, and the costa excurrent in all leaves.

On stones along Asulcan Creek, near the Glacier Hotel, Selkirk Mountains, B.C. August 8th, 1890. (Macoun.)

DICRANELLA POLARIS, Kindb. (N. sp.)

Tufts dusky green, not shining, fuscescent below. Stems 1-3 mm. high, erect and simple, leaves rigid, patent-erect, nearly straight, from the ovate-oblong base narrowed to the subulate, indistinctly two or three toothed, acumen; cells not papillose, the lower marginal narrow, the upper sub-oblong; costa broad, often two-thirds of the lower part below, faintly marked, filling the whole acumen; perichetial leaves larger, entire, broader at the base, with more numerous marginal cells. Capsule asymmetric suboval, finally subclavate, curved, smooth, short-necked, orange; lid with a long, oblique beak; peristome of 16 teeth, nearly entire, slightly cleft above, orange with paler tips; annulus not distinct; pedicel yellow, erect, 10-12 mm. long. Spores small, about 0.015 mm. Calyptra short, dimidiate.

Differs from *Dicranella cerviculata* in the structure of the peristome, the broader leaf costa, and the larger perichetial leaves; also from *D. heteromalla* in the smaller size, the rigid leaves, the broader costa and the not striate capsule.

St. Lawrence Island, Behring Sea, Aug. 15th, 1891. (J. M. Macoun.)

DICRANELLA CERVICULATULA, Kindb. (N. sp.)

Agrees with *D. cerviculat a*in its dicœcious inflorescence, the strumose capsule and the yellow pedicel; differs in the leaves being gradually acuminate, the cells short quadrate, only the inner at the base rectangular, the costa narrow, well-defined, and not filling the acumen, only in the perichetial leaves distinctly excurrent. The tufts are very dense and compact, dark green, the leaves not spreading, the pedicel is short about 7-8 mm., the stem 5 mm.

On Digge's Island, Hudson Strait, August, 1884. (R. Bell.)

LEPTOTRICHUM (Ditrichum) TOMENTOSUM, Kindb. (N. sp.)

Tufts very compact and tomentose, 2-3 cm. high, the tips yellowish green, faintly glossy. Leaves small, entire, from the ovate-oblong base attenuate to the involute or canaliculate, scarcely longer or often shorter acumen, appressed in a dry state; costa occupying the half of the leaf-base, and the whole acumen; alar cells not distinct, the lower ones subrectangular, the upper shorter, suboval. Barren.

Probably allied to *Leptotrichum homomallum* or *Lepto. zonatum* Lev. The leaves are broader than in *L. homomallum*, and not so long-acuminate. It has also the habit of *Campylopus*, and some forms of *Dicranella heteromalla.*

St. Paul's Island, Behring Sea, July 3rd, 1892. (J. M. Macoun.)

RACOMITRIUM FASCICULARE, Brid. Var. HAPLOCLADON, Kindb. (N.var.)

Branches attenuate, acute, simple, or nearly without branchlets.

St. Paul's Island, Behring Sea, July 6th. 1892. (J. M. Macoun.)

MNIUM GLABRESCENS, Kindb. (N. sp)

Differs from *M. punctatum* in the stems being nearly glabrous, the leaves green, not nigrescent, faintly reflexed at the borders in a dry state, the upper leaves narrower, oblong or oblong-lanceolate, the cells smaller, more rotundate, the costa red only in the middle, (as in *M. stellare*) pale at the borders, the inner perichetial leaves ovate-oblong subobtuse, the pedicel sometimes 5-6 cm. long.

Sitka, and Port Etches, Alaska, 1891-92. (J. M. Macoun.)

Swamps, Queen Charlotte Islands, and Comox, Vancouver Island, 1878, 1885. (Dawson.) Near Victoria, and at Comox, Vancouver Island, 1875, 1887. (Macoun.)

LESKEA MOSERI, Kindb. (N. sp.)

Stems creeping, irregularly branching or pinnate. Leaves small, green, not glossy, from a short ovate, at the borders recurved, base, narrowed to a longer and filiform acumen, entire, indistinctly papillose; cells rotundate or quadrate; costa percurrent or excurrent. Perechetial leaves narrowly ovate-oblong, obtusate, short-acuminate, serrate above, at least to the middle. Capsule erect, cylindric-lanceolate, with a small mouth; peristome pale; endostome as long as the teeth; cilia none; lid conic, short-apiculate; pedicel about 2 cm. long. Male flowers not found. Differs from *Leskea nervosa*, principally in the leaves being longer-acuminate, and the perichetial ones subobtuse; it differs also in the peristome.

Tay Forks, York Co., N.B., 1890. (J. Moser.)

ANOMODON PLATYPHYLLUS, Kindb. (N. sp.)

A. obtusifolius, Can. Musc., No. 256; Macoun Cat., Pt. VI, 171.

Stem irregularly divided or irregularly pinnate; branches thick; leaves large, pherifarious and crisped when dry, (as in the *Anomodon apiculatus* and *A. viticulosus*), undulate and entire at the borders, very broad, nearly ovate-oblong or from a little broader, cordate and strongly papillose, base slightly narrowed to the lingulate at apex rounded acumen; inner basal cells subhyaline, not well-defined. Perichetial leaves strongly papillose and subdentate at the base, and contracted to a narrow, lingulate acumen. Capsule much smaller than in *A. apiculatus*, oval-oblong; endostome rudimentary; lid short-conic, not rostellate; pedicel yellow, less than 1 cm. long. Dioecious.

Differs from all our other species in the broader leaves, from the nearly allied in the small capsule.

Apparently all my specimens of *A. obtusifolius* are of this species. (Macoun.)

PSEUDOLESKEA ATRICHA, Kindb. (N. sp.)

P. atrovirens Var. *atricha*, Kindb., Macoun, Cat., Pt. VII, 180.

Tufts brownish or olivaceous, with green tips, loosely cohering, without rhizoids. Leaves distinctly papillose, ovate-oblong, short-acuminate, serrulate at the acumen ; cells elongate, conflated, irregularly sinuous. Capsules not found.

On rocks along the Eagle River, just below the little bridge at Griffin Lake, B.C., August 11th, 1889. (Macoun.)

THUIDIUM (Elodium) PSEUDO-ABIETINUM, Kindb. (N. sp.)

Stems imbricate, densely tufted, creeping, densely brown-tomentose, simply pinnate ; branches distant, short. Stem-leaves faintly papillose, broad-ovate, short-acuminate ; cells generally elongate, the middle ones oval-oblong ; branch-leaves ovate-oval subobtuse, distinctly denticulate and papillose on both sides, opaque. Capsule curved, lid not found. Monœcious. Habit of *Thuidium* (Elodium) *paludosum*.

In a swamp a little west of Britannia Station, and south of the Canadian Pacific Railway, six miles west of Ottawa, September 11th, 1890. (Macoun.)

THUIDIUM ABIETINUM, *PACHYCLADON, Kindb. (N. subsp.)

Differs in the branches being crowded, the stem leaves gradually long acuminate, ovate-lanceolate, the apical cells narrow, the basal orange. Capsules not found. Resembling in habit *Thuidium Blandowii*.

On rocks, summit of Tunnel Mountain, at Banff, Rocky Mountains, Alt. 5,500 feet, June 29th, 1891. (Macoun.)

ISOTHECIUM MYOSUROIDES, *BREVINERVE, Kind.

I. acuticuspis, Mitt.

Differs in the stem leaves being nearly entire, long acuminate, with a short and sometimes forked or indistinct costa. Capsules not found. Dicœcious.

New Harbor and Speedwell Bay, Newfoundland, Dec. 11th, 1890. (Rev. A. C. Waghorne.)

ISOTHECIUM MYOSUROIDES, *HYLOCOMIOIDES, Kindb. (N. subsp.)

Branches subjulaceous, sometimes bipinnate. Leaves larger than in the type, short-acuminate, those of the branchlets subobtuse; costa stout.

On old logs at Comox, Vancouver Island, April 30th, 1887. (Macoun.)

EURHYNCHIUM SUBSCABRIDUM, Kindb. (N. sp.)

E. Sullivantii, Macoun Cat., Pt. VI, 206.

Tufts pale green above, dirty yellow below. Stem creeping, pinnate; branches subjulaceous, nearly crowded, long and attenuate, Leaves long-decurrent, not striate, very papillose on both sides, serrulate nearly all around; borders reflexed below; cells sublinear or lanceolate, those in the angles short and numerous; costa vanishing near the acumen. Stem-leaves ovate with a subfiliform point; branch-leaves ovate-oblong, generally long-acuminate. Perichetial leaves nearly entire, filiform pointed. Capsules not found. Dicœcious or pseudomonœcious.

Allied to *E. Sullivantii*, Canadian Musci., No. 296. This species was examined by James and Austin, and pronounced *E. Sullivantii*, but Lindberg, in 1871, named it differently. The specimens from Royston Park that were distributed as No. 296. See Macoun Cat. VI, page 206, for distribution. (Macoun.)

EURHYNCHIUM SUBINTEGRIFOLIUM, Kindb. (N. sp.)

Tufts green, not glossy, sparingly radiculose. Stem irregularly branching or subpinnate; branches complanate. Leaves somewhat large, long-decurrent, faintly striate, distant and subdistichous, ovate-oblong, short apiculate, nearly entire, minutely denticulate near the apex, chlorophyllose; cells sublinear, the alar short and somewhat numerous, not large; costa thin, generally reaching to the acumen. Capsule arcuate or subobovate; lid not found; pedicel long and smooth. Probably dicœcious.

Habit of *Eurhynchium* (*Rhynchostegium*) *serrulatum*; allied to the European *Eurhynchium* (*Rhynchostegium*) *megapolitanum*.

On old logs in woods along the Columbia River, about one mile above Revelstoke, B.C., May 5th, 1890. (Macoun.)

EURHYNCHIUM REVELSTOKENSE, Kindb. (N sp.)

Tufts pale green. Stem pinnate, creeping; branches complanate. Leaves distichous, plicate, pellucid, ovate-lanceolate, long-subulate, minutely denticulate, sometimes short-decurrent; cells lanceolate, those in the angles short and large; costa thick, reaching to above the middle. Capsule arcuate; pedicel short and smooth. Lid and male flowers not found.

On old water-soaked logs in woods west side of the Columbia River, at Revelstoke, B.C., May 6th, 1890. (Macoun.) This species and the preceding were included in the references under *B. serrulatum* in Part VI.

EURHYNCHIUM SERRULATUM, *ERICENSE, Kindb. (N. subsp.)

Differs in the leaves being shorter, subovate, less distant, nearly crowded, also in the smaller, and short-pedicellate capsule.

On earth in woods a little west of Leamington, Essex Co., Ont., Sept. 21st, 1890. (Macoun.)

EURHYNCHIUM SERRULATUM, *HISPIDIFOLIUM, Kindb. (N. subsp.)

Differs in the branches being longer, the leaves very long, ovate-lanceolate, long-acuminate and sharply dentate. Capsules and flowers not found.

On old logs, Hastings, Burrard Inlet, B.C., April 8th, 1889. (Macoun.)

EURHYNCHIUM PSEUDO-SERRULATUM, Kindb. (N. sp.)

Rhynchostegium serrulatum Canadian Musci. No. 456.

Tufts dark green, faintly glossy, radiculose at the base. Stem irregularly branching or subpinnate; branches complanate. Leaves distichous, striate, often larger than in *E. serrulatum*, chlorophyllose, ovate or ovate-oblong, minutely denticulate, not or indistinctly decurrent; cells lanceolate, the lower shorter and more dilated, principally the alar ones; costa thin, reaching above the middle. Stem

leaves filiform-pointed or short-acuminate ; branch-leaves with a short, subulate, sometimes twisted acumen. Capsule arcuate ; lid short-rostellate ; pedicel rough. Monœcious.

Differs from *E. serrulatum*, principally in the striate, minutely denticulate leaves, the capsule not rostrate, and the rough pedicel.

On earth in woods at Beechwood, Ottawa ; (Macoun.) At Tay Forks, York Co., N.B.; (J. Moser.) Western Cove, Harbor Deep, and Seal Cove, Newfoundland, 1891 ; (Rev. A. C. Waghorne.)

RAPHIDOSTEGIUM PSEUDO-RECURVANS, Kindb. (N. sp.)

Tufts olivaceous, not or faintly glossy. Leaves patent and incurved-falcate when dry, ovate-lanceolate, long-acuminate, gradually narrowed to the filiform point, minutely denticulate nearly all around ; cells linear, the alar not large. Perichetial leaves long-subulate, denticulate only at the long, linear point. Capsule obovate ; lid not found ; pedicel short. Probably dicœcious.

On the bases of trees west of Columbia river, and south of the Railway Bridge at Revelstoke, B.C., May 5th, 1890. (Macoun.)

HYPNUM (Drepanium) ALASKÆ, Kindb. (N. sp.)

Stem regularly pinnate, creeping. Stem-leaves small, entire, not reflexed at the borders, ovate-lanceolate, equally attenuate to a subuliform or finally hair-like acumen, shorter than the base ; alar cells inflated, very distinct, sometimes yellow, the other cells hyaline. Dicœcious.

Differs from *H. callichroum* in the creeping stem, etc., from *H. curvifolium* also in the smaller leaves. It has the habit of *H. hamulosum.*

THE AIR OF OUR HOUSES.

BY FRANK T. SHUTT, M.A., F.I.S., F.C.S., IST VICE-PRESIDENT.

Delivered December 15th, 1892.

I have selected this subject, chiefly, for two reasons. First: although it is one of great importance, and has a vital interest for every one of us, widespread ignorance prevails regarding the grave danger to health from continuously breathing impure and vitiated air. Secondly: because it will form a fitting sequel to the lectures on Water and Food which I delivered on former occasions before this Club.

In pursuance of the course I adopted in those addresses, I propose to discuss the subject from the hygienic, as well as from the chemical, standpoint. My endeavour will be to point out the composition of pure, normal air; the nature, sources, and amounts of impurities in vitiated air; and the effects of these impurities upon the system.

THE ATMOSPHERE.

The atmosphere that surrounds our earth is composed, chiefly, of two elements—Oxygen and Nitrogen. These gases exist in the air, not as a chemical compound of the two, but in the free and uncombined condition. This can be easily and abundantly proved. I shall content myself, however, with telling you of a few of the reasons why air must be considered as a mechanical mixture of its constituents, and not a compound. The ratio, or proportion of the oxygen to the nitrogen in the air does not correspond to the ratio existing between these elements in any of the oxides of nitrogen, which are true chemical compounds. Neither the relative nor absolute amounts of the oxygen and nitrogen remain always the same and constant; and it is a *sine qua non* that the ratio between the constituents of a chemical compound should be invariable. Again, water dissolves from air both oxygen and nitrogen, but owing to the greater solubility of the former and the laws of gas absorption, the proportion between them in the dissolved air is not that existing between them in the atmosphere. For instance:

	Air dissolved in Water.	Atmospheric Air.
Oxygen	34.92	20.96
Nitrogen	65.08	79.04
	100.00	100.00

Such would not take place if the oxygen and nitrogen were chemically united.

Let me briefly remind you of some of the salient properties of these elements, and the functions they perform in the atmosphere.

OXYGEN.

Oxygen is known as the "supporter of combustion," since it is essential for combustion, whether such be accompanied by flame or not. It is the active element. It is the life-giving or, rather, life-supporting element. Without it animal life could not exist. In one of our former lectures we saw the vigour with which it united with many of the elements, giving out both light and heat, and learnt how, that of the compounds similarly formed, the rocks and the soil were very largely composed. Hence, oxygen may be termed the world-building element.

NITROGEN.

Nitrogen is an inert, inactive gas, incapable of supporting life or combustion. Its function in the atmosphere, as far as respiration is concerned, appears simply to be for the purpose of diluting the oxygen. For though oxygen is so necessary and essential for vitality, yet we could not live long in atmosphere of *pure* element. Such would shorten our lives to a very brief period, and we should hourly stand in jeopardy of an almost universal conflagration.

Roughly speaking, the air consists of one-fifth of oxygen, and four-fifths of nitrogen, by volume; but since it has been shown to be a mixture, and not a compound, we should expect to find the relative amounts of these gases variable. And this is the case, within small limits. From many hundred analyses of air made in different parts of the world, the percentage of oxygen in pure, wholesome air varies from 20.989 to 20.949 by volume. The extreme difference, then, amounts

to .04 per cent. The maximum amount of oxygen is to be found in the air on the sea shore and mountain sides.

OTHER CONSTITUENTS OF AIR.

We have said that air consists chiefly of oxygen and nitrogen, but *normal* air always contains small and variable quantities of vapor of water, carbonic acid, organic matter, and ammonia and ozone. Air vitiated by breathing, as we shall see, contains some of these constituents in excess, while others of its constituents are diminished. In addition to the above it should be mentioned that in the vicinity of large smelting and chemical works, certain gases, e.g. Sulphuretted hydrogen, Hydrochloric acid, etc., may be present, and pollute and poison the air. Owing to the law of the diffusion of gases, and the prevalence of air currents, there is always present the *tendency* to preserve a constant composition of the atmosphere, and thus it is that noxious gases cannot accumulate to a dangerous degree, save under extremely artificial circumstances.

THE MOISTURE OF THE AIR.

Moisture or vapor of water, always present in the atmosphere, is the result of the evaporation of water from the ocean, lakes and rivers, as well as from the soil and vegetation. Its amount is directly dependant on the temperature. Hot air can hold or absorb more moisture than cold air. When saturated air is cooled, moisture is deposited, of which the well known condensation on the outside of a glass of cold water in summer, is an illustration. Our breath is loaded with moisture, and hence the determination of the amount of moisture in the air of a room may sometimes serve as a guide to a correct diagnosis of its condition. Over the hygrometric state of the atmosphere, of course, we have no control, though to a certain extent, and especially in winter, we can regulate the amount of moisture in the air of our houses.

EFFECT OF EXCESS OR DEFICIENCY OF MOISTURE.

It might be well here to note that an excess or deficiency (above or below the normal amount) exerts a decided action upon the health. An excess of moisture is more prejudicial than a deficiency, since, in the first place, it tends to preserve the organic matter, which is one of the

chief impurities in vitiated air. It also seriously interrupts or interferes with the exhalation from the skin and lungs. When excessive moisture is associated with high temperature, we are cognizant of an oppressive and sultry feeling, and an enervation of mental and bodily vigour; with low temperature it is conducive to a damp, penetrating chilliness, which seems to search us through and through. Coughs, colds and rheumatic troubles are common when this state of atmosphere prevails. When the air is too dry, the mucous membrane of the mouth, pharynx and nostrils become parched, and the use of the voice impaired or impossible. A general irritability of the system is a common result of too dry an atmosphere.

CARBONIC ACID.

Carbonic acid gas, until quite lately, has been regarded not only as the chief impurity, but as the only impurity of vitiated air, and the one constituent that it is necessary to determine when examining an air for hygienic purposes. Important as it is that carbonic acid should not be allowed to exceed a certain amount in an air we breathe, we now know also how detrimental organic matter is, and that we must look upon *it* as probably the much more dangerous to health of the two. Carbonic acid is always present in the atmosphere. Over the sea, on mountains and moors, and in localities far from contaminating sources, it varies from .03 to .04 per cent. by volume. It is the result of the union of carbon (or charcoal) with oxygen. It is formed in the process of combustion, in the respiration of animals, and by decay or putrefaction of organic matter in the air. The chemistry, as far as the result is concerned, is precisely the same in all of these. The burning of wood, coal or other material rich in carbon and hydrogen, is accompanied by the development of heat and light. This is what is commonly understood as combustion. The products are carbonic acid gas, and water. By estimating their amounts, the chemist can tell how much carbon and hydrogen the burnt material contained. And again, knowing the weights of carbon and hydrogen in a substance, the heat that will be generated by their combustion can be calculated with accuracy, since in their union with oxygen they always produce for a known weight a certain amount of heat.

RESPIRATION.

The process of respiration is really one of combustion, though unaccompanied by flame. Our food is rich in carbon and hydrogen. Starch and sugar, fats and albuminoids, of which our food consists, all contain large amounts of these elements. The blood which receives the digested food from the alimentary track is pumped from the right side of the heart into the lungs, where it is passed through countless small capillary tubes, with extremly thin membranous walls. It is here that it comes into close contact with the inspired air, the oxygen of which it absorbs in large quantities. From the lungs it is then passed through the left side of the heart, and forced into the general circulation of the body. During its circulation, the absorbed or dissolved oxygen burns up the food material in the blood, forming carbonic acid and water, which are discharged chiefly on the reflow of the blood to the lungs though small quantities escape by way of the skin. The heat generated in the combustion of this food in the body to carbonic acid and aqueous vapor, is precisely equal to the amount that would have been produced if the food material had been burnt in the air; and it is the heat so generated that maintains our body temperature.

DECAY AND PUTREFACTION.

Decay and putrefaction have been mentioned as the third source of carbonic acid gas in the atmosphere. These processes of the disintegration and dissipation of organic matter, are really of the nature of slow combustion, usually brought about by the agency of microscopic plants, known as bacteria. Their products are much the same as those resulting from the combustion of fuel and of food.

ORGANIC MATTER.

Having now discussed the sources of the carbonic acid in the air, we must now speak of the organic matter, which is more especially present as the result of deficient ventilation.

It has already been mentioned that the deleterious character of badly ventilated rooms is due rather to the organic matter than to the carbonic acid. It is therefore of great importance that we should learn somewhat of its origin and effects upon health. Organic matter, and

ammonia in small quantities, are from much the same source as the carbonic acid. Our breath contains comparatively large quantities. Air fouled by the gases produced by decay, by sewage emanations, by contact with fifth of all kinds, is loaded with organic matter, largely in the form of noxious gases, which may contain disease germs, but which, at all events, is extremely detrimental to health.

The unpleasant odour, and sometimes even taste. experienced on entering crowded and heated rooms, is due to organic matter in the atmosphere. The pleasurable sense of relief on going out into the fresh air from a room, is a sure indication that its air is seriously contaminated with organic matter. We should take care that we do not habituate ourselves to unpleasant odours of this kind. The constant smell of food in the house should be avoided, or rather prevented. Dust should not be allowed to accumulate in carpets; worn clothing should be thoroughly aired before putting away, and above all, defective drainage should at once be made perfect

AIR VITIATED BY RESPIRATION.

Let us now briefly recapitulate those points, in which expired air differs from that of the atmosphere.

1. Its oxygen is largely reduced. By respiration between 4.5% and 5.0% of oxygen is removed for the combustion of the food material in the blood.

2. It contains a considerable amount of organic matter of a particularly deleterious character. From the lungs alone about 3 grains are thrown off daily, and to this must be added the variable amount from the exhalations of the skin.

3. The carbonic acid is largely increased. While fresh air contains about 4 volumes of carbonic acid per 10,000, expired air contains between 400 and 450 volumes in the same quantity. This tremendous increase is easily understood when we remember that the individual breathes about 18 times per minute, and at each respiration produces nearly 1⅓ cubic inches of carbonic acid. This amounts to ⅔ cubic feet per hour, or at least 16 cubic feet in the 24 hours—a quantity equal to that produced by the burning of 7½ oz. to 8 oz. of carbon.

4. The amount of aqueous vapor is augmented, for, as we have

already seen, expired air is saturated, or nearly so, with moisture. The quantity thrown off from the lungs daily is subject to variation, but is usually between 9 and 10 ounces.

EFFECTS OF VITIATED AIR ON HEALTH.

I have already pointed out that vitiated air, and more particularly air that has received largely the products of respiration, is extremely deleterious to health. But I would now emphasize the insidious character of these impurities, how they gradually undermine the health and how easy it is for us to habituate ourselves to a morbid condition of the air we breathe. Fainting fits, giddiness, nausea, and headache are recognized as the immediate results of breathing the air of badly ventilated halls and rooms, but it is not so widely known that indigestion, diarrhœa, and impaired and feeble condition of the system—a general lowering of the bodily and mental vigour are often caused by the continuous breathing of vitiated air. Those who through carelessness, or apparent necessity of circumstances, live and work in a confined atmosphere, run a great risk, for apart from immediate evil results, they are not in a condition to resist attacks of zymotic diseases. Further, statistics clearly prove that the death rate of those living and working in an impure atmosphere (e.g. certain factories, mines, crowded tenement houses, etc.), is much higher than amongst those whose more fortunate lot allows them to live and work in a purer air.

VENTILATION.

For private dwellings no cheap and efficient system of artificial ventilation has as yet been invented. For public halls, schools, hospitals, and the like, however, there are now systems by which the air may be kept perfectly wholesome without creating a draft, either in summer or winter, and at the proper degree of temperature and moisture. What we might call public ventilation should now become a matter for legislation. Our public schools, halls of assembly, and all confined spaces, where large numbers of people congregate, should all be provided with the requisite means for constantly renewing the air. As private individuals, we have to be thankful that the materials of which our houses are constructed—and more especially brick and plaster—are porous, allowing a constant interchange of the air within with that outside. We should take care to increase this

interchange as much as possible by such means as are available. Draughts from open doors and windows are certainly to be avoided, but they may be overcome by judiciously placed screens and numerous other devices for distributing the current of fresh air. One such that answers admirably for the bedroom in winter is to raise the lower sash of the window, allowing it to rest on a piece of board some three inches high, and which fits snugly into the window frame. The air will now enter in a broad stream between the upper and lower sashes, and the sliding pane of the storm sash can be left open, as a rule, without fear of a draft. I might add here, that it is extremely important for the air of a bedroom to be pure and fresh, and the temperature of a room should be such as to allow the above, or some similar, method of ventilation to be practised throughout the winter. A grate fire is perhaps the very best means of assisting ventilation for private houses. If its function were only that of keeping the air of the room pure it could not be too strongly recommended, for it compels fresh air to enter by doors and windows, and by its strong draught continuously renovates the atmosphere. Looked at as a source of heat, it may be considered extravagant, but is certainly the most healthful, as well as the most pleasant and attractive of all our modes of heating. The windows should be opened for ten minutes first thing in the morning, and the whole air of the house renewed. Even on the coldest day, this will be found economical as regards fuel, as well as invigorating.

TEMPERATURE OF THE HOUSE.

One word may be said here regarding the temperature of our houses in winter, since it is a matter closely related to ventilation. It is more healthy to have the air of our bedrooms too cold than too hot, and the same remark refers, though not with equal force, to the rest of the house. I feel sure that many diseases of the lungs and throat are the result of going out of our over heated houses into the severe cold. The difference in temperature is enormous, and the system is in the worst possible condition to withstand the shock.

And now that I am about to conclude my lecture and these suggestions, which if put into practice may mean better health for many of us, let me urge upon every householder the necessity of knowing that

the drains are properly trapped, and in good working order. No expense should be spared, if health is a matter of importance, in preventing the possibility of sewer gas entering the house. Then again, cellars should be drained, dry and well ventilated. Refuse and garbage should not be allowed to accumulate in or about the house. Perhaps the best means of disposing, in the city house, of vegetable refuse and general kitchen scraps is the cooking stove. From a sanitary standpoint it has not its equal.

In the matter of ventilation, as in everything else, we should use our common sense. We all have some powers of observation, we can all study cause and effect, even if we do not understand fully the chemistry that underlies it all. Let us see to it as a people—both in town and country—that in this matter of fresh air we do not err in the future as we have done in the past. We have learnt the origin and detrimental effects of foul and vitiated air; let us not from carelessness or wilful neglect refuse to take necessary means to provide our houses with fresh pure air.

———:o:———

EXCURSION No. I. To LA PÊCHE.

The Excursion Committee has made the necessary arrangements for the first excursion of the season. The date selected is Saturday, May 27th, and the locality to be visited is that known as La Pêche, or Wakefield, a most picturesque and attractive resort. The party will leave the C. P. R. Union Station at 9.45 a.m.by the Gatineau Valley Railway.—Before returning the Leaders in the several sections of the Club's work will make the usual brief addresses on the results of the Outing. Bring your friends and any persons whom you know to be interested in Natural History.

Tickets, Members ..... 50 cents.
" Non-Members ..... 60 "
" Children of Members ..... 25 "
" " of Non-Members ..... 30 "

Tickets can be obtained at the Station.

MY AQUARIUM.

BY H. B. SMALL.

(Read March 2nd, 1893.)

In a work that I published on "The Fresh Water Fish of Canada," I quoted on the title page, the following passage from W. Scrope, a writer in the early part of the century, where he says:—"I like the society of fish, and as they cannot with any convenience to themselves visit me on dry land, it becomes me in a point of courtesy to pay my respects to them in their native element." Quaintly as he expressed it, it forshadowed the study of their habits. Now Nature opposes certain obvious obstacles to the pursuit of knowledge in the water, which renders it difficult for the ardent naturalist, however much he may be so disposed, to carry on his observations with the same facility as in the case of birds and mammals. Still, by observation here and experiment there, watching through a sheet of plate glass, naturalists manage to piece together a considerable mass of curious and interesting information of an out of the way sort, about the domestic habits and manners of sundry members of the finny tribe. To the eye of the mere casual observer, every fish would seem at first sight to be a mere fish, and to differ but little from all the rest of his kind. But when one comes to look closer into their ways, one finds fish are in reality as various and as variable in their modes of life, as any other great group in the animal kingdom. Concealed under stones in babbling brooks, hiding in the grassy margin of purling streams, buried in the depths of silent ponds, roaming in the submerged forests of aquatic vegetation, is a multiplicity of animal life that may profitably be made a study, and to thoroughly explain which would require a lifetime.

In 1850, Mr. Robert Warrington addressed to the Chemical Society of London, a series of observations on the fact announced by Ingraham in 1778, that plants immersed in water when exposed to the action of light, emit oxygen, and the consequent necessity of their presence for the preservation of animal life. He reported placing two small gold-fish in a glass, having first planted in sand and earth at the bottom, a small plant of valisneria. The latter, as the leaves decayed,

fouled the water, and to remedy this he tried the introduction of a few snails, which, feeding on decaying matter, quickly restored purity and clearness to the water. In 1852, he experimented with sea-water and its occupants, with equal success. To Mr. Grosse, however, the well-known naturalist, may be attributed the popularity of the Aquarium which is certainly the purest of all household recreations. His first work on the subject, somewhere about the year 1855, was read with avidity, and although the London "Punch." levelled its keenest wit and satire against the new mania, and pointed to all the mishaps which might befall housekeepers by the breaking of the Aquarium and the consequent deluging of carpets, the passion for aquaria grew, and in 1857 they may be said to have been formally established in England. In that year, one of the quarterly Reviews remarked that the making and stocking of these had created a new and important branch in commercial industry. In 1856, Barnum introduced into New York the first of what he styled—"Ocean and River Gardens," and a few months afterwards they were for sale of all sorts and sizes, for private use. Before that, the glass globe for gold-fish was the only representative of the new apparatus. In keeping an Aquarium, very little is wanted besides the tank itself. It is well to have an india-rubber tube or a syphon for drawing off the water when necessary; a wooden forceps for removing any object, and a sponge stick for cleaning the glass, together with a small fine-meshed hand net for handling any of the inmates if need be.

Some years ago, when residing in New York State, I was attached to one of the Military Colleges affiliated with West Point; and one of the first things that I did to engage the interests of the Cadets under my charge, was to turn their minds, during leisure hours, to the study of Natural History.

As I was at that time making collections of all kinds, I enlisted them in the work of procuring specimens, and I organized, on our Saturday holiday, field parties among the woods and mountains in the vicinity of the College, along the Hudson River. This was just at the time when Aquaria were in vogue, and I took advantage of the first visit that I paid to New York, to purchase an Aquarium for my own private use, which I kept in my quarters, open to the inspection of all

who wished to see it. This was over thirty years ago, and that I still have the Aquarium in almost as good condition as when I purchased it, is, I think, sufficient evidence that it was well adapted for its purpose. It is a comparatively small one, being only fifteen by nine inches. I think I may say it has done its full share in the way of attracting attention to " Life below the water." The first great difficulty I had to contend with was the multiplicity of objects that were brought to me for it by my cadets.

You would be astonished if I were to give you all the varied suggestions that were made respecting what should constitute the floor of the tank, some recommending small pebbles, others, gravel or sand, till finally a compromise was effected to the satisfaction of all, by giving each of the proposed materials its own place. Experience afterwards showed that a little clean river sand is the safest ground work for all purposes. Then there was the natural inquisitiveness of boyhood to combat. Whilst the novelty was at its height, the inmates were subjected to all sorts of ordeals, such as poking up with a stick, to see if they were lively; and a continual desire was evinced to handle them. Overfeeding was one of the most trying evils to contend against, for the superfluity of bread and meat supplied, in all good intent, for the use of the inmates, had a tendency to sour and discolor the water, and to create, when overdoses were administered, a fermentation by no means conducive to vitality. However, for the sake of encouraging research and creating amongst the cadets an interest in my Aquarium, I would naturally put up with all these little inconveniences, removing as soon as possible when left to myself, all extraneous matters from the water, and by frequent use of the siphon withdrawing the disturbed contents to be replaced with fresh, healthy, spring water, In a very little time the Aquarium ceased to be a wonder and became an object of interest, and so my point was gained.

I well remember its first inmate, which was the larva of a Dragon-fly, the various stages of whose subaqueous life were of continual interest, and great was the astonishment one day, when only an empty case was found attached to the stalk of the water weeds, its inmate having taken to itself wings and disappeared. The locality afforded a splendid field for collecting, as the Croton River emptied into the Hudson within a

mile or two of the College. Rockland Lake and Haverstraw Bay were on the opposite shore, whilst in the hills back of us were numerous ponds and streams abounding with life. Near the mouth of the Croton River lay the old Van Cortland Manor House, on the lawn of which was a fish-pond, constructed by some of the early Dutch occupants and well stocked with gold-fish. During a heavy freshet one spring, some years previous to the time I am talking of, the banks of this pond gave way, discharging its waters and its contents into the Croton River. As a consequence of this, the gold-fish took up their quarters in the Croton and Hudson Rivers, and it was no unusual thing when the fishermen were drawing their seines in this vicinity, for a number of gold-fish to be among the fish taken. These were generally thrown back, but anyone on hand at the time could always procure what he wanted and I, at various times, picked out such as I chose. These fish had also from time to time been taken by boys to various ponds in the hills, so that there is no lack of gold-fish in the waters of West Chester County. I may here mention, that further up the Hudson River a similar fish-pond years ago gave way, well stocked with the European Carp that had been brought from Holland. These have also taken to the Hudson River and are from time to time netted there. Being of the same family, they have crossed with the gold-fish in breeding, and the result is that a mottled fish is frequently to be seen, some of which bear very little of the distinctive red that marks the gold-fish proper. I have seen the latter in the lagoons along the railway in that vicinity, eight or nine inches long, and although it may seem scarcely credible, I have seen them lying in shoals near the surface of the water on a bright sunny day, in such abundance that the surface appeared to assume where they were, a red tinge.

The Hudson River is famous for its eels, and small specimens of these were occasionally brought to me. A scoop-net, drawn through the liquid mud in any of the tide-water pools along the river margin generally brought up more or less small eels, so that a good selection could be made of the size best adapted for observation. From the experience I gained with them, I would never recommend more than one small eel being placed in an aquarium, as two which I first introduced took up their respective quarters at either end of the tank, and

were perpetually doing battle like knights of old, charging on each other most furiously, with the final result one morning of my finding both dead on the surface of the water, one of them having half swallowed the other, but the latter in the operation choked his conqueror, with the result mentioned. A subsequent specimen of mine was in the habit of secreting himself between two stones, with part of his body only exposed, as if watching everything. There is apparently much of the snake in their habits, and the same timidity exists in each. The least noise disturbs their equanimity and thunder seemed particularly to affect my specimen. Although he occasionally moved round in the daytime, night was the time for his activity, and the artificial light of a room seemed in no way to interfere with his apparent recognition of time. One eel at a time affords ample opportunities for studying the habits of that family.

One of the most interesting fish to watch, is the cat-fish, which I am seldom without, but it must be kept well fed, and even then the fins and tails of the other fish bear evidence of its attacks upon them It is astonishing what an amount of food a cat-fish will swallow. You can watch his stomach swelling out to such an extent that it presents the appearance of a fowl's crop when fed to repletion. After he has thoroughly bloated himself out, he generally settles down, under or beside a stone, and lies there in a sort of comatose state for some time, closely resembling in this the serpent family. As soon as the effects of his meal have passed off, he becomes one of the most restless of the occupants of the aquarium, and swims backward and forward and up and down, incessantly, as if calling attention to his wants. I have not the slightest doubt that, after a time, fish know intuitively to a certain extent, when feeding time comes and the party that feeds them. I think that cat-fish are affected by, and feel coming changes of weather, but one cannot deduce conclusions from observations taken in a room where the temperature is probably uniform, as compared with the natural temperature out of doors.

Sticklebacks I have had in abundance, but more than two at a time become a nuisance. It is a perpetual warfare all round, especially if the males predominate. They, together with sun-fish, are, probably the most pugnacious of all fish, showing hostility even to my finger when

held towards them under water, their fins and spines bristling up like the hairs on a bull-dog's neck, when excited. They snap at everything, and it is impossible to keep any larvæ in an aquarium any length of time if these fish are joint occupants. I have read of sticklebacks building their nests and breeding among the weeds in an aquarium, but I never witnessed any operation of this kind myself, as I frequently changed my tenants for the sake of watching the habits of the different kinds of fish from time to time brought to me, with the exception of the gold-fish, which I have always retained.

Bass, I find to be for the most part, nocturnal in their habits, lying comparatively still the greater part of the day. Like the sun-fish, they are very tenacious of the spot they select, which they occasionally sail quietly round and round as if guarding, and woe to the unwary fish who may venture to settle down in the quarters they have chosen. The small brook sucker, I have kept and watched with a great deal of interest. They are useful scavengers, cleaning up, by suction, everything they come in contact with at the bottom, rolling it over their palate, swallowing whatever suits their taste, and thus disposing of a good deal of refuse matter which otherwise gives considerable trouble in getting rid of. These fish are, however, of what I might style, too delicate a constitution to be recommended as permanent occupants, Accustomed as they are to running water, and evidently given to roaming in streams, they seemed to suffer when pent up in a small space and except for temporary observation, I would not recommend their introduction into any private aquarium. Crayfish, in the same way, are very unsatisfactory occupants, and I never was able to keep one alive for any length of time.

One of the most interesting fish that I ever had in my aquarium was a small gar-pike, which was caught in a scoop net at the foot of the locks here in Ottawa and brought to me. This fish lived for several weeks, and after his death I placed him in spirits, where he still exists, He was most unsociable, turning his back upon all other fish that approached him, accepting the apparent overtures of none. The only surviving remnant of the fossil bony-scaled Ganoids of the Devonian rocks and belonging to the Mesozoic period, his pedigree probably caused him to look down on the finny tribe of the present age as his

inferiors. Hugh Miller, speaking of the living representatives of these fossil fish, says :—"They seem to have been spared amid the wreck of genera and species to serve as a key by which to unlock the marvels of icthyology of those remote periods of geological history appropriated to the dynasty of fish." I am inclined to think that my specimen scorned the ordinary food of the other fish, and died from inanition, as I never could induce him, while I was watching, to approach while they were feeding, and if he did satisfy himself at all, it must have been under cover of darkness. However, as he did not appear emaciated at his death, he may have subsisted on animalculæ in the fresh water from time to time supplied. The ordinary pike and dorée I never attempted to keep, and it is almost needless for me to say that brook trout will not live in any ordinary aquarium. The "Shiner" is also too delicate for general keeping and requires highly aerated water.

I have had almost all kinds of small fry, known as "minnows," in my aquarium, consisting of young chub, dace and minnows. They are very lively and become in a short time accustomed to their confined quarters, but from their delicate formation I would never recommend them as permanent inmates. There is one exception, however; that is the barred, or black minnow, which is very hardy and a very amusing fish to watch. Sometimes motionless on the bottom, as if wrapped in deep meditation; at other times balancing himself in the water, he keeps up a continual flapping of his ventral fins, working them like a fly-wheel, with apparently no other object than exercise. At other times, he darts about from side to side, and if more than one of these minnows are occupants they seem to exchange ideas, as the rest of his own species sail about conjointly with him.

Moving about, as I have done, from place to place, my Aquarium occupying the safest place in my baggage and being the first thing attended to after unpacking, I have had opportunities of stocking it from various waters, and when I went to reside for a short time at Buckingham I obtained one day, when fishing in a little trout stream, back of the village, a small specimen of the Bull-head, one of the very few that I have ever taken. He was carefully consigned to my Aquarium but only lived a few days, owing probably, to his transfer from the clear, crystal waters of that running stream to the narrow compass of

still water, to which he was unaccustomed He lay all the time ensconced between two small stones, hiding himself as closely as possible from observation, refusing food, and evidently sulking as wild animals do when first placed in confinement. The enormous size of his mouth as compared with his other dimensions, gave evidence of the capacity of these fish for disposing of a large meal at a time, but I never had the satisfaction of witnessing the operation of feeding, and I fancy from the retiring habits of the "bull-head" family, very little is really known about them.

Now leaving fish, I must dwell for a minute or two, on the amphibious denizens of the Aquarium. The Water Newt, Eft, and Triton, familiarly known as Lizards, although as repulsive as snakes to some people, afford much interest and amusement. I must confess I have never been fond of them, as I have a great aversion, inborn I suppose, to both lizards and snakes, but I have had Tritons in my Aquarium, as the cadets I spoke of, frequently brought them to me. The Triton is by no means shy, and is really grotesque in his movements, lying sometimes midway between the bottom and the surface, with all his legs spread out at right angles. At other times he suspends himself in the water, moving his feet up and down as a bather treads water, then darting frantically about with great rapidity. Occasionally he sits erect on the bottom of the aquarium, on his hind legs with his fore paws bent forward, like a dog begging. This position the Triton will keep for some time. He is also fond of resting on any portion of rock projecting out of the water, but if he can by any possibility climb to the edge of the aquarium, that is the last of him, as he is evidently of a roving disposition, and in search of the nearest road to liberty he is very apt to be crushed out of existence under foot.

The Tadpoles that were brought to me in every stage of growth, were, as the auctioneer says: "Too numerous to mention." I occasionally, to please the bringer, kept one or two for a short time, or till such period as their tails dropped off, at which stage of their existence, if I had not treated them myself to freedom, they would have gained it for themselves, as a frog in a state of maturity can only be kept in bounds by a fine wire grating laid over the aquarium, without which it is futile to keep them for observation. The tadpole, owing to the imperfection

of its gills has to frequently rise to the surface with a rapid zig-zag motion, something like an unsteady kite in the air. The process of change in these animals is very curious. The hind legs are the first to appear, and there is an interval, ranging from one to three weeks, before the fore legs push through the skin. Then the metamorphosis is rapid, the tail is absorbed and the final state of frog-hood is reached.

Among the respective inmates of the Aquarium, which were brought to me, was a small Turtle, about the size of a silver dollar, for whose benefit a small fragment of rock, projecting a little above the surface of the water, was provided, on which this animal delighted to sun himself whenever there was a chance, but at the slamming of a door, or even at the vibration caused by walking scross the floor he would immediately slide off the rock, and swim violently about for a few minutes. He was not one of the "snapping" order, but black, with red marks on the under part of his shell. Turtles seem to be very susceptible to sound, and, apart from noticing ordinary noises as above mentioned, he had a habit of constantly turning his head from side to side as if listening. He was very ravenous, the food I gave him consisting of earth worms, and small pieces of raw meat. These he would hold with his fore paws while he pulled at them and occasionally shook them, much in the same way as a terrier does a rat. His end was like that of all pets. He contrived one night to creep out of the aquarium, got on the floor and was crushed by the heavy tread of a human foot.

Another inmate, whose movements I watched with great interest, was a leech; not one of the kind used by doctors, but that known as a "horse-leech." The movements of this creature were very interesting. Fastening himself on the side of the glass, he would swing his body backwards and forwards, elongating and contracting it by turns, in every direction, as if looking out for something, and when finally satisfied that there was nothing within reach, he would slide himself along the glass the length of his body when extended, and then again go through the same proceeding. I would not, however, recommend the introduction of leeches into ordinary aquaria, as the fish therein are sure to suffer from their attacks. These, however, seem to be made under cover of darkness, for I never saw my leech attack any

of my fish, though the death of some of them while he was an inmate, I attributed to his work.

A very interesting class of occupants are the so-called Fresh Water Snails, among which I have always preferred Planorbis, whose shell reminds one of the fossil ammonite, Paludina, or marsh agate shell, Limnæa, and Physa. These are all and each a study in themselves. Seen only in their native state they would seem to possess few points of attraction, but when under observation they are very different. The species of Physa and Limnæa have a curious habit of floating on the surface with shell downwards, propelling themselves by a wavy motion of the wing-like apparatus that encircles their body. They all multiply rapidly, attaching their eggs by a transparent substance to the glass, or to stems of plants, but the voracity of their co-occupants,—fish—seldom allows them to come to maturity, so that there is an alarming table of infant mortality amongst these shell-fish. The utility of these as agents in keeping down the green growth of confervæ in an aquarium is great and the way in which they clean the glass is most interesting. The occupant of the shell puts forth his proboscis, turning it apparently inside out as we do a stocking, until the silky surface, which is the tongue, comes in contact with the glass. It then makes a sweep, like a mower's scythe, taking up into a swath all the confervæ on that spot. The proboscis enfolds this, and the tongue takes upon it all the vegetation which it has collected and disappears in the animal's interior. A forward movement is then made and another portion of the glass is swept clean by the same process, so that the track of the snails upon the glass may be traced as distinctly as that of a mower, by his swath along a meadow. Although I have had what are known as "fresh-water clams," that is the Unios and the Anodons, as occupants, they are unsatisfactory, and if a person wishes to study their habits, I think they ought to have a receptacle for themselves. They require a muddy bottom in which to move, and their habits are so distinct and different from those of everything else that they would need segregation from other occupants.

Water Beetles are another interesting branch of life under water, but the larger ones are too voracious to be kept any length of time. I introduced the large Horny-cased, Black Water-Beetles (species of

Dytiscus), into my aquarium several times, but I found that they were given to roam by night; rising to the surface they would unfold the gauzy wings encased under the horny covering and take flight from the water, and would be found next morning somewhere about the room if there was no outlet, or attention would be called to their escape, from their flying about the room like a small bat. I may state here that it is not unusual to find these insects on our sidewalks at the foot of an electric light pole, to which they seem attracted by the glare. There is another Beetle (a species of Acilius) with a bronze casing, which is an interesting object, from its rapid motion and apparent game of hide and seek from stone to stone.

A few years ago, a specimen of Menobranchus, that curious batrachian with gills and breathing tubes protruding therefrom, was offered to me by a boy who had caught it whilst fishing in our Rideau Canal. Repulsive looking as these creatures are, I would have liked to have studied his habits, but the reptile had been so bruised that it was too far gone to make use of, and I have never since had an opportunity of obtaining one. These animals are numerous in the waters of the Ottawa, and are not unfrequently taken by persons bait-fishing. I have seen specimens in one or two windows in town here, but the pent up waters of an aquarium seem scarcely healthy enough for them, as I noticed their place was very soon empty.

I believe that it remains an open question as to what senses are possessed by Fish, apart from that of sight. There is every reason to believe that they possess the faculty of smell, for it is no uncommon thing when fishing to notice their manner of swimming round and about the bait that is used, bringing their heads in contact with it, even pushing it, which to my mind is evidence of their using their olfactory organs to help them thereby to ascertain the quality of the bait. Again, many fishermen use oil of aniseed and other essences on their bait, which they affirm have the property of attracting fish, and I myself have many a time noticed a fish after dallying with the apparently tempting looking bait and moving it with its snout, finally turn away as if in disgust. Sir Humphry Davy says he thinks the principal use of nostrils in fish is to assist the propulsion of water through their gills, but he thinks also there are some nerves in these organs which give a sense of the qualities of

the water or of substances dissolved in, or diffused through it, similiar to our sense of smell.

With regard to hearing, it is very difficult to arrive at any conclusion, for what may be attributed in them to the sense of hearing is, in most cases, if not all, attributable to vibration. A sudden slam of the door, a clap of thunder, or a stamping on the floor will start into violent movement a fish lying perfectly still. I remember as a boy, standing by a fish pond, belonging to my father, (at which, by the way, before the days of aquaria, I picked up a good deal of knowledge on the habits of fish,) watching a shoal of roach sunning themselves on the surface. A dark cloud was speedily approaching, from which suddenly burst out a bright flash of lightning without in the least disconcerting the fish, but the instant the thunder sounded, they dissappeared with a dive downwards, scattering in all directions, and I am very much inclined to the opinion that it is vibration or percussion alone that supplies to them what with us we attribute to hearing. Those who had the pleasure of listening to Dr. Powell's recent lecture on "Sound", will remember that his explanation of hearing was, that it is to a great extent, based on sound vibrations conveyed through our organs of hearing, to the brain.

The vision of Fish is peculiarly acute. This is known to all fishermen, who, on a sunshiny day carefully avoid letting their shadow, or even the shadow of their rod fall upon the water. I have seen trout dart from cover to seize a bait floating midway down the stream and before they had reached it suddenly turn back, deterred from their object, either by a shadow cast on the water, or by a sight of a man on the bank. When a strange fish is put into an aquarium, he at first avoids showing himself in the open when an observer is by, but when he becomes accustomed to frequent visits he seems to have no objection to a stranger and swims about unconcernedly.

Fish exhibit an inquisitive turn of mind. If a new pebble is dropped into an aquarium they watch it from a distance, evidently with great curiosity. After a while they will swim around it at a respectable distance, till one of them, bolder than the others, makes a dash at it, immediately rejoining his fellows. Then one or two will swim round and round it, gradually approaching nearer to it, till finally they come in contact with it and, when satisfied that it is an object of no harm,

they then pass and repass it without any further apparent notice. Again when fresh plants are placed in an aquarium, they will swim in and out of them in every direction as if to satisfy themselves that they are really plants. Another curious thing that I have noticed is that, when fresh clean sand is deposited in one spot, they are very fond of balancing themselves over it in an almost perpendicular position, drawing in, by suction, a mouthful of it, which they convey to another spot and there deposit it, carrying on this operation till quite a quantity of the sand has been removed. This apparently curious habit I attribute to their propensity for preparing in their natural condition, a fitting repository for their spawn.

Whether Fish have taste or not, is I think past our comprehension but I am inclined to the idea that they have for we all know that when one bait fails to attract, another will often prove attractive, and the only reason one can naturally assign for that is that it is one more suited to their taste.

I should like to say something about the diseases to which Fish, pent up in acquaria seem subject, but although I have suffered from time to time by apparent epidemics, I am not able to pronounce any deductions from these losses. Only this winter I record the loss, one after another, of some 12 or 14 minnows which I obtained in October last, and which remained thoroughly strong and lively till the early part of January, when they commenced to sicken and die two or three a day till the whole disappeared. The water was regularly changed and they were properly fed, but some evident epidemic had taken possession of the shoal, as happens among the human race. The symptoms were an apparent enlargement of the head, with protrusion of the gills, and loss of color in the tail end of the body. The air bladder was evidently affected as they first kept on the surface, then lost their power of balancing themselves and within twenty-four hours, died. Two small minnows which have occupied the aquarium since the previous winter escaped, and are still alive.

I have noticed that in a majority of the deaths amongst my Goldfish, a peculiar fungus-like growth covers the gills, sometimes both, sometimes only one gill. This seems to come on in the last stage as it does not show when they first sicken. The early symptoms are violent restless-

ness, darting to and fro, even knocking their heads against the glass as if delirious; then loss of balance, the air bladder loses its power and the victim lies on its side with the tail bent downwards as if contracted by spasm, sometimes for two or three days. I have tried everything; change into warm water; change into very cold water, and I once tried the effects of bread crumbs soaked in wine (a remedy used in Germany to revive carp when transported for long distances) but all to no effect and I have now come to the conclusion that man cannot prescribe for the denizens of the water, the conditions of life being with them so utterly different from other animal life. The apparent attack of an epidemic amongst fish, which is known to take place in their natural habitats, is only part of that law of nature which subjects life of every description to attacks upon it.

Goldfish are naturally long lived and I have had specimens for ten years at a time, in perfect health. The limited space of an aquarium seems to dwarf their growth and size, as they certainly do not attain to their full proportions half as rapidly as in open waters. Catfish, when grown too large for their quarters, I have frequently taken to the nearest stream and they swim off as unconcerned as if always accustomed to liberty. An aquarium owner soon comes to regard its inmates like all other pets, and it may be said in their favour that they do not require anything like the attendance needed for other living pets. The loss of them is in certain cases more difficult to replace as you cannot always obtain, at the time, a specimen of the kind perhaps most wanted.

There has been great discussion as to the best aspect in which to place an Aquarium, and opinions are varied, but the conclusion I have arrived at is, that a northern aspect is desirable, a southern aspect is worst, and the western nearly as bad, as the sunlight falling on it materially assists the green coating caused by the growth of confervæ on the glass. The bottom, which ought to be, if possible, of slate, should be covered with small pebbles or fine gravel about an inch in depth, leaving a small patch for clean sand. Earth is not required, as water plants mostly grow floating. A few pretty stones or a little rock-work should be added with a part of the latter projecting above the water for the purposes already alluded to, especially if fish only are to be kept, as the latter delight in loitering in the friendly shade of a rock. Besides the pleasing appear-

ance afforded by water plants, the purpose of vegetation is to decompose the carbonic acid gas thrown off by animals, the carbon being absorbed into the substance of plants, and the oxygen set free for animal life. Even a growth of confervæ, unsightly as it is, is conducive to this. In a large Aquarium, a lily may be introduced, planted in a shell or small pot, hidden by weeds, but any plant that grows above the water is apt to aid any creeping animal to effect his escape. The whorled millfoil is one of the best plants for general use as it prefers still water, and I have succeeded, by inserting it late in the fall, in keeping it through the winter in sufficient quantity to answer all purposes. The goldfish and others of the Carp family, nibble at it, and it is probably as essential to their welfare as vegetables are to man. Valisneria is a clean, sightly plant and answers well as an air provider, besides being one of the few plants which afford a microscopic view of the circulation of the sap in the leaves.

There is a pleasure in connection with keeping an Aquarium, that to a lover of Nature, adds materially to the charm that attends the observation of its inmates, and that is the rambles made to collect various specimens of aquatic life. The keen lookout for water snails amongst the vegetable growth at the bottom or on the surface of some stagnant pool, and the eagerness to get the little scoop net over one, perhaps just out of reach, affords a pleasure, equal to, if not surpassing that felt by the sportsman beating the bush for game, or the fisherman eagerly watching his bait. The health-giving stroll along the bank of some tiny streamlet, on the lookout for minnows or larvae or any of the varied inmates of its waters, is far different from the monotonous constitutional, along the dusty highway, of the man who has never read a page out of Nature's book of life. The most important principle, perhaps, in life, is to have a pursuit, a useful one if possible, and at all events an innocent one. The scenes you enjoy, the contemplation to which they lead and the exercise attendant on specimen collecting are salutary to the body as they are to the mind. I always find a peculiar effect in such outings; they carry me back to early times and feelings, and create afresh the hopes and happiness of youthful days. Could we all recover anything like that freshness of mind possessed in youth, which, like the dew of morning covered all objects, and in which they

were more beautiful than even in midday sunshine, what would we not give? Rambles with an object go far to bring back the spring of early life.

In conclusion, I will quote the words of Sidney Hibbard, in an Article on the subject of this evening. He says:—

"The Aquarium introduces us to new scenes, hitherto hidden from our view, and makes us acquainted with the economy of creatures of whose very existence, many of us, not altogether unlearned in the history of the world, were previously ignorant. Their habits of feeding, moving, and burrowing, their battles, their change of form, the display of even a strange intelligence working its way by wonderful means to wonderful ends, impress the observer with the idea of the boundlessness, the variety, the adaptations and resources of a world brimming with life, in all manner of strange forms and developments. Here we see them equipped and armed for battle against each other, the strong destroying the weak, yet each contributing its part to the preservation of the whole, just as in all other departments of Nature, the great balance of perfection is sustained by incessant and intestine war; the struggles of opposing elements and powers and beings, all working mysteriously in a manner independent of isolated circumstances, Nature, the prodigal mother, setting no value upon individuals, but regarding tribes and races as paramount, the whole seeming confusion tending to one end; the revolution of the mighty wheel on which the creatures are painted as signs and in which ages are but minutes in a revolution which itself is eternity. In the midst of all, everlasting Wisdom watching, loving and sustaining; happy we to get some glimpses of His method of working through the medium of the strange creatures which leave the mysterious deep to throw a new radiance on our homes."

"THE BIRDS OF MONTREAL."

We are pleased to notice the promised publication of a new work on local ornithology under the above title. The author, Mr. Ernest D. Wintle, is an Associate Member of the American Ornithologists' Union, and has devoted ten years of special study to the bird life of his district, the results of which, with the records of previous observers, ought to furnish materials for a pretty full list as well as many interesting facts of life history. The author promises 251 species and sub-species. The work is to be descriptive and illustrated; and, treating of a district whose bird-life is in most respects similar to that of Ottawa, will no doubt furnish a convenient and useful hand-book to the students of Ornithology among the members of the Ottawa Field Naturalists' Club. It is with pleasure we add that Mr. Wintle himself is one of our members.—A. G. K.

———:o:———

EXPERIMENTAL FARMS.

The Annual Report of the Government Experimental Farms, recently issued, is of special interest to us as the Central Farm is located at Ottawa and its officers are active members of the Field-Naturalists' Club. The Reports consist in all of 289 pages. In the first 54 the Director, Prof. Saunders, concisely outlines the operations of the various farms, and the numerous experiments with wheat and other crops. Prof. Robertson, as Agriculturist, follows with 30 pages (the space allotted to each of the officers,) on experiments in dairying, feeding stock, fodder-crops, etc. The Horticulturist, Mr. Craig, figures some new native plums and grapes, and discusses the treatment of the fungous diseases affecting various fruits. The Chemist, Mr Shutt, gives very valuable analyses of various fodders and fertilizers, also of well-waters submitted by farmers, and the results of experiments with fungicides. The Entomologist and Botanist, Mr. Fletcher, treats carefully of the Hop-vine Borer, the Red Turnip Beetle, the Western Blister Beetle, the Birch Bucculatrix and of various parasites. He also treats of the Potatoe-rot and experiments for its prevention, and of Lawn and Fodder-Grasses. Mr. Gilbert, as Poultry Manager, details his experiments with various breeds, and the relative values of each. To the

foregoing very interesting and instructive reports are appended those of Messrs. Blair, Bedford, MacKay and Sharp, Superintendents of the respective Branch Farms at Nappan, N. S., Brandon, Man., Indian Head, Assa., and Agassiz, B. C.—Ed.

———:o:———

SIR RICHARD OWEN.

By the death of Sir Richard Owen, of the British Museum, not only has England lost one of its ablest scholars in the realms of science, but the world mourns a prince amongst naturalists. Of genial temperament and generous heart, ever ready and willing to assist in the furtherance of science and scientific research, Sir Richard earned for himself a reputation and a name which place him for ever among the fathers of vertebrate palaeontology. On "Fossil Mammalia" "Fossil Reptilia," "Dinosauria," "Cetacea" and numerous orders of vertebrata, he wrote works which will remain as monuments to his scholarly attainments and natural abilities. In the field of Canadian paleontological literature he has left interesting memoirs. The earliest of these was an elaborate paper, beautifully illustrated with large folding lithographic plates, published in the Quarterly Journal of the Geological Society of London. This dealt with the tracks or trails of marine animals in the Potsdam Formation of Canada. The specimens from Beauharnois and other localities which Sir William Logan placed in his hands were admirably described and now adorn the walls of the National Museum on Sussex street, with the names which Sir Richard gave them. These "foot prints" or 'ichnites' have been greatly admired and are much sought after by collectors and museums. His other papers were on the Reptiles of Eastern Canada. His descriptions are clear and the facts well defined and presented. Britain owes a great debt of gratitude to the departed naturalist and it is gratifying to see that at a meeting presided over by H. R. H. the Prince of Wales it was agreed to erect to his memory a monument to be placed in the spacious Entrance Hall of the British Museum. His Royal Highness paid a personal and high tribute to his deceased friend, and Lord Kelvin, (Sir Wm. Thomson), Thomas Huxley, Sir Wm. Flower, and many others spoke at length on the loss which science had sustained. H. M. Ami.

CONCHOLOGY.

I am very much pleased to be able to record an addition to the list of Ottawa land shells :

In May, 1890, while searching for specimens of *Pupa Armifera.* Say, near the railway bridge on the Hull side of the Ottawa River, I found a number of Pupæ, which at the time I considered to belong to some form of *pentodon.*

A few weeks ago I sent some of the shells to Dr. Sterki, and he has returned them marked *Pupa Holyingeri.*

Holyingeri and *pentodon* are very similar in size, color and arrangement of the "teeth," but differ in shape.

Pentodon tapers rapidly, the apical whorls being much narrower than the later ones.

Holyingeri is cylindrical, being of an almost uniform width through out.

Dr. Sterki tells me that he now considers that *pentodon* and its ally *curvidens* belong to the genus Pupa, and not to Vertigo, to which genus they were removed, I think on his authority, a few years ago.—GEO. W. TAYLOR, Victoria, B.C.

———:o:———

THE ROYAL SOCIETY OF CANADA.

The twelfth Annual Meeting of the above Society commenced on Tuesday, May 23rd. After routine business, the Reports from the associated Societies were read by the Delegates present. The Ottawa Field-Naturalists' Club was represented by Mr. Shutt. In the afternoon Dr. Kingsford read a paper *in memoriam*, on the late Sir Daniel Wilson, and one on the late Mr. Gisborne was read by Sir James Grant, after which there was a short but most enjoyable "At Home" given by Mr. Sanford Fleming, C.M.G. The Presidential Address by Dr. Bourinot, C.M.G., delivered in the Normal School at 8 p.m., was a masterly treatment of "Our Intellectual Strength and Weakness," and was listened to with the closest interest by all who were present. After the close of the lecture, Dr. Bourinot had a most charming "At Home" at his residence. On Wednesday, at the close of the morning session, the Fellows and

Delegates accompanied the President to the office of the Governor General, and presented to His Excellency a Farewell Address, to which he made a very able and sympathetic reply. The several sections met, but as it was the Queen's Birthday it was largely observed as a holiday. A sub-excursion of the O.F.N.C. was organized in the afternoon, for the benefit of Section IV, and a very pleasant visit was made to the woods near Hemlock Lake. The excursion was brief, to enable the participants to attend the delightful "At Home" given by Sir James and Lady Grant. On Thursday morning the sections completed the reading of papers and election of their officers, and in the afternoon the officers of the Society were elected as follows: Pres., Dr. Geo. Dawson, C.M.G.; Vice-Pres., Mr. Lemoine (Quebec); Sec., Dr. Bourinot, C.M G.; Treas., Dr. Selwyn, C.M.G. In Section IV, Geological and Biological Sciences, with which our interests are most closely allied, the officers are as follows: Pres., Prof. Macoun; Vice-Pres., Mr. Fletcher; Sec., Prof. Penhallow (Montreal). Fourteen papers were presented in this section. The Presidential Address, by Mr. Whiteaves, dealt with the Cretaceous rocks, which are largely developed in the North-West Territories and British Columbia, and which have yielded many interesting fossils, and minerals (such as coal) of much value. Mr. Whiteaves also read a paper on some new fossils from the Trenton limestone of Manitoba. Three other papers were presented by members of our Club, viz.: "The Geology of the Proposed Tunnel under the Northumberland Strait between New Brunswick and Prince Edward Island," Dr. Ells; "Sponges from the Pacific Coast of Canada," Mr. Lambe, and "Canadian Uroceridæ," Mr. Harrington, (present as Delegate from the Entomological Society of Ontario.)—Ed.

———:o:———

EXCURSION No. II, TO ROCKLAND.

It is proposed to hold the Second Excursion on June 17th, down the Ottawa to Rockland, Ont., a locality not yet visited by the Club, and which is highly recommended by the Excursion Committee. The Steamer Empress leaves the Queen's Wharf at 7.20 a.m. The price of tickets will be twenty-five cents.

FOOD AND ALIMENTATION.

L. COYTEUX PREVOST, M.D.

Read January 19th, 1893.

I most sincerely thank the officers of this Association for having conferred upon me the honour of reading a paper before the "Field Naturalist's Club," which possesses, among its members, names already illustrious.

I am happy to have the opportunity of contributing, as far as my feeble means permit, to the achievement of its aim, which is intellectual progress and advancement of science.

The physician, gentlemen, has another role to play on earth besides relieving or curing the evils that afflict our poor humanity. His duty, above all, must be to ward off diseases, in pointing out their causes and the best means of avoiding them.

These causes, alas! are manifold. They accompany man from the cradle to the tomb; they surround him at his birth, escort him all his life, being for him a perpetual threatening. But the most common, undoubtedly, are those which arise from some disorders of the digestive system.

It is by the digestive tube that life enters our body, and by the digestive tube also that enters death.

The intestines and the stomach can be considered as true laboratories where the most deadly poisons are incessantly produced. Nature, it is true, has provided us with powerful means of defence, but, some day, the foes will swarm and overcome the barriers opposed to them by physiological laws; disease then is constituted with all its sufferings and dangers.

These disorders, in the greatest majority of cases, are owing to ignorance or contempt of the laws of hygiene. It is, therefore, our duty to teach these laws and point out their importance.

In preparing this paper, gentlemen, I dreamt a moment of trying to dazzle you with the depth of my science. I had almost made up my mind to enter into transcendent considerations upon the physiological machinery of nutritive phenomena, penetrating the essence itself of the

composition of the tissues of human organism, endeavoring, in short, to create an imperishable monument worthy of being preserved in your archives, for the greatest glory of its author and the amazement of posterity. But - - - - I changed my mind; the scientist yielded to the hygienist's more practical obligations. I generously sacrifice, therefore, my ambitious and legitimate aspirations to simply try to be useful. I merely want to speak of alimentation, explaining, by the way, the phenomena of digestion and the rules which must preside to its normal working.

At first, gentleman, "*noblesse oblige.*" You have done me the honour of inviting me to lecture before you, I do not wish to remain in debt of courtesey: I invite you to dinner, here and now—But I must tell you that it is going to be a mere intellectual banquet, excellent means of avoiding indigestion and cramps in the stomach, you must confess.

Therefore. let us sit down to table; here is the bill of fare, the simple lecture of which will make your teeth water:

Bill of Fare.

Oysters in shell. Sauterne. Chablis.

SOUP:

Pea with crumbs. Sherry, Madeira.

FISH:

Fried Haddock. Fresh boiled Salmon.

ENTRÉES:

Chicken with truffles. Omelette with ham. Veal chops, tomato sauce. Chateau Lafitte.

ROAST:

Tenderloin steak. Roast beef. Mutton chops. Pork chops. Apple sauce. Ve. Clicquot.

RELEVÉS.

Black Duck. Patridge on toast. Chambertin.

VEGETABLES:

Potatoes a la Lyonnaise. Sweet corn.

FRUIT:

Pears, apples, oranges, grapes. Cheese, milk, porridge. Bread, butter coffee. Chartreuse.

Now, you must admire, gentlemen, the intelligence which presided at the confection of this truly royal bill of fare. It is the deed of a thorough "*gourmet*" and also of a friend who aims at your most perfect gastronomic welfare and of a physician who attended to all the requirements of hygiene.

"But," some of you will say, "your bill of fare contains indigestible ingredients : I never can taste such and such dish without experiencing the most violent indigestion." Let us explain ourselves.

There are no indigestible aliments, in the etymological sense of the word. All eatable substance is digested, more or less completely, if you like, and more or less rapidly, but it ends always by going through. The word "indigestible" is relative and if any one hears again in a rather disagreeable fashion, of what he has eaten, it is because this unfortunate individual is ill, or the privileged possessor of some peculiar idiosyncrasy which departs from the general rule.

But as I consider you all as I wish you to be, that is, perfectly sound and devoid of all caprices as far as your material organization is concerned, I am convinced of having found for the composition of this repast, the most agreeable and most nutritive aliments.

I said "agreeable" because we never do well but what we do with pleasure. In fact, let you sit down to table with an anxious and preoccupied mind, the stomach will pout for your paying such a little attention to the fulfilment of its functions and will punish you with indigestion, for having diverted, for the benefit of the brain, the concentration of energy which it has a right to claim when it is its turn.

A meal may be a regular work, but that work must be recreative and one cannot exaggerate the importance of dining in good company, and, besides, food must be artistically prepared in order to be palatable and stimulate the appetite. This accounts for my calling forth all the secrecies of culinary art to impart to my bill of fare the most irreproachable character.

At last, you must remark that the dishes are numerous and varied in order to supply the tissues of organism with the whole scale of the elements they want, for their intimate rebuilding. In fact, all aliments do not possess the same nutritive value and the same digestibility and the most nutritious are not always those we digest the most easily.

The aim of alimentation is to supply the animal economy with the principles it requires for the production of its energy, and with the primordial elements which directly or indirectly go to the repair or growth of tissues. The more an aliment contains of these elements in quality and quantity, the greater is its nutritive value.

In the admirable paper read before you last year, your worthy vice-president has made you acquainted with the principles which constitute the chemical composition of our body. Here they are briefly enumerated : Oxygen, hydrogen, nitrogen, carbon, sulphur, phosphorus, calcium, sodium, potassium, magnesium, chlorine, iron and fluorine.

These elements are found in various combinations with one another and form nitrogenous and non-nitrogenous compounds, carbo-hydrates and salts. They enter into the composition of all the tissues of the body. Since food is destined to the rebuilding of those tissues, it is evident that the ideal aliment, the perfect type, would be the one into the composition of which would enter in the meantime, all the chemical elements I have enumerated. But that ideal does not exist. There are, for example, nutrients which contain a considerable proportion of nitrogen, making them eminently proper to repair the tissues, but which, on the other hand, possess too small a quantity of carbo-hydrates to meet the wants required by respiration and the production of animal heat. Others, while they are rich in carbon and hydrogen, are very poor in azote. Hence, the necessity of a mixed alimentation to properly supply nutrition with all its requirements.

Formerly, primordial foods were divided in two classes, namely : the plastic and the respiratory aliments.

The plastic aliments were constituted by albuminous substances to which the name of quaternary was given, because they possessed a more or less great number of atoms of oxygen, hydrogen, carbon and nitrogen. They were found in almost all the tissues and fluids of the body, forming the base of muscular tissue, gelatine of the bones, fibrin of the blood, casein of the milk, albumen of the egg, gluten of the bread, etc., etc. Respiratory aliments, so called because they are used for respiration and are consumed in the body, formed the base of fats, sugars and feculents.

For this altogether theoretical division, we have nowadays substitute a

another more in harmony with the modern teachings of physiological chemistry, and we divide the primordial elements of food in two great classes, namely, the organic and inorganic principles. In the latter class enter the salts and water, and the organic compounds are considered under two divisions: nitrogenous and non-nitrogenous.

It is to the groups of organic substances that belong the albuminoids, the chief flesh formers of our body. Still, in spite of their great nutritive value, these albuminoids, taken separately cannot alone sustain animal life and in order that they should acquire a real nutritive value, it is necessary that they must be associated, not only to the other substances of other classes of food, but even to the different kinds of albuminoids themselves. For instance, an animal fed on albumen or on gelatine alone, would very soon succumb, as it has been demonstrated by Papin, Magendie and Hammond's experiments.

Now, gentlemen, the food which contains the greatest quantity of nutritious substances is not always the one that is digested the most easily; on the contrary, we shall see that certain very nutritious aliments are of a slow and painful digestion. We must acknowledge, besides that several causes bring modification to the precise rules that we might establish with regard to the digestibility of food; it would be difficult nowadays to classify alimentary substances into light and heavy aliments. One of the chief objections to this classification would be individual predisposition. In fact many would easily digest foods which would infallibly produce indigestion in others.

We must add to this: Habit, which permits the digestive tube to get accustomed to such and such aliment.

But there is a point upon which physicians and physiologists agree; it is the importance of the state of cohesion, and the looser is that cohesion the easier is the digestion. There exists, in the same substance, very wide differences, according to the different states in which that substance is presented, and nothing is more interesting than the results given by Schiff upon the digestibility of a given quantity of albumen taken in solid and compact mass or else administered finely divided.

Digestive value and nutritive value of food, are therefore two different things and we could say with Trousseau: "That the most

digestible food is that which supplies the body with the greatest quantity of reparative elements, requiring in the meantime the less possible exertion from the digestive functions."

Now that we have made these few restrictions, perhaps it would not be without interest to examine the experiments made to determine the digestibility of food and the conclusions arrived at on the subject.

Were the human body transparent, it would be an easy matter to follow the phases which alimentary bole undergoes from the moment it is formed in the mouth until it has given up all its nutritive particles in the depth of the digestive tract. If the Creator, instead of kneading our body with clay, had made our tissues in crystal, anybody would, at aglance, determine the precise moment that the mouthful of bread, the piece of meat cease to be what they were, to become absorbable paste. But the opaque substance, of which our integuments are formed, hide to our view the phenomena that take place within ourselves, and we have to resort to certain crafts in order to uncover the mysterious operations of the digestive system.

For instance, Spallauzani would introduce alimentary substances in tubes or hollowed balls which he would make his patients swallow. When these balls would be returned, either by vomiting or by a more indirect by-way, he would examine the modifications undergone by the substances contained inside.

But we may easily understand, that as these foreign bodies were rejected at indeterminate hours, it was difficult to obtain, by these experiments, anything like serious and reliable results.

Gosse, of Geneva, was endowed with a peculiar privilege: he could vomit whenever he wanted to. He availed himself of this talent to study the degree of digestibility of foods. He observed that the substances which he would most easily digest, that is, within one or two hours, were: Fresh boiled eggs, milk, lamb, veal, fresh fish, gruel, potatoes. He would take four to six hours to digest: pork, hard eggs, oysters and pastry—other substances would remain very long in the stomach such as: rind of pork, orange peels, mushrooms.

I must confess, gentlemen, that we cannot grant much credit to these experiments, deprived as they were of the accuracy exacted by a truly scientific method. But it is not so with regard to the knowledge

supplied by the phenomena observed in individuals bearing gastric fistula. Amongst these observations, there is one renowned above all, and cited everywhere, I mean the case of the Canadian, Alexis St. Martin, related by Dr. Beaumont. That celebrated patient received one day a shot wound in the pit of the stomach. Fortunately for the man and for science, the wound did not prove fatal, but the result was an opening which never closed and established a permanent communication between the outside and the stomach. Dr. Beaumont, during several years, studied the functions of digestion on this robust Canadian. He would make him swallow all kinds of food, watching their exit on a level with the artificial opening and could then calculate the time taken by alimentary substances to undergo a complete digestion in the stomach. He made us know the results of his experiments in a rather curious table of which I will give you a brief abstract. He observed that the following foods were completely digested at the end of the periods mentioned :

Rice	1 hour.	Fried oysters	3 hrs. 15 m.
Boiled milk	2 hours.	Roast beef	3 hours.
Roast turkey	2½ hours.	Beefsteak	3 "
Boiled turkey	2 hrs. 44 m.	Boiled beef	3½ "
Boiled goose	2½ hours.	Roast mutton	3 hrs. 15 m.
Suckling pig	2½ "	Roast veal	4 hours.
Fresh lamb	2½ "	Boiled fowl	4 "
Fresh eggs, boiled hard	3½ "	Roast duck	4 "
Fresh eggs, boiled soft	3 "	Roast pork	5 hrs. 15 m.
Fresh eggs, raw	2 "	Sausage	3 hrs. 20 m.
Fresh eggs, fried	3½ "	Bread	3 hrs. 30 m.
Salt codfish	2 "	Boiled potatoes	3 hrs. 30 m.
Salmon trout	1½ "	Fried potatoes	2 hrs. 30 m.
Oysters, raw	2 hrs. 55 m.	Boiled cabbage	4 hours.
Oyster soup	3½ hours.		

The experiments of Dr. Beaumont on his Canadian were made as well by Ch. Richet on a man named Marcellin upon whom Surgeon Verneuil performed a gastric fistula. I do not wish to enter into the details of this case which I mention only on account of a curious fact that happened with that man, Marcellin, a fact showing how hard it is, sometimes, to resist the impulse of a passion even in spite of the greatest obstacles to its gratification.

Marcellin, aged 17 years, swallowed by accident on the 4th February, 1876, a solution of caustic potash. The most intense inflammation followed, and brought on the obliteration of œsophagus. He could therefore no more be fed in any manner whatever. Verneuil saved his life, in making in the pit of the stomach an opening through which they then introduced the solid and liquid foods necessary to his subsistence.

This poor man at last died of consumption brought on, do you know by what cause? He was deprived of œsophagus, and consequently could not drink, but this did not prevent his becoming a drunkard: he would introduce, through his fistula, the alcoholic beverages which took him to his grave.

But let us return to our bill of fare, gentlemen, I want to say a few words of the ingredients of which it is composed. To facilitate this description allow me to somewhat alter the order of their disposition. Let us divide them all, at first, in two classes: the solids and the liquids. Amongst the solids we shall examine meat and vegetables, sprinkling afterwards this dry subject with milk, broth and wine. But enough of words, time has come to act—Waiter—bring on the oysters.

Oysters, gentlemen, contain carbon, nitrogen, salts and water and constitute a very useful aliment, easily digested, provided that they are eaten raw. Fried or in soup they are a great deal more indigestible. William Roberts has tried to give the explanation of this fact. The small yellowish mass which is called the "eye" and which is the most palatable part of the oyster, is the liver—which is but an agglomeration of glycogruic substance. That liver during life contains, besides a digestive ferment, the hepatic diastasis. By the mere fact of mastication, these two substances are brought in contact, so that the glycogruic is immediately digested by its own diastasis.

Raw oysters therefore digest themselves without any other intervention. This advantage is annulled by cooking, because the heat, even moderate, destroys the ferment associated with the glycogruic substance. According to Roberts, alcohol has the same inconveniences, so that we should not drink any wine while eating oysters and be satisfied with milk, which did not prevent my ordering Sauterne to sprinkle these delicious mollusks. It is the fashion, do you see. In France and in Canada amongst those who eat "*à la Française*" white wines are indispensable with oysters.

(Continued on page 69.)

Report of the Ornithological Branch for the Year 1892.

To the Council of the Ottawa Field Naturalists' Club:

Ladies and Gentlemen,—The Leaders in Ornithology in presenting their report for the year 1892 have to regret that in the section of the work under their oversight there has not been so much activity shown as in some former years. But four observers have reported, and the total number of species recorded reached only 118. None of these were new to the list but a number of previously doubtful records have been corroborated.

The department of "Editorial Notes" in the Naturalist has contained from month to month items in connection with bird-life deemed of sufficient interest for publication, and these need not be recounted here. In addition to these the following records are worthy of notice:—

Field sparrow, *Spizella pusilla*, 2nd July, about 4 miles south-east of King's Mountain; in full song and evidently breeding, though nest not found (F. A. Saunders).

Tree sparrow, *S. monticola*, 8th January, on the "mine road" north of Hull (F. A. Saunders). This species, common enough in the season of migration has never before been known to winter with us; indeed there is said to be but one previous record of its appearance during winter anywhere north of latitude 44° (Cooke's Bird Migration Miss. Valley).

Wood thrush, *Turdus mustelinus*, 26th May, near McKay's Lake (A. G. Kingston), and 29th June on King's Mountain (F. A. Saunders).

Blue-grey Gnatcatcher, *Polioptila cærulea*. Previous to this year there has been but one record of this little bird for this locality—about 12 years ago. This year it is reported twice, once on 26th May by Mr. Kingston and again on 10th July by Miss Gertrude Harmer. No specimen was secured, however, and at most the visits of this resident of the Alleghanian district to our neighborhood must be regarded as merely casual.

Common tern, *Sterna hirundo*, 11th August near Brockville (Miss Harmer). Though somewhat beyond our limits, the appearance of a flock of these birds at a point so far from the sea and the great lakes is worthy of note.

A. G. Kingston,
John Macoun,
Wm. A. D. Lees,
} *Leaders.*

ORNITHOLOGY.

EDITED BY A. G. KINGSTON.

Winter visitants.—The winter of 1892-3 was marked by a great scarcity of bird life in the neighbourhood of Ottawa. Irregular and uncertain though the movements of the winter birds always are, it is seldom that the winter season passes without the appearance of some one or more species in considerable numbers. Probably these visits depend more upon food supply than upon the mildness or severity of the temperature; but in both of these respects our district showed itself last winter a very inhospitable quarter for the birds. The weather here, as throughout the whole of North America was marked by unusual and almost unbroken cold; and as the rowan-berry crop of 1892 had been a total failure, with tamarac cones and cedar seeds much below the average, the "visible supply of breadstuffs" for the feathered population must have been alarmingly short.

Of Crossbills, Redpolls and Pine Siskins there have been no reports whatever. The Purple Finch which is usually fairly well represented throughout the winter in suitable localities did not put in an appearance until the 4th May, and the Goldfinch came seven days later, after having donned his summer plumage elsewhere. A few straggling Pine Grosbeaks, (one 25th January), and an occasional small flock of Snowflakes (one 11th February) were the only representatives of these frequently abundant species.

It is often asserted, however, by ornithologists that in their favorite study, at all seasons and in every locality, the diligent student is sure of some reward, and that there is much truth in this claim the following further records will slow:

Robin.—One seen 18th January on Wellington Street, by Prof. Macoun. Mr. Fletcher also reports one, a fine male, in Archville on 12th March, and another has been reported as appearing several times in New Edinburgh. It is possible that all these records refer to the same individual—perhaps a wounded bird that was unable to undertake the hardships of migration, and was yet so fortunate as to find food throughout the severe weather.

Prairie Horned Lark.—(*O. alpestris praticola*). On 27th February three or four were seen along the roads on the Experimental Farm.

The next day several appeared, and during the milder weather of March they were abundant.

Blue Jay.—15th February.

Canada Jay.—(*Perisoreus Canadensis*). 15th February (A. G. K.) about 25 miles up the Gatineau.

Chickadee.—18th February.

Crow.—As for this sable scavenger, he is always to be found where there is work for him to do; and the enterprising local reporter who at any time during the long winter is in want of material for an item headed "Harbingers of spring" has only to visit the neighbourhood of one of the slaughter-houses beyond the Rideau river, in order to be favored with a sight of, and if the weather is mild, perhaps even a "caw" from one or all of the proverbial black three.

House Sparrow.—It has been a matter of general remark that the "English Sparrow" population suffered heavily during the past winter. Apparently their numbers on the opening of spring did not exceed one third of what they had been when the first snow fell. It is worthy of record that the first to disappear under the severe weather were the albino specimens referred to in these notes in October last. Not a single case of albinism has been noticed since 1st January. The first brood of young sparrows, however, is now (15 June) on the wing, and as each pair of old birds raises three or four families in a season there is no doubt that they will have replenished the earth ere October returns again.

Spring Migration.—This is not the place to publish a list of spring arrivals. Suffice it to say that although the opening of vegetation this year was unusually late, the birds do not seem to have delayed their movements much on that account. The Robins and Song Sparrows appeared in small numbers on the 24th March, then retired before a short spell of cold weather, and returned again in force on the 29th, when they were accompanied by the Blue-birds. The Bronzed Grackle arrived on 2nd April and the Redwing Blackbird on the 3rd. Turning to the Swallows, an unusually early appearance of the Tree Swallow (*Tachycineta bicolor*) was noted on 1st April by Mr. W. A. D. Lees and several other observers. No other tree swallow was reported until 22nd April. Purple Martin 2nd May; Barn Swallow 5th May.

EXCURSIONS Nos. I AND II.

The first excursion for the present season was held on May 27th and proved very successful, there being three hundred members and their friends present. The point selected was the village of Wakefield, or La Pêche, and the Gatineau river, at the height of its spring flood, afforded some fine views as the train skirted its rapids and falls. The morning was bright and clear but unfortunately before noon it clouded up and showers and light rains continued during the afternoon. In spite of the moisture, however, many of the collectors continued their explorations and some good botanical collections were made. Two prizes which had been offered by the Council were awarded to Miss Blaikie and Mr. McCurdy for their very creditable collections. The adjacent school-house gave shelter to many during the day, and probably had within its walls a more learned and scientific body than on any previous occasion. The excursion cars also formed a rallying point, and in them were delivered the usual interesting addresses by Dr. Ells and Messrs Ferrier, Craig and Cowley, the leaders of the Geological and Botanical sections. Ed.

The second Excursion was held on Saturday, the 18th June, and those who attended spent a delightful day. After a pleasant sail down the Ottawa on the fine Str. Empress, the party on reaching Rockland was met by a steam launch, on which a short cruise was made among the adjacent islands and bays. Then the quarries were visited, from which is being excavated the stone for the Soulanges canal, and which furnish a very fine, massive limestone. The geological exposures of this neighbourhood are exceedingly interesting, several formations being visible, and good series of fossils were obtained from the various strata, of which notes will appear later. The members were then conveyed in carriages to Mr. Edwards's splendid farm, and they were much interested in the fine stock exhibited. The neighbouring fields and woods were found to be most inviting; strawberries were abundant, and various flowers in profusion. During the afternoon the mills were inspected and the river banks examined. The thanks of the Club are due to Mr. Edwards, M.P., for his kind invitation to visit his extensive mills and farms, and for placing his launch and carriages at the service of the members. Also to Mr. Archie Stewart, who has the contract for

the canal for which the stone is being taken out, and who very generously provided a bountiful supply of fruits and refreshments. Mr Angus McLean kindly escorted the party, and Mr. Gardner, the Superintendent of the quarries, was most obliging in describing the operations.

SUB-EXCURSIONS.

The continued rains and unpleasant weather of the early spring months rendered it often impossible to hold the regular Saturday afternoon outing, but members took advantage of any propitious days. A very pleasant visit was made on May 20th, to the Beaver Meadow, Hull, and many interesting plants and insects were obtained. Among the more conspicuous plants which were in charming profusion, and of which several fine nosegays were gathered, may be mentioned Trilliums, (white and red) Uvularia, Dicentra (Squirrell-corn, very abundant,) Dentaria and Violets of several kinds. A nice addition to the Ottawa List of Coleoptera was made by Master T. MacLaughlin who captured a fine male of *Dicælus teter*, Bon. Among the Carabidæ captured may also be noted *Calosoma frigidum*, Kirby and *Harpalus vulpeculus*, Say.

The Mer Bleue, a favorite resort of our botanists, was visited on June 3rd and the masses of bloom which decked the surface of the "Big Swamp" gave it a most attractive appearance. Among the more showy plants growing around the borders or scattered among the prevailing *Cassandra calyculata* (Leather-leaf) mention may be made of *Menyanthes trifoliata* (Buck bean), *Kalmia glauca* (Sheep Laurel), *Pirus arbutifolia* (Choke-berry,) *Andromeda polifolia*, with its lovely delicate blossoms, *Vaccineum corymbosum* (Swamp-Blueberry) and three species of Eriophorum (Cotton Rushes) one of them (*Eriophorum russeolum*) being new to our local flora. Insects were not abundant but several interesting species were taken, including two examples of a previously unrecorded butterfly, (*Thecla angustus.*)

Casselman which has always proved a rich collecting ground was visited on June 10th, by a strong botanical contingent among whom was Prof. Fowler, *F.R.S.C.*, of Queen's University, Kingston. As usual the party was well rewarded by the occurrence of many fine plants including the following additions to the local lists :—*Polygonatum giganteum*, *Polygonum erectum* and *Phragmites communis*. Some of the party went on three or four miles, where the land becomes swampy as

at the Mer Bleue and offers almost the same plants. *Cypripedium parviflorum* was abundant, but the flowers were mostly faded, and *Lonicera oblongifolia* occurred in great profusion Those who remained at the river obtained among other fine plants *Cypripedium acaule* and *Orchis spectabilis.* Insects as on the previous Saturday seemed unusually scarce, but towards evening the Black-flies and Mosquitoes were sufficiently abundant.

Some members, lovers of botany and the muses, made a trip to North Wakefield on the 18th June, for the purpose of visiting a swamp discovered last autumn to contain great numbers of the Showy Ladies-slipper (*Cypripedium spectabile*). The display of these lovely plants was even more extensive than had been expected, and charmed and delighted the party, who returned laden with spoil.

VALUABLE EXPERIMENTS.

Mr. Frank T. Shutt, M.A., chief chemist of the Dominion experimental farms, read an interesting paper at the recent meeting of the Royal Society, descriptive of a preliminary series of experiments with the object of ameliorating certain alkaline soils in Manitoba and the North-west territories. He opened by drawing attention to the occurrence of the "alkali patches" in many parts of these provinces. These patches or barren spots, which vary greatly in extent, always occupied low places or natural depressions in the soil. In dry weather they were covered with a white incrustation, but when moist the affected soil was usually black. Apart from the presence of the injurious chemical, analysis had shown these alkali soils to possess all the elements of fertility. Complete analyses of the three samples of soils—supposed to be typical of these spots—were given. They showed that in addition to comparatively small quantities of salts of soda, a considerable amount of magnesium sulphate (Epsom salts) was present. To get rid of the soda salts, thorough drainage was instanced as the most effective means. The soda salts were usually either carbonate or sulphate—the latter was not as injurious as the former. The use of an application of gypsum had proved efficacious to soils impregnated with carbonate—which was thereby converted into the less injurious form of sulphate. To ascertain the effect of magnesium sulphate on vegetation, Mr. Shutt

had carried out a series of pot experiments with corn, wheat and peas. The results showed clearly that this chemical proved most disastrous to vegetation. He therefore inferred that in many instances the sterile character of the soil was due in part, and in some instances, perhaps, wholly to the presence of magnesium sulphate (Epsom salts).

Elaborate pot experiments were then instituted with wheat, peas and corn, to find out if the addition of (a) carbonate of lime and (b) lime to a soil containing magnesium sulphate would render this substance non-injurious and allow the plants to come to maturity. While the carbonate of lime proved beneficial, lime proved much more so. During the course of the experiments careful records were made at intervals of a week, and mathematical plottings of these were shown to the meeting. Photographs, also illustrating the growth of the plants in the treated and untreated soil, were exhibited. The chemistry underlying the changes induced in the alkaline soils by these remedial agents was explained. The value of lime in improving soils impregnated with magnesium sulphate was fully established by the scientific data here brought forward.—*Toronto Empire.*

(In our brief report of the proceedings of the Royal Society we were able only to refer to the papers read in section IV, and we therefore reproduce with much pleasure this abstract of the paper presented to Section III by our Delegate. Ed.)

FLORA OTTAWAENSIS.

By James Fletcher, *F.R.S.C.*

The annotated list of the Flora of the Ottawa district which was begun three years ago in the *Ottawa Naturalist* and the completion of which was unavoidably delayed, first of all by illness of the writer and afterwards by press of official work, will be completed in this volume of the *Naturalist.* Members will please observe that the sheets issued with each number are unattached and that the pagination begins at page No. 78 in continuation of the part issued with the May number 1890. Some members will receive the forthcoming sheets who were not subscribers to the Club when the former parts were issued. They may perhaps be able, with a little enquiry, to procure the first 77 pages from some members not specially interested in Botany.

ENTOMOLOGY

Edited by JAMES ELETCHER, F.R.S.C.

Meloe niger, Kirby. The Black Oil-beetle makes its appearance in the first sunny days of spring, while the snow still lingers in shady corners, and may often be seen crawling on the city sidewalks, apparently having issued from the adjacent lawns. There are certain sections of sidewalk upon which they may then be captured daily. This beetle is easily recognized by its abbreviated elytra and absence of wings; its colour is a greenish black. W. H. H.

Toxotus vittiger, Rand. A specimen of this pretty longicorn was beaten from Oak at Casselman, on June 26th, 1883, and on the 10th of present June, Mr. Fletcher secured a dozen specimens flying about, or on the flowers of *Osmorrhiza longistylis*, in the same locality. W.H.H.

Donacia pubescnes, Lec. This distinct species appears to be local, and to appear early in the season. In 1878, Mr. Fletcher took six examples near Billings Bridge, and it was not collected again until this June, when it was specially looked for in the same locality, and several specimens were taken by sweeping bullrushes (*Typha*) and grasses along the banks of the Rideau river. *D. jucunda* and *D. subtilis* were abundant, and a few *D. proxima*, which is more abundant later in the season, and frequents the lily pads. W. H. H.

Sphinx Kalmiæ. I have received from our Canadian veteran botanist, Mrs. C. P. Traill, of Lakefield, Ont., now in the 93rd year of her age, a fine specimen of the Lilac Sphinx, *Sphinx Kalmiæ.* Mrs. Traill also writes a long and interesting letter on the Holy Grass (Indian Sweet Hay,) *Hierochloa borealis.* The bed of this grass on the Experimental Farm is now a mat of flowering stems, and well worthy of a visit from our botanists. J. F.

EXCURSION No. III, TO BORTHWICK'S SPRINGS.

A Saturday afternoon Excursion will be held on the 8th July, to Borthwick's Springs, by special invitation of Mr. Borthwick. The Club vans will leave the Post Office at 2 p.m. *sharp.* The price of tickets has not been definitely fixed, but will probably be 25 cents.

FOOD AND ALIMENTATION.

BY L. COTEUX PREVOST, M.D.

(Continued from page 60.)

Personally, I do not know whether these lovely drinks really have a pernicious influence upon the "*eye*" of *oysters*, but all I can say, is that everytime I perchance witnessed any indigestion brought on by this association of wines and oysters, it was that the quantity of liquids ingulfed had been totally out of proportion with the laws of sobriety, required by any reasonable stomach.

Mussels (*Mytilus edulis*) are not generally known in Canada, at least in restaurants. In France they delight those who are really fond of delicious eatables. But if ever your good fate takes you to Paris, beware of what they call there : " Moules a la Marinière."

If you should forget this wise advise you might pay dearly the satisfaction of your legitimate curiosity. I saw some of my friends twisted by the most excruciating colics, accompanied with an abundant rash of urticaria, owing to their having eaten but a few mussels. In Ireland, these shells seem to be less poisonous. In 1874, I had just arrived in Dublin, where I entered the Rotunda Hospital as resident pupil. One evening towards 10 or 11 o'clock, I was leaning on the window sill of my room thinking of my absent native land, when I heard a strolling dealer bawling out his goods, contained in a basket suspended to his arm. Impossible to understand what he was offering from door to door. " What is he saying ?" I asked my room companion. " This is the Cockle dealer " he answered. These Cockles are mussels which delight the people in Dublin. Every night they constitute the family revel, every body eats them with a glass of sherry wine and I never heard that they had the reputation of being hard to digest.

While we are under water, gentlemen, we must not get out without saying a word about fish.

As far as digestibility is concerned, fishes may be divided in 3 groups : those with white flesh such as trout, haddock, etc., they are the most digestible, but the least nutritious ; those with yellow flesh, such as salmon are of a slower digestion but contain more nutritious principles ; thirdly those with fat flesh such as eel, very nutritious but hard to

digest. It has been contended that exclusive fish alimentation might have some inconvenience, namely that of producing cutaneous diseases —do not believe it; still it is absolutely necessary that fish should be eaten perfectly fresh. Of all animals fish is the one which most quickly putrifies. Twenty-four hours after death, there takes place in their tissues a develcpment of enormous quantities of toxic substances the adsorption of which may give rise to the most serious disorders in the digestive tube.

I have very little to say concerning fowl and game. Game, however, offers special conditions to which Gubler has called our attention. You are aware that some kinds of game are very often brought on the table in a state of incipient decomposition. This condition is a sort of fermentation which has a certain analogy with the fermentation that takes place in the stomach, and owing to this fact, according to Gubler, assists the work of digestion. But that putrification must not be too far advanced or else it will introduce in the system toxic alkaloids, as will fish, and these cadaveric substances may then cause fatal results. Bronardel, for instance, has cited cases of people dying after having eaten tainted game pie. At any rate, as far as I am concerned, I vote for fresh things—and the duck as well as the partridge that I ordered on our bill of fare are of an irreproachable freshness. Taste them without fear and sprinkled with a glass of good Chambertin I promise you ineffable pleasure. For it is with game that Burgundy wine must be drunk.

With regard to fowl, let us speak of eggs, that precious and complete food above all others. I say complete food, that is containing associated all the substances necessary to the nutrition of our tissues. Eggs contain nitrogenous compounds, such as albumen (vitelline); fatty substances (margarine, oleine) and salts. Should we compare the quantity of nitrogen, carbon, fat and water contained in eggs and milk, we shall find that an egg weighing for instance 50 grammes is equivalent to 100 grammes of cow's milk.

Eggs are generally very well borne by the stomach, they are easily digested. But we must remark the considerable influence of cooking upon this kind of food. A fresh egg, boiled only a few minutes is rpaidly peptonized, being completely digested within 1½ or 2 hours, as

showed by Dr. Beaumont, whereas a hard egg has hardly undergone this process at the end of three hours and a half. Must I add that it is of the greatest importance that eggs should be perfectly fresh? For choice, look through the egg, fresh eggs are more transparent in the centre, old ones at the top. Dissolve one ounce of salt in ten of water, good eggs sink, indifferent swim, bad eggs will float even in pure water.

Amongst the preparations having eggs for base I want to particularly point out what is called "American Cream." It consists in beating two yolks together, in adding some powdered sugar and then flavouring with rum or sherry. This mixture is very easily digested and exceedingly nutritious. You may conceive how precious it is for sick persons as well as for weak stomachs which require a strengthening food under a small volume. This mixture constitutes also the first meal recommended by Coats in training pugilists. I regret, gentlemen, that time and the limits of this paper do not permit my saying a few words upon this marvellous method employed by sportsmen in their training for competitions.

I heard, in Paris, Professor Bouchardat speak most emphatically of the excellence of alimentary diet, united to exercise, used by these athletes to obtain that perfect ponderation of muscular powers which permit their going everywhere and disputing prizes in races, on foot or horseback, rowing, fencing and boxing. He contended that these trainers knew and applied better than anybody the laws of hygiene the observance of which is the *sine quâ non* condition of perfect health.

Here we are now, gentlemen, at the solid joints of our bill of fare, that is the meats of mammifers, such as beef, mutton, pork and veal. Those are the aliments to which is entrusted the repairing of our tissues, owing to the large proportion of azote they contain. According to Beaumont, the most digestible meat is that of mutton, then beef and lastly pork. But the age of the animal bears a considerable influence upon digestibility: for example veal is more digestible than beef, lamb more than mutton. I mean, of course, the digestibility and not the nutritive value of these nutrients, or else the order would have to be changed. In fact adult animals are those that give the most nutritious meats. According to Payen, the composition of roast beef cut up in slices three centimeters thick, is as following:

Water	69.89	Fatty substances	5.19
Albuminates	22.93	Mineral matters.....	1.05

Muscular flesh contains, besides free lactic acid and sulphur united to the nitrogenous organic compounds, mineral matters constituted by salts formed out of the bases, potash, soda, lime and magnesia united to the phosphoric, lactic and muriatic acids.

Roast meat is far preferable to boiled, not only on account of the preservation of the nutritive qualities of the meat, but also, owing to the development during cooking of certain odoriferous nitrogenous principles such as osmazone, which render these meats palatable.

Since I mentioned boiled meat, it is impossible not to say something of broth, a preparation which has given rise to rather interesting discussions; certain physicians praising, others denying its nutritive properties. Schiff's experiments, however, permit our deciding this question. This physiologist has demonstrated that the secretion of gastric juice is not indefinite and that it suffices to give a dog, with an empty stomach, a considerable quantity of meat to see, under the influence of this exaggerated alimentary mass, the secretion of gastric juice dry up. Food, then, acts as a real foreign body and is consequently thrown up. This state is known under the name of indigestion *a crapulà*. But, and here is a very interesting remark of Schiff, it suffices to introduce into the circulation certain substances to immediately cause the gastric juice to be secreted anew, at the surface of the gastric mucous membrane. Among these substances, dextrin appears to possess this property to the utmost, and on animals thus crammed with food and in whose stomach gastric juice is no more secreted, it suffices to introduce a dextrin solution, either in a vein or in the rectum, to promote the immediate digestion of that excess of alimentation. To those peculiar substances, Schiff has given the name of "peptogenes," that is, substances promoting the secretion of gastric juice and therefore the conversion of albuminoids into peptones. Well, gentlemen, broth precisely contains almost exclusively these peptogenous compounds, and the secular tradition of eating soup before meals, receives in the discoveries of modern physiology a resplendent confirmation. Not very nutritious by itself, since it contains a very feeble

quantity of organic matter, hardly 16 p. 1000, and an enormous proportion of water, 985 p. 1000, broth helps the digestion of food in rapidly penetrating into the circulation and bringing back the materials necessary to the secretion of gastric juice.

Therefore, if I am allowed to offer you here a practical advice as a conclusion of what I have just said, I will give you the following : If ever it is your misfortune to suffer some day from bad digestion, before exposing yourselves to be stuffed up by all the drugs invented of late to cure dyspepsia, try a cup of good broth before or after meals ; others have often derived much benefit from this practice and the experiment is inoffensive and certainly worth trying.

In spite of the nutritive value of the aliments we have just examined, they cannot exclusively compose the food destined to repair the waste of the organism. If meats possess the advantage of containing a large proportion of nitrogen (albuminoids) on the other hand, they are deprived of starch and carbohydrates which we are compelled to ask of the vegetable foods, characterized by low albuminoids and high carbo-hydrates. The vegetable kingdom will supply us with flour, bread, vegetables and fruits, and if you want to form an idea of the nutritive value of these nutrients, allow me to place before you the composition of some of them. For example, wheat flour contains :

Water	14.0	per cent.
Fatty Matters	1.2	"
Nitrogenous substance insoluble in water (gluten)	12.8	"
" " soluble in water (albumen)	1.8	"
Non-Nitrogenous substances (dextrin)	7.2	"
Starch	59.7	"
Cellulose	1.7	"
Salts	1.6	"

Oatmeal, out of which porridge is made, contains 63 parts of starch, and 12 per cent. of nitrogenous substance, that is, almost as much as muscular flesh of animals. Peas contain 22 per cent. of proteic compounds, and 53 per cent. of starch.

Among usual alimentary compounds, the most important is without doubt bread. The whitest is the most nutritious, and the crust

has a more considerable nutritive value than the pith, as you may judge by the following table :

Water	Crust	=	17.15	pith	= 44.45
Insoluble nitrogenous subst	"	=	7.30	"	= 0.92
Soluble " "	"	=	5.70	"	= 0.75
Soluble non-nitrogeous "	"	=	3.88	"	= 3.79
Starch	"	=	62.58	"	= 43.55
Fatty substances	"	=	1.18	"	= 0.70
Salts	"	=	1.21	"	= 0.84

Potatoes for 100 parts contain 2 parts of nitrogenous substances and 21 of carbo-hydrates. Rice has 5 parts of albuminoids and 83 carbo-hydrates.

Among the fats I shall mention butter, which contains 91 per cent. of fatty substances ; cheese, which contains 24 per cent. of fat, besides 33 per cent of nitrogenous substances.

My intention is not to dwell at any length on fruits, wishing only to remind you that they introduce into our economy salts of sodium and potassium, useful to nutrition, and since I am speaking of salts, I wish to point out the importance of common salt, and of all mineral matters in alimentation. These substances are just as necessary as the reparative and respiratory aliments. Forster has given pigeons, mice and dogs a food very poor in mineral matters, and he has observed that mice lived 21 to 30 days only, pigeons 13 to 29 days, and dogs 26 to 36 days.

According to Barbier, man must take daily within 24 hours, 12 to 20 grammes of salts, either pure or mingled with food. When for one reason or another man cannot take the necessary quantity of salts, the same accident happens as with other animals, he falls into a state of weakness and languor, offering, after a while, all the symptoms of anemia, owing to the dimunition of albumen and blood corpuscles.

With regard to the importance of salts in alimentation, I cannot resist the desire of saying a few words about " scurvy," a disease I particularly studied within the last few years. This disease, which formerly was the terror of navigators, exists nowhere, so to speak, except in Canada, where it pretty severely treats, almost every year, the raftsmen who spend the winter in the midst of our forests. You have all heard of that disease called " blackleg " by our " voyageurs," which 20

or 25 years ago was a regular plague, as it would strike down 25 or 30 men in a shanty composed of 40 individuals.

Nowadays, we meet almost every spring with a certain number of cases, but it has become a good deal less common, and shows a tendency to disappear. What is the cause of this consoling diminution? Formerly, our forests, so rich in wood, were poor in settlers. Food intended for the shantymen was exclusively bought in cities, and consisted of salt pork and beans. As clearings allowed settlers to establish themselves, farms were created on almost every limit. On these farms, vegetables are being cultivated, especially potatoes, with which the shantymen can easily be supplied for their alimentation. Those who are to-day the victims of scurvy are those who winter in the remotest parts, away from established settlements. Do you know to what treatment we subject these unfortunate patients suffering from black-leg? We actually stuff them with potatoes and other fresh vegetables, and in a few weeks they are perfectly cured.

The general opinion to-day is that scurvy proceeds from the privation of vegetables, and that these vegetables posess anti-scorbutic properties, owing to the salts of potassium they contain. Here it is curious enough to remark, that these salts of potassium exist in vegetables in a special chemical state which causes all their efficacy. In fact, mutton contains by ounce 0.846 of salts of potash, and besides, you are aware that the pork destined to shantymen is generally salted with nitrate of potash. Still, in spite of this alimentation, scurvy soon appears. What can be the reason of this apparent contradiction?

Here it is: Salts of potash in food, as all the mineral salts, must be introduced on determinate chemical forms in order that these principles may be fixed in sufficient quantity by the functions of assimilation. Thus, phosphate, nitrate of potash, and chloride of potassium traverse the whole system, and are expelled almost entire through the excretions and secretions of the body. These salts are stable. On the contrary, in a combination of potassium with an organic acid, such as the citrates, nitrates and tartrates, the organic acid is decomposed, giving up carbonic acid, and the economy finding itself in posession of a salt of little stability, nutrition takes up and utilizes its base. Fresh green vegetables contain potash combined with organic acids, which

are thus decomposed. Meats, on the contrary, contain phosphate or nitrate of potash, which are are stable salts. These facts explain why mutton, although containing a certain amount of potash, is unable to prevent scurvy, whereas lime-juice, for instance, with an equal quantity of this base, but in the state of super-citrate, acts as a true specific in the prevention of this disease.

One word now, with your permission, about milk and wines; because however succulent may be all the dishes we have spoken of so far, it seems to me that the subject is rather dry, it wants liquids. Milk, like eggs, is what we call a complete food. It contains albuminous substances; casein and lacto-protein and albumen; fatty matter the butter; a sugared substance, lactose; saline principles, phosphates, and chlorides, and lastly water. Its digestion is most rapid, it is the food most quickly absorbed, requiring in the mean time the least digestive work possible. We must add that it is the nitrogenous compound which contains the smallest quantity of toxic alkaloids.

Its nutritive value is certain. Unique aliment of the child during the first months that follow its birth, milk supplies it with all the materials necessary for a rapid growth. Even with adults, milk employed alone suffices for their alimentation, and we often observe that certain patients fed on strict milky diet obtain by it a sufficient nutrition. Lastly, it is an admirable therapeutic agent in some diseases of the stomach. In ulceration of that organ, for instance, milk given exclusive of all other food and even without any drugs whatever, acts in a truly specific manner

I have, in the course of this paper repeatedly spoken of toxic alkaloids, products formed during digestion in the stomach. I think it proper to dwell a moment upon these curious phenomena which, although within the province of pathology, still have a proximate relation to alimentation and the functions of the digestive tube. You have all heard of microbes, and bacteria; micro-organisms, the discovery of which has had such an influence upon medical doctrines in general and the theory of infectious diseases in particular.

It is to Pasteur that we owe the wonderful discovery of the role played in our planet by a whole world of infinitely small beings which, everywhere invisible and present, constitute by the manifestation of their

incessant activity, one of the greatest forces which govern matter and determine its transformations. In applying all the faculties of his deeply investigating mind to the study of these infinitely small beings, much more powerful than the antediluvian monsters and often much more dangerous, M. Pasteur has succeeded in watching them at work in catching the play of their functions and in establishing their relations to the phenomena of fermentation of which they are necessary agents.

These micro-organisms swarm by millions in the atmosphere. They lie everywhere ; our clothes, our furniture, our books, the walls, the hangings of our houses are covered with them. The water we use for our ablutions, the water which purifies, as we fancy, the things it washes, the water we drink, how many microbes does it not contain and nourish ? Miguel has demonstrated that a single glass of Seine water contained 300,000 microbes. Evidently, all these micro-organisms are not malefactors : many of them are, on the contrary, for us very useful auxiliaries, others are quite harmless or indifferent. But mixed with these indifferent germs, there exists around us an immense quantity of them which are formidable. Such are the germs of infectious and contagious diseases, especially during epidemics.

These ferments, introduced with food into our stomach, feed themselves upon what we have prepared for our own nutrition ; they are our guests, our parasites, and live upon the portion of our aliments which we do not consume, clients who eat the leavings of the table. A great number of them are immediately killed by the chlorhydric acid of the gastric juice ; among those remaining some work for us, playing an important role in the digestive transformation of alimentary substances, but more often they openly work against us.

It has been thoroughly demonstrated by recent investigations, that the pathogruic microbes secrete, by the fact of decomposition produced by their vital action, special toxic substances, real nitrogenous bases similar to the alkaloids extracted from vegetables, such as quinine, morphine, strychnine, which dissolved in the fluids of the organism produce a true poisoning. It is they which incessantly fabricate in the digestive tube compound ammonia, such as indol, leucin, tyrosin, phenol, scatol. Carbonic acid and other gases are set free, such as for example, sulphurated hydrogen, and the products secreted by these

ferments, after their penetration into the economy give rise to the manifestations of a real poisoning. Such is the explanation of the strange phenomena offered by those who suffer of what is commonly called gastric embarrassment, indigestion, biliousness, flatulence, dyspepsia. To prevent this state of things we have a double means at our disposal : destroy the microbes by intestinal antisepsy and expel them from the alimentary canal by purgatives.

Here we shall remark how much the interesting researches in putrid fermentations of the intestines justify the traditional medication of our forefathers, and the physicians rediculed by Moliére were not altogether wrong after all, when they gave so much importance to the reiterated expulsion of atrabiliary humours upon which depended most of the evils that afflicted their clients.

But that is not all; there is something better than to cure an evil when it has been produced ; the ideal is to prevent it. Well, it is a known fact that animal food, such as meat and fish, is the aliment that contains the greatest quantity of germs: moreover, we may consider all albuminoid compounds as the most favorable soil for the origin and development of ferments ; consequently for the production of these toxic alkaloids.

You may, perhaps think that these considerations upon such a wonderful subject as bacteriology, have altogether made me forget our bill of fare. Not at all, and you will see that the conclusion of what I have just said will naturally bring me back to the starting point of this long digression. In fact, if we ever should find ourselves in presence of these disorders commonly called flatulent dyspepsia our first duty may be the getting rid, by the free administration of purgatives, of the morbid products gathered in the stomach. But this is not everything; we must above all suppress from alimentation all albuminoid food, since it constitutes the *materia prima* of this excess of morbid fermentation.

Still the patient must be fed. Here is where the usefulness of milk comes in, since that aliment is a complete food, as I have already said, since it is the nitrogenous nutrient which contains the smallest quantity of toxic germs. By the administration of this precious liquid food, we shall have suspended all mechanical work from the suffering stomach, which will be then in the position of a broken arm laid at rest

in a splint. Besides, the suppression of albuminoid food will prevent the development of further fermentation and allow the digestive functions to be restored to their normal state. This is what we are doing every day, and we may say that we possess in a milky diet the most powerful and efficacious means of treating and curing that so common disease called dyspepsia.

As far as wines are concerned, you may see that I have given them a large share in the drawing up of my bill of fare. And I believe that I showed proof of extensive artistic knowledge about the choice and distribution of their different kinds. White wines strike up the march and sprinkle the soup and fish; Bordeaux wines accompany the solid joints; Burgundy wines are associated with game, and Champagne with the dessert. All these wines are endowed with particular *bouquets* according to their variety, but the principle base of every one is alcohol, which enters into their composition in the proportion of 7 to 15 per cent. They contain also tannic acid and salts of potash, etc. Absorbed in small quantities during meals, it is a known fact that they possess a salutary action in assisting the secretion of gastric and pancreatic juices. And they contribute to cheerfulness of mind and consequently place the guests in excellent moral disposition, banishing from their brain all cares and preoccupation, which, you will confess, is worth consideration.

We know now, all the ingredients composing our alimentation. Here they are briefly enumerated :—

1.—Albuminoids, especially derived from the animal kingdom and the principal element of which is nitrogen united to carbon, hydrogen and oxygen.

2.—Ternary substances containing only carbon, oxygen and hydrogen without azote, they are represented by sugars and feculents.

3—Fats deprived of oxygen, being consequently composed of carbon alone and hydrogen.

4—Salts, which we meet in food supplied by both the animal and vegetable kingdoms. These are the materials destined to the nutrition of the body.

Now, what is the want of the organism? The human body is a living machine having two different kinds of functions *viz.* the *functions*

of relation, such as intellect, sensation, locomotion and voice and the *organic* or *vegetative functions*, as digestion, absorption, respiration, circulation, secretion, nutrition and calorification. These functions are what we call life. Life means movement, which again is but a transformation of forces contained in nature. These forces are concealed in a latent state in food, and their transformation into movement takes place within the body by means of the digestive functions. Feculents and sugars are consumed and provide animal heat, albuminoids and salts are fixed in our tissues and repair the wastes produced by use. Lastly fats, which have escaped oxidation are stored in the body and kept as a reserve for further and unforeseen wants of the organism.

Among substances destined to repair the incessant loss of the animal economy, some are directly absorbed and carried at once into the circulatory torrent; others deposited at the surface of the digestive organs, must undergo the influence of juices which are poured in and are modified so that they may be absorbed. This is the reason why food introduced into the mouth successively travels over the different parts of the digestive tract, being subjected by the way to various mechanical actions, but especially to the action of varied fluids.

Let us take, if you please, the alimentary bole. Follow me, we shall accompany it in its pilgrimmage into the depths of the digestive tube and see what will take place. Let us suppose this alimentary bole composed of albuminoids, feculent and fatty substances. Once introduced into the buccal cavity, it finds itself in presence of a special liquid called saliva. The latter contains a ferment named ptyaline, which, while deprived of all action upon fats and albuminoids, possesses the property of converting feculent substances into dextrin, rendering them, therefore, assimilable. Hence, the necessity of thorough mastication of all starchy and sugared food, in order that these compounds shall be well impregnated with saliva. Hence again the dyspeptic disorders arising with people deprived of suitable teeth, as well as those who eat as if they were pursued, allowing no time for this important function to properly take place.

Arrived in the stomach, the alimentary bole meets with another liquid, the *gastric juice*, which, like saliva, contains a ferment called *pepsin*. The latter's task is to digest albuminoid substances, which it

transforms into peptones, a product eminently assimilable. These peptones still possess some of the chemical characters of albuminoids ; they give, for instance, with nitric acid, a yellow precipitate of xantho-proteic acid, but they have lost the property of coagulating under the influence of heat or acids. Besides, when an albuminoid substance is injected into the veins of an animal, it is found again in the urine, but it is not so with peptones, which are absorbed into the economy, and of which no traces are found in urine, a proof that they have been thoroughly assimilated.

So far, feculent and albuminoid compounds alone have undergone the action of digestion, fats are intact. But when once it has been expelled from the stomach, the alimentary bole, softened, modified, reduced to the state of pulp, meets in the first parts of the small intestines, another juice supplied by a gland called the pancreas. This fluid plays in digestion a considerable role. Its ferment, "the pancreatine," possesses the property of completing the digestive action which began in the buccal and gastric cavities. It modifies not only feculent and albuminoid compounds, which escape the action of saliva and the gastric juice, but it possesses besides the exclusive power of digesting fatty substances. Defresne, who made a careful study of the properties of pancreatic juice, attributes to three distinct ferments the threefold properties I have just mentioned ; *Amylapsine* would have the charge of converting starch into sugar ; *Steapsine* would favour the emulsion of fats ; lastly, *Myapsine* would dissolve albuminoids.

After having undergone the action of pancreatic juice, the aliments start on their way through the small intestines. As they progress, their consistency increases, while in the meantime their mass diminishes, owing to the greater part of them being absorbed by the chyliferous vessels. The excrementitious portion traverses the large intestine to be evacuated *per anum* ; the absorbed portions pass through the mesenteric glands to the thoracic duct, and are finally poured into the left subclavian vein, where they are mixed with the blood. They will hereafter belong to that regenerating fluid, which enters every organ, through the circulation, distributing the nutritive principles to every texture, and becoming the source of every secretion.

Gentlemen, in my quality of physician and hygienist, I do not

want to terminate my lecture without pointing out a common error committed in our alimentation in general, an error just as prejudicial as possible to the health of those who render themselves guilty of it, and they are the greatest number.

You undoubtedly know Count Tolstoi, that remarkable Russian writer, who within the last few years, has astonished the literary world by the originality of his characters and the boldness of his theories in social economy. He seems to have imposed upon himself the task of regenerating society, morally as well as physically, and lately he wrote peculiar articles which everywhere provoked a certain emotion. In fact this celebrated philosopher, falling upon the idols that man worships the most, emitted with his usual daring spirit the three following propositions :

1.—Luxury is bad, 2.—Our alimentation is too abundant. 3—We must replace our animal alimentation by a vegetable one.

Naturally we have nothing to do with the first part of his thesis, but with regard to the second proposition, I subscribe to it with both hands. Yes, *we eat too much.* Almost everybody eats more than his hunger commands, and how many in presence of a good dinner leave the table only when it is impossible for them to eat any more? The old maxim should never be forgotten that "we must eat to live but not live to eat." And do you know how little one need eat not merely to live but even to live comfortably, and to secure for the body the necessary materials for daily work? If we compared the quantity of food which suffices a poor peasant and the food necessary to the wealthy citizen, we would feel tempted to say that they were beings of different species. The fisherman is satisfied with a piece of bread and cheese and the tourist who accompanies him takes with him a whole kitchen paraphernalia.

The Arabian who guides the excursionist through the desert requires for food but a little bread and a few dates and it is not without a certain expression of contempt, that he considers the baskets of provisions, the cans of preserved meats and other innumerable ingredients that the sportsman thinks necessary to take along with him under fear of starvation.

Sheriff Sweetland, one night at a meeting of the Medico-chirurgical Society, caused no little amazement, in stating that the cost required for feeding a prisoner did not exceed 8 cents a day, that is 3 cents per meal.

He added, that being one day in England, in the course of a conversation with some officers of the London jails, these officers had found the sum exorbitant. They said that each prisoner in London did not cost them, for food, more than 4 cents daily. "If we fed them, they added, at the rate of 8 cents, as you do in your country, our jails would soon become insufficient to receive the mass of those who would rush in solely to be fed in such a luxurious manner."

These examples suffice to demonstrate how few aliments are required to keep life and repair the wastes of the organism. Twenty grammes of nitrogen and 300 grammes of carbon are all that is wanted; or in other terms, physiologists have found that within 24 hours, 125 grammes of meat were sufficient for an adult, associated to 300 grammes of potatoes and 50 grammes of butter and cheese. The food which is taken in excess is not absorbed; it then undergoes chemical changes in the alimentary canal and at last putrifies; and quantities of gas such as carbon-dioxide, carburetted hydrogen and hydrogen sulphide are formed, as I said before, in explaining the fermentation produced during the digestive process. It is then, especially, that dyspepsia arises and that constipation and irritation, causing diarrhoea which does not always empty the bowels, are produced. Some of the putrid substances are absorbed, and then appear signs of evident poverty of the blood, a febrile condition, torpor and heaviness, fetor of the breath and sometimes, possibly, even jaundice.

When excess of albuminates continually passes into the system, if especially a certain amount of exercise is not taken at the same time, there is a want of proportion between the absorbed oxygen and the absorbed albuminoids which leads to imperfect oxidation. Nitrogenous substances, instead of being converted into soluble urea, remain in the state of insoluble uric acid; gouty affections have no other origin. Should excess of starchy food be taken, an excess of fat is produced which accumulates in the tissues, leading to obesity with all its inconveniences.

In conclusion, what can we say of Tolstoi's third proposition, that animal alimentation should be replaced by vegetable diet? You know that there exists a certain class of individuals who contend with Tolstoi that animal alimentation is absolutely useless; they are called vegetarians

Here, we must make a destinction. It is evident that animal food is not absolutely necessary. Herbivores are beings like us, having the same physiological laws of nutrition, heat and respiration and still they do not starve although they consume no meat whatever. The Hindoos, Arabians, Chinese and others are satisfied with rice, dates, flour, vegetables, and fruits. If, to these aliments they join milk, eggs, butter and cheese they then possess a perfectly sufficient alimentation.

Chemists and physiologists agree in saying that in bread, peas and beans, there is enough azote to supply nutrition of the body. Cheese of all others is the alimentary substance which under the smallest volume contains the greatest quantity of nitrogen, Therefore the question is decided; we can live and live comfortably without eating meat. But this proposition by no means involves the consequence that animal alimentation must be given up. It is understood, and accepted that a certain quantity of nitrogen is necessary to the repair of our tissues. Milk, cheese, eggs, flour, fruits and vegetables can fully supply this quantity of nitrogen, but that alimentation has the inconvenience of requiring a large alimentary mass and consequently necessitates a more laborious digestive work than if a small quantity of meat were added to it. 100 grammes of bread contain about 1 gramme of azote, whereas 100 grammes of meat contain 3 grammes of it. Therefore as far as the nutrition in nitrogen is concerned. three times more bread than meat would be required to meet the wants of the organism. Besides, in supplying our system with the necessary quantity of azote, by the means of feculents and vegetables alone, we would be compelled to introduce into the stomach a disproportionate quantity of starchy food, with all the dangers of an excess of this kind of alimentation. In short, no one group of aliments is capable of alone properly sustaining healthy life and a combination of all, or nearly all the different constituents of diet is required to accomplish the best results.

It remains to me, now, but to thank you for your kind attention. I fear that I have perhaps abused your good will by the length of my paper. The only excuse I have to offer is that I had unfortunately no time to make it shorter. As it is, all my ambition has been to interest you. If I have succeeded I declare myself happy and satisfied.

NARRATIVE OF A JOURNEY IN 1890, FROM GREAT SLAVE LAKE TO BEECHY LAKE, ON THE GREAT FISH RIVER.

From the Journal of Mr. James McKinley, officer in charge at Fort Resolution, H. B. Co.

By D. B. Dowling, B.A. Sc.

The "Barren Ground of Northern Canada," is the title of a book recently issued by Mr. Warburton Pike. It contains a popular description of his experience of travelling and hunting in the country north of Great Slave Lake, and on the Peace River. A few notes from the diary of his sometime fellow traveller, Mr. James McKinley, may be of interest, as supplementing in a somewhat more detailed way the description there given of the country between Fort Resolution, on the Great Slave Lake, and Beechy Lake, on the Great Fish River. A part of their route was through the hitherto unexplored region immediately north of the Great Slave Lake,—a very rugged tract, dotted with lakes, followed further north by a more even though somewhat hilly country, almost barren, extending to Aylmer Lake.

Of previous explorations in the region to the north-eastward of Slave Lake brief mention will be made.

The earliest we find was that of Samuel Hearne, commissioned by the Hudson Bay Company to undertake an overland expedition, to make explorations to the north west of the inland sea on which they had their posts, and also to search for a large river, on which a copper mine was said to exist. Leaving Prince of Wales Fort, on the Churchill, he made two unsuccessful attempts to reach this river and copper mine, but in the fall of 1770 he again started, and by the middle of July, 1771, had reached the Coppermine River. The map of his route, with the latitudes of points of interest, are inaccurate and untrustworthy, but it is quite certain that in the spring of 1771 he passed near, if not over, Artillery and Clinton Golden Lakes. Returning in the fall of the same season, he arrived at some point on the north shore of Great Slave Lake, and crossed through a chain of islands to the south shore, where he arrived about the beginning of 1772.

Other expeditions, including Franklin's two, have since passed by the more western route. These seem to have passed to the west of the district under consideration.

Owing to the long absence of Capt. John Ross of the Victory, in the northern seas, a relief and exploring expedition was organized under the command of Capt. Back, who intended reaching the north coast of America by descending the Great Fish River. This was supposed to flow in a north east direction, and reach the sea at no great distance from the longitude in which Parry's ship, "Fury," had been abandoned in 1824. It was known that Ross would endeavour to reach this spot and take some of the store of provisions piled up on the beach. Capt. Back, therefore, in 1833 reached Slave Lake, and advanced by Artillery and Clinton Golden Lakes to Aylmer Lake, and made an examination of the head waters of the Fish River. He then returned to the wooded country to winter. At the eastern end of Slave Lake he built his winter quarters, and called the house Fort Reliance.

On March 26th intelligence reached him of the return of Ross, so that the expedition now was for exploration only.

Early in the spring a start was made, and during the summer he successfully descended the river to the sea, and by fall had returned to his former winter quarters, where he passed the winter of 1834-5, and then returned to England.

One result of the explorations of Dr. Ross on the shores of the Gulf of Boothia in 1853-4, was the obtaining of relics of the Franklin expedition from the Esquimaux, with the information that some at least of the party had reached the mainland, near the mouth of the Fish River, though they probably all perished in that vicinity. England at that time was engaged in the war in the Crimea, and could not at once fit out a relief expedition, but asked the Hudson Bay Co. to undertake and fit out an expedition to descend the Fish River, and search the coast in the vicinity of its mouth. This expedition was under the direction of Messrs. Anderson and Stuart, officers of the Company, who, in 1855, made the descent of the river, but were only partly successful in finding traces of the party, and returned to Fort Resolution the same season.

The next traveller giving any account of this district is Mr. Pike, as already noticed above.

During the season of 1889 Mr. Pike made a very interesting trip northward, to a large lake lying to the westward of Aylmer Lake, to

which he gave the name "McKay Lake," in honour of Dr. McKay, the Factor in charge of the Hudson Bay Co's posts in the Athabasca District. In this vicinity he spent some of the winter months, hunting the Barren-ground Caribou and Musk-ox ere he returned to Slave Lake. It was his intention to go much further north the ensuing summer *via* the Great Fish River. With a view to encourage trade with the Esquimaux who hunted in that district, Mr. Jas. McKinley, the clerk in charge of Fort Resolution, joined with Mr. Pike in forming a somewhat large party. The proposed route was evidently to retrace Mr. Pike's steps northward to McKay Lake, thence coasting eastward to the outlet, and following the Lockhart River to Aylmer Lake, from the north east corner portaging to the Great Fish River, but after reaching Lac du Mort on this route, a short distance north of Slave Lake, the direction was changed to a more direct course, across country to the Lockhart River.

On the afternoon of May 7th, with dog trains and sleds or tobogans, the party left the Hudson Bay Co's establishment at Fort Resolution, and travelled principally on the ice of the lake northward along the eastern shore. On the 9th they crossed the lake to the group of islands called by Capt. Back, Simpson's Group. Turning more to the north east, their course for several days lay among the islands forming this chain, and on the 13th they probably reached the narrows, or within a short distance of that point. Here they met some Indians, and halted to engage them to accompany the party. Much objection was made owing to the scarcity of provisions, the Indians being in a starving condition and the travellers but lightly equipped. This necessitated a delay to hunt, and finally on the 23rd they all started and travelled about ten miles. On the 23rd the travelling was slow, and they went probably the same distance. Of that part of the lake the description given in the journal is as follows: "The lake on leaving camp widens out, is studded with rocky islands, and the banks on each side are high and rocky, sparsely covered with stunted pine and birch." The next day they travelled only about five miles on the lake to a small river, up which they turned, leaving the Great Slave Lake. "We found on following up the little stream a succession of falls, which were all frozen, with high banks of ice. These took us till evening to surmount, some

of the men packing and the rest helping the dogs. Climbed to the top of the hill and found a high, rolling, rocky country; hardly any trees to be seen."

"May 25th.—Made a portage for four miles to a long, narrow lake. Then more rocky portages and small lakes till mid-day, when on account of the thaw we halted near a high cliff at a small, round lake. Started towards evening, and made a short portage into Lost Dog Lake. Made a couple of miles on this lake, and left by a low valley and camped in sight of Lac du Mort. Rocky ridges all around, here and there thinly strewn with small pines. If it were not for the lakes, which cut up the country, it would be impassable. They are generally more like a river than a lake. The portages are short, and continue to get lower the further we get away from the range of hills which skirts the north east shore of Slave Lake. The track is fairly straight. West of north is the general course.

"May 26th.—By mid-day reached the north end of Lac du Mort, where we were obliged to camp. Made about eight miles. This lake is rather large, with long bays surrounded by smooth, rocky hills or banks nearly destitute of timber. This gives it much the appearance of a lake in the rolling prairie.

"May 27th.—The party remained in same camp, hunting in the vicinity with apparently little success. Of the country seen, he says it consists of "long ridges of either smooth rock or piles of loose stones, similar to the edge of the lake, between which are mossy valleys or narrow lakes."

"May 28th.—Travelled to the end of Lac du Mort and portaged to the next lake." Here they thought they had found a câche of meat, and spent a couple of days trying to thaw it out, but it proved a disappointment, and they halted still longer, hunting the country over to find the deer. They travelled now only short distances—a mile or two—towards reported bands of deer. Of the country he says: "We have now got past the last of the belt of hills which lie to the north of Lac du Mort. The country, looking ahead north, is a level or rather rolling field of snow as far as the eye can see. The snow is perceptibly deeper as we go north." "In the immediate vicinity the rocky ridges are often

covered with loose boulders, while between, lakes occupy the low ground ; a fine grass thinly shows amongst the moss, rather like bunch grass ; wood now and then in sheltered places." On the 3rd June they succeeded in getting among the caribou, and the journey was resumed.

" June 3rd.—Made a small portage to Bear Head Lake. Travelled in the night on account of the heavy thaw. Camped about midnight.

" June 4th.—Were obliged to pass the day in the same place on account of the heavy thaw. Since the caribou are apparently in more numbers to the east of the track we have been following, the Indians have decided to break off and cross to Capt. Blanc's route or Stewart and Anderson's track. The endless chain of lakes which intersect the barren, stony ridges, enables one to take any direction.

" June 5th.—Shifted camp across the lake to get wood, having burnt up all around this camp. Snow drifting like mid-winter. Found a fine clump of pines in which to camp. The lake is about two miles and a half wide at this point.

" June 6th.—Shifted camp a couple of miles to the end of Bear Head Lake. This is a lake I should say of about 10 or 12 miles in length, and of about two miles in width. Surrounding country still of rolling, broken ridges. The party remained in same camp till June 9th. Some further notes of the surrounding country observed on their hunting excursions are added. The country still the same as that to the west. Rolling ridges, broken rocks and loose stones, often of immense size balanced on a few smaller ones, are a very common feature. The ground is covered with several kinds of mosses, and a small plant bearing a small black berry. Cranberries are also to be found in the swamps, where there is also a short grass with a thin, round blade. Wood is getting scarce, and only to be found in sheltered spots.

"June 9th.—Off this morning and made probably 8 miles. Course, N. E., to strike Capt. Blanc's track, first on two small lakes and then on a long one, in appearance like a river, at the end of this we camped. After dinner we all started off hunting. The country still of the same appearance, but not a single stick of wood did I see. Noticed mica in small quantities, of a poor quality. The rocks are of small sizes, being split up by the frost and other causes.

"June 10th.—Heavy thaw, with water on the ice of the lakes. Made about 4 miles on small lakes, with short portages between. Wood is very scarce at this camp, and we can only find a few dry roots on spots where the snow is off the ground. The same bleak country. Red and gray granite rocks and ledges everywhere.

"June 11th.—Travelled about five miles in an easterly direction, on a long, narrow, winding lake. The hills are a good deal higher to-day, with rougher abrupt bluffs and broken rocks. Leaving the lake we made a small portage, and camped below a bank of fine sand of a red colour, on the edge of another lake at the end of the little rocks. This is on Stewart and Anderson's route, where they canoed it to the Great Fish River. The bank of sand on which we are now camped extends for a couple of miles, and is perhaps half a mile in width. It is quite a pleasant sight after the monotonous rocks. It is formed into ridges, mounds and hollows like its rocky neighborhood, and bears a few small stunted pines here and there."

Owing to the thaw the water from the melting snow had so accumulated on the lakes, that the party were obliged to wait until the ice and snow had so loosened as to rise above this. The snowshoes were no longer needed, and consequently had been abandoned. Four days were lost on this account, and on June 15th a start was made again, but the travelling was very bad, only about 5 miles being the progress for the day. The lake, from their account, would be about 15 miles in length, with many rocky islands and points. Good whitefish reported in it, though the party did not set any nets.

June 17th.—"Started in the morning and travelled 8 or 9 miles to the north eastern end of the lake, and made a portage of about a mile, camping half way on it on account of the scarcity of wood. Here there are only bushes of stunted pines; the largest is not a yard in height. They are of a considerable size at the base, from which the branches spring; the whole is bent and crooked in every imaginable position, and generally dry at the top.

June 18.—Finished the portage, and travelled on a narrow lake about 5 miles, to where a little river joins it with the next lake in our route. The ice in it we found had gone, so we had to make a portage of about a mile and a half over the hills.

"The whole of this section of the country is simply a bed of stones; no gravel or earth of any kind, but the stones piled on each other with great holes between. The country much the same in appearance, only less large bluffs of rock, and now and again large areas covered with loose stones. No bushes, except on the borders of lakes, and occasionally small patches of grass in the hollows.

"June 19th.—Left the men packing down to the lake and started ahead to see some clumps of large pines. The bay we first reach is a long inlet, running north and south about six miles. At its northern end it widens out, forming a large, apparently circular lake of about ten miles in diameter. The narrows being three or four miles wide, we there took the western shore and passed over a pretty fair level country, having more soil and stretches of grass, and sandy hills and ridges, and several patches of pines suitable for building purposes and firewood. On the whole it is the best country seen since leaving Slave Lake. Parties who took the east shore of the bay report the country unsually smooth and level. All around the lake there is plenty of firewood. A small river runs out to the south from the north east end of the bay. Our party with the dog trains followed the east and south shores of the lake, and camped at the south east end, having made some sixteen or eighteen miles. Good travelling on the ice. Duration of sun light for the day, 20h., 40″.

June 20th.—Left camp about mid-day and made a portage to the east of about two and a half miles into a long, narrow lake, running northwards. Went about two miles on this lake, and camped on a dry point. The country north of this appears level as far as one can see, and less covered with boulders and rock than that we have left behind. Small bushes of pines in clumps in the low ground. The travelling on the ice is much improved, owing to the surface water having drained off.

June 21st.—Taking the right side of the lake we found the country much more level than we had seen it. It consists of long, smooth, sandy ridges, covered thinly with bunch grass, while in the muskegs and on the edges of the numerous small lakes much more grass is to be found, with small pine bushes in the sheltered spots. We must now be getting very near to the so called last woods."

The party camped early after travelling about ten miles, as they had succeeded in killing sufficient deer to keep them busy the rest of the day cutting up and drying, and also a sufficient supply to give them a quiet Sunday in camp.

"June 23rd.—While the men were fixing up the sled for a start we went ahead, crossing a point on the south east side, where we found a small stream entering the lake. Here the Indians were successful in catching several fine trout, which we roasted for dinner. The country we found rocky, and intersected with small lakes. The party with the dog sleds made about eight miles.

"June 24th.—Made about four miles to the end of the lake, which is probably about twenty miles in length, and from two to two and a half in breadth. Then portaged over a mile to the north east end of another small lake, which we crossed about three miles, and pitched our camp. Wood is getting very scarce. In winter the little that is here must be covered deep with snow.

"June 25th.— From here we have to make a portage of four miles to a small lake on the course of the Lockhart River, which connects McKay Lake and Aylmer Lake. Found the river open between the lakes, and lots of water at the lake edge. Went about two miles on the north east bay of this lake to the outlet—the Lockhart River—and camped on the north bank. The native soil of the Musk-ox. Here a portage has to be made of over a mile over a rocky hill. On the road we saw a couple of Musk-ox heads killed a couple of years ago by one of our men. The country near the mouth of the river is smooth and sandy, with a good deal of muskeg. On the north bank a range of hills runs north east, having the general aspect of rocky and rough land. Aylmer Lake, as seen from this point, bends away to the south east. The river that runs below this hill is probably about a mile in length from the intermediate small lake to Aylmer Lake.

"June 26th.—From here we sent several men up the river to McKay Lake to bring back a large birch canoe, used by Mr. Pike last year, the Indians taking our baggage on their sleds. Got on the rocky portage and had dinner, and then started off on Aylmer Lake, but found

To be Continued.

EXCURSION No. 3.

Taking advantage of the kind invitation of Mr. and Mrs William Borthwick, which had been standing for some time, the Club made its third excursion for the present season, on Saturday, 8th July, to Borthwick's Springs, in the Township of Gloucester, some seven miles east of Ottawa. Mr. Borthwick has entered upon the production of fruit as well as the sale of it, and large plantations of small fruits have been made, with promise of great success. About thirty members attended. The trip was made in vans, starting from the Post Office at 2 p.m., and in spite of a violent thunderstorm which overtook them on the way, all reached the objective point without mishap shortly before four. Here they were hospitably received by Mr. and Mrs. Borthwick, and the weather soon clearing the party proceeded to inspect the spring. This lies in a marshy tract at the foot of the hill on which the house stands, and close to one of the branches of Green's Creek. A building has been placed over the spring, with appliances for barrelling and shipping the water, which is sold largely in and about Ottawa. It is of a rather pleasant saline taste, and is celebrated for its mildly aperient properties. An analysis made several years ago by Dr. J. Baker Edwards, of Montreal, is given below. The well known peat-bog, the *Mer Bleue*, commences a short distance farther to the east, and it had been intended to pay it a visit, but owing to the condition of the ground after the storm this had to be omitted. After a generous lunch, provided by the hostess, the Vice-President, Mr. F. T. Shutt, took the chair, and devoted a few opening remarks to the subject of mineral springs, their geological origin and chemical constituents. He then introduced Messrs. R. B. Whyte and John Craig, who delivered addresses upon the botanical specimens collected during the afternoon. Mr. Whyte drew attention to a number of beautiful flowers of easy cultivation, such as the Cone flowers (Rudbeckia) and native orchids, charasteristic of that district, which should be found in every garden. The apt and striking way in which the distinguishing points between different species were described gave Mr. Whyte's lecture additional interest.

An addition was made to the local list of plants, in the shape of *Ranunculus sceleratus*, found by Mr. J. F. Whiteaves.

Mr. Craig spoke of the economic value of some of the grasses found in the vicinity, emphasizing the value of June grass for lawns, and the necessity of making a continual warfare on quack grass.

A vote of thanks to the host and hostess was moved by Capt. McElhinney, and gracefully acknowledged by Mr. Borthwick. The return journey was then undertaken and Ottawa was reached about sundown. A. G. K.

ANALYSIS OF THE WATER BY DR. EDWARDS.

The specific gravity is 1.008. It is not aërated, nor is it alkaline. It contains (in 1000 parts) of saline and earthy chlorides, 11.9 grains, and of bromides and iodides, 0.4 grains. It contains, like some of its congeners, a small portion of strontium, and both bromide and iodide of magnesium. Of total solid saline matter, it contains per Imperial gallon of 70,000 grains, which I estimate to be combined as follows:

Chlorides, 833 grains per gallon, combined as

Chloride of Sodium	784.70
Chloride of Potassium	10.50
Chloride of Stroutium	1.40
Chloride of Calcium	14.70
Chloride of Magnesium	21.70
Bromide and Iodide of Magnesium	2.80
Sulphate of Strontium	2.10
Sulphate of Calcium	15.40
Sulphate of Magnesium	19.60
Silica and Oxide of Iron, etc.	4.90
Saline contents of one Imperial Gallon	877.80

CHEMICAL ANALYSIS OF MANITOBA SOIL.

The Cause of its Great Fertility Explained.

In the American Chemical Journal, Vol. XIV, No. 8, is a particularly interesting article by Mr. F. P. Dunnington, in which comparative analyses by Mr. T. C. Whitlock are given of examples of (1) Soil, furnished by Dr. George M. Dawson, F.R.S., etc., from the prairie lands of Red River, taken at Rosser, about 15 miles west of Winnipeg, and (2) Tschernozem or Black Earth of Russia, from the district of Balashoff, in the government of Saratoff. The specimens are described as so similar in appearance that they cannot be distinguished by the eye.

ANALYSIS.

	Manitoba.	Russia.
Sand	59.82	53.71
Silica, amorphous	5.45	12.80
Ferric oxide	4.00	4.13
Alumina	7.14	6.04
Titanic oxide	.64	.63
Lime	.61	.75
Magnesia	.61	.21
Sulphuric oxide	.03	.06
Carbonic oxide	.37	.02
Phosphoric oxide	.13	.16
Potash (with trace of Soda)	1.91	1.97
Organic matter	12.49	14.91
Containing humus (soluble in ammonia)	(.45)	(.44)
" total nitrogen	(.44)	(.31)
Water	6.86	5.04
	99.76	100.43

"With the exception of the amounts of carbonic acid, and of the proportion of the silica which is amorphous, the composition of these two specimens is almost identical.

"The peculiarly large amounts of organic matter and nitrogen, as well as of the principal constituents of the ash of plants, lime, potash and phosphoric acid, are all to be noted and accord with the well known exceeding fertility of each of these soils.

"The soil from Manitoba is described by Dr. Dawson as spread with great uniformity over the Red River Valley, a wide prairie on the first or lowest prairie level of the north western country. It has a depth of say one to four feet, and consists of the superficially modified parts of the sediments of a later glacial or post-glacial lake, which at greater depths are found in the form of well bedded silts.....The surface is a dark mould, composed of the same material as the subsoil, but mingled with much vegetable matter.....The uniform fertility of this soil cannot be exaggerated.

"The Tschernozem or Black Earth of Russia has long been famous by reason of the heavy crops which it has, in many localities, annually produced for almost a century. Prof. Krassnof, in a paper (Proc. Geol. S. Amer. 1891, p. 68,) describes it as distributed over the steppes of the

south eastern portion of European Russia. He concludes that this black colour is due to an accumulation of vegetable matter from the herbaceous plants of the poorly drained steppes of the post-glacial deposits which overlie the loessoid clays, so difficultly permeable to water. At the close of this paper he draws attention to the close correspondence which exists between the climate of Russia and that of the prairie land of Minnesota, and suggests the probable similarity of the soils of these regions.

"The above analyses make it to appear that the Tschernozem and the soil of the Red River prairies are similar in chemical composition; they occur in the same latitude, with the same general relief and climate, and from the above quoted authorities are judged to have a similar geological history; may they not, therefore, be properly considered as of the one variety of soil, "Black Earth."

BOOK NOTICES.

SCUDDER, S. H. A Brief Guide to the Commoner Butterflies of the United States and Canada. 12mo., 12 + 206 pp. Henry Holt & Co., New York.

In our August, 1892, number we gave notice of a Butterfly book for boys which Mr. Scudder had in preparation. We took occasion then to point out the advantage of all young people having some hobby in natural history, and looked forward with pleasure to the early appearance of this work, which should, we thought, act as a first stepping stone from which young students might find an easy entry to one of the most attractive fields of study offered to us by Mother Nature. Such a book, which was much wanted, has now been prepared by Mr. Scudder in his characteristic manner, and has been published by Messrs. H. Holt & Co. as a neat duodecimo of convenient form, well printed and got up. This little work treats only of the commonest butterflies, such, in fact, as any energetic collector in the Northern States or Canada is pretty sure to take within a year or two. It is to be followed by a more complete Manual of the Butterflies of North America, north of Mexico, to be issued at an early date, and prepared in a similar style to Gray's Manual of the plants of the Northern States. Mr. Scudder's Brief

Guide will, we believe, be the means of inducing many to take up the study of butterflies, who have been prevented from doing so for want of a suitable and accurate book. The introductory chapters, treating generally of the nature, structure and habits of butterflies are very concise, covering the ground well, and with the concluding chapters where instructions are given for the collection, preservation and rearing of insects, provide the beginner with all that is necessary to make him a good naturalist. J. F.

SCUDDER, S. H. The Life of a Butterfly. 12mo. pp. 186, 4 plates.

Under the above title Mr. Scudder has written in untechnical language a charming little book, in which while recounting the life-history of the Milk-weed Butterfly, he compares it with other species and succeeds in condensing into a remarkably small space an account of the most interesting features in the lives of the whole tribe of butterflies. It has been prepared for the general reader, and the hope is expressed that it "may perhaps gain for butterflies the serious study of some who had before looked at them as merely pretty creatures,—types of the frivolous,"—we feel sure that it will do this and much more besides. We recommend it heartily to all boys and girls of healthy mind, to naturalists and to thoughtful readers. J. F.

ENTOMOLOGY.

Edited by J. FLETCHER.

Hypomolyx pineti Fabr. This large pine-weevil has not been previously recorded from our district, but a dead specimen, in good condition, was found at Casselman (June 10th) in the leaf of a pitcher-plant. Among the contents of leaves examined *Cytilus sericeus* appeared very frequently. A small, pale crustacean was also not uncommon, and seemed to thrive in its prison cell. W. H. H.

Adimonia rufosanguinea Say. At the Mer Bleue this pretty little Chrysomelid was very abundant upon Kalmia augustifolia, and occurred also occasionally on other plants Hitherto I had generally taken this species upon the wild cherry. W. H. H.

Aphodius prodromus Brahm. This European beetle appears to be extending its range westward. Dr. Horn, in his monograph of the sub-family (1887,) recorded it from Maine and Montreal. Several

years ago I received a specimen from my brother in Campbellton, N.B., and soon after specimens from the late Mr. Caulfield, of Montreal. This year Mr. Fletcher took several at the Experimental Farm at the end of May, and I captured one at Eastman's Springs. W. H. H.

Desmocerus palliatus Forst. On June 14th I took a pair of these beautiful longicorns upon an Elder bush, and on the 26th received one from Col. Chamberlin, which he had taken in his garden in New Edinburgh. The larva lives in the stems of the Elder, and the beetles, though not common, can usually be found by a careful examination of the shrubs in June. It is perhaps the handsomest of our Cerambycidæ, especially when alive and in the sun light. It is almost an inch long, of a deep steel-blue colour, and with a bright yellow band across the base of the elytra, from which it derives its name of the Cloaked Desmocerus. W. H. H.

Ditylus cæruleus Rand. While at Casselman (June 10th) two fine examples of this usually rare beetle were taken, almost accidentally. The first crawled up on a log where we were collecting *Tritoma humeralis* in fungi, and the second came crawling up to us as we were lunching. This beetle seems to inhabit swampy areas, as last June we captured specimens in a beaver-meadow at Sudbury, and another was taken about the same time at the St. Louis Dam by Mr. J. A. Guignard. The western species of this genus seem to be more abundant, as numerous specimens have been received from British Columbia. W. H. H.

Ergates spiculatus Lec. A fine female of this beetle has been received from Rev. Father Dontenwill, O.M.I., now principal of St. Louis College, New Westminster, B.C., who a few years ago was a frequent attendant at our Monday afternoon lectures. *E. spiculatus* is the largest beetle found in Canada, and belongs ro the Longicorns or wood-borers. The present specimen measures 2⅜ inches from the front of the head to the end of the body, and $\frac{5}{6}$ inch across the base of wing cases. J. F.

Argynnis Triclaris Hüb, in the Ottawa District. I was much surprised and pleased at taking a few specimens of this rare butterfly in the *Mer Bleue*, on 13th and 14th June. It is a northern species found in Labrador, at Hudson Bay and in the Rocky Mountains. The size and general appearance when on the wing are similar to *A. Myrina*, but the

flight is stronger. It was no easy matter to run them down over the soft sphagnum swamp as they dodged amongst the stunted spruces, with the thermometer ranging between 80 and 90 degrees. J. F.

Diplax costifera Uhl. Two specimens of this rare dragonfly have been taken this summer by Master Stephen MacLaughlin, in Powell's Grove. One specimen was taken here some years ago by Mr. T. J. MacLaughlin, but the exact locality was not then noted.

BOTANY.

Edited by W. Scott, B.A.

Aphyllon uniflorum at London, Ont. Some fine specimens of this interesting Orobanch were found on June 2nd in Mount Pleasant Cemetery, near London, Ont. They were growing in the grass, the large purple corollas having a very attractive appearance. This is the first record of the plant being found near London. Some more specimens were found in the woods on June 10th. The same plant has been collected also by Mr. J. Dearness, of London, in the Township of MacGillivray, Ont. J. Alston Moffat, *London, Ont.*

The Mayflower. Some beautiful specimens of *Epigœa repens* have been received from Fort Coulonge by Miss McKellar, of the Richmond Road. Members of the Club will always hear with interest and satisfaction of new localities in our district for this floral treasure of the spring. R. H. Cowley.

Erythræa Centaurium, Pers. (Centaury.) I found this elegant little member of the Gentian family growing in some numbers among grasses and flowering at the end of August at Roach's Point, Lake Simcoe. Gray's Manual (revised edition) gives as localities, "Waste ground, shores of Lakes Ontario and Michigan." The only Canadian record mentioned in Macoun's Catalogue is "Sandy wastes on Sable Island, off the coast of Nova Scotia. Collected July, 1870, (*Mrs. Almon.*)" I therefore thought that this note might be of interest to the readers of the Naturalist. C. J. S. Bethune, *Port Hope, Ont.*

GEOLOGY.

EDITED BY H. M. AMI, LL. D., F.G.S.A., ETC.

On a small collection of Fossils from the Trenton Limestones of Port Hope :—Port Hope is situated on the north shore of Lake Ontario, near the mouth of Jones's Creek, a stream which is slowly cutting for itself a bed in the hard Trenton limestone. In former ages it was a stream of much greater dimensions, and evidences of raised beaches are seen along both sides of its valley. The higher ground is here occupied by clays, mostly glacial, and sub-aerial denudation has played a prominent part in making for the town its peculiar orographic site above the present level of the lake.

On the occasion of my last visit I saw an outcrop of limestone, at the Rapids near the Bridge and foot of the main business street, from which a number of fossils were obtained, or noted. They were all typical or rather common Trenton forms, and are here recorded only because I have so far seen no list of fossil remains from this locality. The species are as follows :—

1. Crinoidal fragments. 2. *Heterocrinus simplex v. Canadensis*, Billings. 3. *Stictopora acuta*, Hall. 4. *Prasopora Selwyni*, Nicholson, (= *P. lycoperdon*, Rones.) 5. ? *Diplotrypa Whiteavesi*, Nicholson. 6. *Lingula sp.* 7. *Orthis testudinaria*, Dalman. 8. *Leptæna sericea*, Sowerby. 9. *Strophomena alternata*, Conrad. 10. *Anazyga recurvirostra*, Hall. 11. *Vanuxemia Montrealensis*, Billings. 12. *Modiolopsis sp. indt.* 13. *Trochonema umbilicatum*, Hall. 14. *Orthoceras sp.* 15. *Dalmanites callicephalus*, Green. 16. *Asaphus platycephalus*, Stokes. 17. *A. Canadensis*, Chapman. 18. *Calymene senaria*, Conrad.

It would thus appear that the light grey, somewhat bituminous and impure limestones of Port Hope belong to the Trenton and well up in that formation. With time to collect along Jones's Creek, a careful observer should obtain much interesting material. H. M. A.

THE NEXT EXCURSION

Will probably be to Paugan Falls, on the Gatineau Valley Railway. Arrangements are being made for as early a date in September as possible.

NARRATIVE OF A JOURNEY IN 1890, FROM GREAT SLAVE LAKE TO BEACHY LAKE, ON THE GREAT FISH RIVER.

From the Journal of Mr. James McKinley, officer in charge at Fort Resolution, H. B. Co.

By D. B. Dowling, B.A. Sc.

(Continued from page 92.)

the walking on the ice very bad. Collected all the small drift willows at the points passed, as there is no wood here. Made about five or six miles and camped on a low point a short distance from a small river that falls in on this side the lake. The banks of this lake appear to be low and covered with grass, gradually rising as they recede from the lake. The Indians are now nearly all carrying canoes on their sleds, picked up here and there, where they had been câched on the route.

"June 27th.—Followed the north shore of the lake, and found it nearly level and good walking, but had to take the ice to avoid streams which were open. The north shore continued level, but we crossed a deep bay where the hills came to the lake again. Here we camped on a small island after travelling about eight miles. Willows, etc., for firewood, have to be carried on our sleds from wherever they can be picked up.

"June 28th.—Started off again in a north east direction, making about eight miles. We have kept the north side of the lake all along. It is indented by many long bays, and dotted with islands. A greater portion of the hill sides are grassy slopes, and the level plateaus covered with moss and grass, with here and there ridges of rocks and stones. There seems quite enough feed for horses and cattle in summer, but there is not a sign of anything in the shape of bushes large enough to make a fire. Moss is the only thing in this region that will burn. The canoe route to Slave Lake stretches away to the south east, through an arm of this lake, then through several other lakes connected by the Lockhart River, to the eastern end of Slave Lake. From the western extremity of McKay Lake to the eastern end of this lake is about one hundred and fifty miles, general course, east and west, all of good navigable water. The route to Fish River from here is north east to the end of the bay running in that direction, then a portage of some length to the headwaters of that river.

July 1st.—Started late on account of fog, but made the end of this bay, called Sandy Bay, which we have been following, and camped on a high bank of sand. Close by to the north of us, a range of sandy hills and banks runs east and west, at the foot of which a small stream, one of the sources of the Great Fish River, runs. The country in sight and surrounding, consists of prairie ridges, with most of the hollows occupied by small lakes. We have finished our sled work, and as our large canoe is in good condition, we are prepared for a trip down the river, having plenty of ammunition and fishing gear. We will probably have a few days delay where we finally part with the indians, getting shoes made and meat dried to cache along our route, to insure our way back.

"July 2nd.—Remained in camp at Sandy Bay, repairing canoes, dressing leather &c.

"July 3rd.—The indians with their small canoes, portaged to the south west, crossing a narrow lake on the ice, and then turned northward, and camped when they reached the river. Our men passed down by the small river, but had much trouble getting through, breaking the canoe shortly after starting, as the river was very shallow and full of stones. Seven portages had to be made, and much time spent following the open waters on the margin of the larger ice covered lakes, so that it was about two o'clock when they joined the camp. The camp on Sandy Bay is probably not over four or five miles from us here, in a straight line to the southeast. Among the rocks on the river bank, there are enough dry sticks for firewood. No pines of any description are to be seen, nothing but willows; but they grow to a good size for this quarter. The country is a rolling prairie, with more moss and stones, but less grass than the prairies south. The banks and bed of the stream, are stoney, widening out here and there into narrow lakes, connected by the river which is there generally rapid.

"July 4th.—Portaged the canoe over a bad part of the river, to a lake, around the edge of which there is a narrow passage. Striking inland, I crossed a couple of small streams falling into this river, and saw a large lake to the west. The country is grass covered ridges, with here and there, mostly on the margins of small lakes, piles of rocks. The course of the river to-day, is about due north, on which we have

made only about five miles, camping at the mouth of a small branch entering this lake expansion, which is called Musk Ox Lake.

"July 5th.—Started off again this morning, but made poor headway, as the canoe has to follow the shore line, where there is only a small passage free from ice. We made probably four or five miles on Musk Ox Lake, which lies nearly north and south, and is from a mile to a mile and a half in breadth. This shore of the lake is pretty much the same as that seen yesterday, being bordered by grassy hills and valleys, but from here north is yet more hilly and rocky. The eastern shore appears rough and rocky."

Near the northern end of this lake, there appears to be a favorite crossing for deer, that being possibly a narrower pass, and as there is an island there the deer in swimming has a resting place in the middle of the swim. Here the indians expected to make a big hunt, or to slaughter great numbers in the water, and thus make a supply of dry meat for the trip onward. From the hides they make their shoes, and often other articles of wearing apparel. Consequently the party halted here, moving their camp the next evening a few miles further north, to a commanding position overlooking the probable place of slaughter. A party consisting of a few hunters had been despatched a few days previously to this place, but very few deer had been seen and consequently the hunt was not very satisfactory. This necessitated a much longer delay than was expected, and any game that could be had was taken. Generally the Musk Ox is not relished as an article of diet, but they were compelled to shoot numbers of these animals to supply the larder. Of this lake and vicinity the Journal says:—

"To the east of our camp across the lake, are the Musk Ox mountains, more properly hills. Northward the country appears to get wild and rocky again. At a distance of three or four miles, a ridge of hills runs north and south, at the foot of which is a river flowing from the westward out of a large lake to this river. The rocky ridge on which we are camped extends to the north west, and from a hill on it, a couple of miles out, can be seen the west branch of this river, of about the same size as the one we followed, flowing in a large valley, apparently a mile or two in breadth, sloping up

gradually to the hills by which it is bordered. A smaller stream flowing from some small lakes in sight, joins the river just below this place. A few remains of snow drifts still are to be seen here and there, but the country generally appears green and fresh."

Several very stormy days on which it snowed pretty steadily, kept them all in camp, after this they decided from the small hunt to move on, so that after a stay of eight or ten days, they were again going northward. The river leading from the lake was very shallow and nearly impassible, so a portage, two miles and a half in length, was made northward over rocky country, to a lake, apparently in the same chain. Camp was made on the shore of this lake, and on the morning of July 18th, they started in the canoe again.

"Found the lake to be of about two miles in length, just as the river leaves it there is a rapid, in the centre of which is a small island on which we made a portage. Onwards, we found the river the whole way, with the exception of three small rapids, two of which we ran, more of the nature of narrow lake expansions than a river. It has very little current, and is very deep, with a width averaging two hundred yards. We passed through two lakes beside the one on which we camped last night, of two or three miles in length. On both sides of the river the country is rough, being covered with hills and bluffs of grey rock and stones. The general course of the river is north east. After having made eighteen miles we camped at the point where the river leaves the third lake, on the western bank where there is a fine sandy beach with a grassy bank rising to a hill behind. This Mr. Pike and I climbed and from there we had a good view ahead. The country we found fine and smooth, again with grassy ridges and valleys.

"July 19th—Starting out, we found a strong current with small rapids widening out again, after about a mile, into a long narrow lake possibly ten miles in length. A river from the west was noticed shortly after leaving camp. The banks on both sides were rocky. Leaving this lake the river flows for three or four miles with strong current having three or four rapids all of which we ran, then we enter a small lake on which, on finding a fine sandy beach on the east shore, we camped. From the north end of the long lake the country is pretty level prairie

with sandy hills and plenty of grass. A little before we reached the lake another stream enters from the west.

"July 20th.—Remained in same camp. From a hill back of camp saw a large lake still apparently covered with ice.

"July 21st.—Paddled to the end of the lake, about a mile. Here a ledge of rock runs across, to pass which we were obliged to portage everything, then we cross a small lake perhaps two miles long, entering the river again. It has here a small current but no real rapids. In a very short distance the river expands into a lake of a mile in length, then contracting into a narrow channel with a rapid. This we ran light, portaging the cargo. From the foot of this rapid the river widens out with a sluggish current for two miles, then a lake expansion for another two miles. To this point the morning's course has been nearly due north. From this lake we enter rough water, two miles being nearly all rapids. The upper half it was impossible to run so portaged but ran the lower half and entered a narrow winding lake, on which we made three or four miles and camped on a sandy ridge. A great deal of the country passed to-day consisted of benches and ridges probably grass covered, the banks of the river and lakes being high enough to conceal the view. Near the camp the banks of the lake become much lower being merely a long grassy slope to the sandy beach. There is very little wood in this part of the country and we have to use moss and green stuff for fire.

"July 22nd. —About four miles' paddling brought us to the end of the lake—direction about due north—then into the river again for about a mile, strong current but deep and good, we then cross a small lake of perhaps two miles in length. Here we turn to the east, the river flowing out of a bay at that end."

Here the party discovered an abandoned camp where the Esquimaux had spent some part of the previous season. After searching the place carefully, the indians determined the probable date of their departure and also the time of occupation, number of families and other details. Starting again the river was followed for nine or ten miles and found to be a large and deep stream, with strong current flowing through a fine prairie flat, with hills which appeared

smooth and grass covered, standing well back from the river. Then they entered a small lake on the north shore of which they pitched their camp under a rocky hill. Here there was fortunately a good supply of willow for fire wood. The prairie tract through which they had passed was sandy and dry, while near the rocks which they seem to have reached again more scrub willow is found growing in the sheltered corners where there is a little soil. The general course since leaving the Esquimaux abandoned camp "has been well to the east." The river leaves this lake at its north eastern end and is noted as consisting of alternate stretches of small lake expansions and narrow channel with strong current. There are two rapids but both were run. The series of lake and river stretches are estimated at ten miles. Beechy Lake is then entered upon and here on July 23rd the party had lunch after crossing over to the north shore. Before camping that evening they travelled eastward along the north shore of the lake about ten miles. Finding no further signs of the Esquimaux in this direction, they concluded they were on the wrong trail and decided to start again at the abandoned camp. This was done and they succeeded in finding the route by which the Esquimaux had come, viz. by a small stream from the west. They were then certain the Esquimaux were only to be found near Bathurst Inlet and as the party had not the time at their disposal to make the journey across country to the Inlet, they turned their faces homewards. The eastern route by Clinton Golden Lake, Artillery Lake and a small chain of lakes was taken to the western end of McLeods Bay, where the Companys' boat was waiting their arrival.

The first pine tree they saw on their way back was noticed on the river between Ptarmigan Lake and Artillery Lake and the first clump of pines about twenty miles down Artillery Lake. Of Artillery Lake Mr. McKinley has given a short description. "The lake lies nearly north and south, and at the northern end, in fact for most of its length, it is seven or eight miles wide. For about twenty miles the banks on both sides are prairie, but from that point the west shore is pretty thickly grown with pines of a fair size. The east bank throughout is prairie except here and there a few pines in a sheltered spot." The southern end of this lake was reached on the 13th of August and the Great Slave

lake on the 15th. The journey down the lake was made under more favorable circumstances than in the spring, they had now a large boat with a crew of indians, and waiting for favorable wind, they could make the run in about three or four days. They left the camp at the east end of McLeods Bay on the 19th, and camped on the evening of the 20th near the point of their departure from the lake in the spring.

Zoological Notes.

Barren Ground Caribou, *Rangifer Grœnlandica*, Linn.—On the present expedition the party lived almost exclusively by their guns, and as the most abundant, largest and best of the game animals was the caribou, the Journal is very exact in the account of the numbers seen and shot each day. This, of course, would vary in different localities.

This animal is essentially a rover, moving southward in the latter part of summer, wintering in the partly wooded districts and returning northward in the spring early before the ice is gone from the lakes. This season they had evidently started before the expedition, as none were seen along the north shore of Slave Lake nor on their trip inland until they were past Lac du Mort on June 1st. After this the party were not in the desperate straits recorded in the Journal up to that time. By following the bands of deer they were able to supply their larder whenever needed. Their dogs were better fed and stronger. The deer here seem to be all males and Mr. McKinley explains and states the fact as follows :—"They are the bucks on their way out after the does which have left some time ago to have their young near the sea coast. They (the bucks) move out as the snow disappears and meet them out on the barren ground on their return."

Their movement northward was at about the same rate as the the travelling of the party of hunters. Occasionally these had to hurry up to get among the deer again. On July 12th, after a stay of ten days on Musk-ox Lake, they concluded the deer were nearly all north of them as they had been unsuccessful in killing many at a well-known crossing. On the 10th of June a note is made that the horns on the bucks were then a foot and a half in length and were much prized by the Indians as an article of diet.

The Musk-ox, *Ovibos moschatus*, Linn.—This is an animal that inhabits only the barren or treeless area of northern Canada. As will be seen from the Journal in regard to the appearance of the country passed over, the treeless area is not entirely barren, but in many places sustains bunches of a coarse grass and plenty of moss or lichen, which afford ample food for this great rush of caribou and the more sedate wanderings of the musk-ox.

The barren or treeless area was reached practically before they came to Lockhart River, but no mention of any signs of the musk-ox is made until they reach the small lake on the Lockhart River. Here on the north side were two skulls of animals killed two seasons before by a hunter who was present in the party. The north shore is called by Mr. McKinley "the native soil of the musk-ox."

The first one killed was seen on the north shore of Aylmer Lake. From there northward large numbers were seen as far as the expedition went. They do not wander in such great bands as the caribou, but feed in smaller herds around the hills, moving in search of food. The cows in the summer generally are more together, the bulls feeding apart or in couples.

Of the smaller mammals the following were noticed :—

White Fox, *Vulpes lagopus*, Linn.—No mention is made of any of the party having seen these animals, but that they are to be found is evident from the many holes seen.

"June 30th —White or arctic fox holes we have come across now and then of late. The first we saw on the portage to the Lockhart River."

Wolverine, *Gulo luscus*, Sabine.—Mr. Pike shot three, August 2nd, and mention is made in several places of caches being robbed by these animals.

Arctic Hare, *Lepus timidus* Linn. var *arcticus* Leach. The first signs of this animal were observed on Lac du Mort which is not a great distance north of Great Slave Lake. The note is to the following effect :—"Saw signs of the Arctic Hare on the banks of this lake, which is probably as far south as they come. They are now off out again to the open farther north."

The first one seen was near Bear Head Lake, June 3rd. Others were shot, one on June 6, one on June 11, and another June 30th on north side Aylmer Lake.

PORCUPINE, *Erethizon dorsatus*, Linn.—Are rather abundant in the northern timbered area. Mention is made of some being captured on the shores of Great Slave Lake early on the trip.

MARMOT, probably *Arctomys monax*, Gmel.—"May 29th. Several ground hogs have been trapped. They are smaller than the mountain hog." North end Lac du Mort.

Of the birds the most numerous was the willow Ptarmigan, *Lagopus albus.* They were numerous around Lac du Mort and were a very important item till the caribou were found. They were likely as numerous farther on but not as much sought for. On June 2nd, "Their neck is now dark brown, the rest of their plumage white." June 20th, "The hen partridge is in summer plumage—speckled brown, but the cock is still white with brown neck."

Geese and ducks were seen in several places and a general note to the effect that geese and ducks were flying north was made.

Swans were seen going north towards McKay Lake June 3. This may have been the whistling swan, *Cygnus columbianus.*

A small goose, called in the Journal a white wavie, was seen flying northward June 2nd and 8th and feeding in the ponds on June 11th. This may have been the Lesser Snow Goose, *Chen hyperboreus albatus.*

A grey wavie was shot on June 9th, and on Aylmer Lake they were seen in large numbers. This probably was the American white fronted goose, *Anser albifrons gambeli.*

The smaller Ptarmigan were first seen on Lockhart River. These are the Rock Ptarmigan *Lagopus rupestris.* "June 25th. The smaller kind, of which we have seen a few, I believe are more plentiful farther on. They are smaller than the white partridge. The cock bird is entirely white so far, but the hen bird is brown already."

The Great Northern Diver *Colymbus torquatus*, was seen frequently, and one was shot on June 12th.

The Black Throated Diver *Colymbus arcticus* was shot by Mr. Pike on June 11th near Davids Lake.

Meteorological Notes.

May 7th, Fort Resolution.—Water knee deep on the ice on Great Slave Lake and most of the snow gone.

May 8th, Great Slave Lake.—Wind north, froze hard enough to bear party on the ice.

May 9th, Great Slave Lake.—Cold, party crossed to Island.

May 20th, North shore Great Slave Lake.—Wind north, thawing in the sun.

May 22nd, North shore Great Slave Lake.—Wind north, very cold.

May 23rd, North shore Great Slave Lake.—Wind north, thawing slightly in middle of the day.

May 24th, North of Great Slave Lake.—Wind north, cloudy and thawing fast on the tops of the hills. The snow is mostly gone, except in the hollows.

May 25th, Among hills north of Lake.—Wind east, heavy thaw.

May 26th, Lac du Mort.—Wind north, thawing.

May 27th, North end Lac du Mort.—Wind north, thawing.

May 28th, Near north end Lac du Mort.—Very cold, north west wind with hard frost.

May 29th, Near north end Lac du Mort.—Very cold north wind.

May 30th, Near north end Lac du Mort.—Wind north and cold but calmed in evening.

May 31st, Near north end Lac du Mort.—Wind south and warm.

June 1st, Near north end Lac du Mort.—Fine day but wind turned north in evening. and cleared up with frost.

June 2nd, Near Bear Head Lake.—Thawing during day. Wind south west and fine.

June 4th, Bear Head Lake.—Fine bright morning, thawing after midday, a heavy storm of snow and sleet came from north west.

June 5th, Bear Head Lake.—Snowed a little all night and throughout the day. Snow drifting on lake like mid-winter, wind north west.

June 6th, Bear Head Lake.—Fine warm day, wind south.

June 7th, Bear Head Lake.—Snowing in the morning and continued to midday, wind northerly and chilly.

June 8th, Near Bear Head Lake.—Wind north but thawing slightly.

June 9th, North of Bear Head Lake.—Wind north east, thawing.

June 10th, Small Lakes north east of Bear Head Lake.—Wind north east but warm, water on all the lakes and the snow fast going.

June 11th, Blind Mans Lake (?)—Wind north east but a regular thaw, water running in all the hollows, and the snow in slush. Fog came up in evening.

June 12th, Sand Ridge.—Heavy fog in morning but cleared up about 9 a.m. Did not freeze much in night. Lakes forming in all the hollows.

June 13th, Sand Ridge.—Wind north east and raw, with now and again a few drops of rain. A slight fog towards evening arose but later on came very thick and storming. Most of the country is free from snow but large drifts still in the hollows.

June 14th, Sand Ridge.— Wind a little east of north, stormy and a very unpleasant day.

June 15th, Sand Ridge.—Wind north east. Rain, snow and sleet all day.

June 16th, Davids Lake.—Wind north east, storm continued to 10 a.m. then cleared up. Water and slush on portages.

June 17th, Davids Lake.—Wind north east, cloudy, milder.

June 18th.—Wind south, warm, a fine bright day.

June 19th.—Wind south and warm.

June 20th.—Wind north east but light and warm.

June 21st. — Wind north east, light and hot. Vegetation is pushing ahead rapidly, leaves starting on the small willows and flowering plants, in fact green grass showing with every sign of spring.

June 22nd.—Wind south and warm.

June 23rd.—Wind in morning, west and hot, but at midday heavy clouds came up with rain, wind veered round to north east.

June 24th.—Wind south.

June 25th, Lockharts River.—Wind south and fine. River open. Flowering plants are coming rapidly into bloom, and little or no snow to be seen.

June 26th, Lockhart's River.—Wind south and fine.

June 27th, Aylmer Lake.—Wind westerly, with a shower or two of rain. Turned colder towards night with frost.

June 28th, Aylmer Lake.—Ice on small pools in morning. Wind southerly and fine. The ice on the lake still good and sound, with snow in sheltered spots not melted from the edges yet. All the willows out in leaf and many flowers in bloom.

June 29th, Aylmer Lake.—Wind south west. The day started in with heavy rain and fog, but towards evening turned fine.

June 30th, Aylmer Lake.—Wind south west, fine and hot in the morning. Thunder storm about midday.

July 1st, Sandy Bay.—Wind north west strong and changeable. Fog in morning.

July 2nd, Portage to Fish River.—Wind north west, fine and warm.

July 3rd, Portage to Fish River.—Wind west; rained early in the morning but soon turned fine. The small lakes are now open but on the large ones there is only a small passage round the edge.

July 4th, Fish River.—Wind south and hot. Saw a loon's nest with eggs. All the other birds are about hatching.

July 5th, Musk-Ox Lake.—Wind southerly.

July 6th, Musk-Ox Lake.—Wind southerly and hot.

July 8th, Musk-Ox Lake.—Wind west and very hot all day, cloudy and close towards evening and lots of mosquitoes.

July 9th, Musk-Ox Lake.—Wind south-west and hot. A few remains of snow drifts here and there, but the country looking green and fresh.

July 10th.—Musk-Ox Lake.—Wind north-west, warm in morning and lots of mosquitoes. Later on thunder with light showers of rain after which it turned very cold and quite the appearance of snow.

July 11th, Musk-Ox Lake.—Strong north wind. Stormy with showers of hail all day. Wind increased in evening to a regular storm.

July 12th, Musk-Ox Lake.—Wind north-west; still stormy, snowed the whole of the day.

July 13th, Musk-Ox Lake.—Weather still unsettled.

July 14th, Musk-Ox Lake.—Wind west, cloudy.

July 15th, Musk-Ox Lake.—Wind west, clearing.

July 16th.—Wind west, cloudy with showers passing.

July 17th.—Wind south, fine.

July 18th.—Wind south-west ; a very fine day.

July 19th.—Wind south-west.

July 20th.—Wind south-west ; very hot.

July 21st.—Wind north-west.

July 22nd.—Wind north ; strong, heavy mist, hiding distant view.

July 23rd.—Wind westerly and light.

July 24th.—Rained most of night ; wind east with heavy rain all day.

July 25th, Beechy Lake.—Cloudy with showers of rain, wind north-east.

July 26th.—Wind east.

July 27th.—Wind north-east.

July 28th.—Wind north-east.

July 29th.—Wind south-east and very hot.

July 30th. — Wind south-east, rained 2 hours and during night.

July 31st.—Before mid-day began to rain and continued all night.

August 1st.—Wind north-east, rained heavily all day till near 6 p.m., wind north east.

August 2nd.—Wind south, fine day.

August 3rd, Musk-Ox Lake.—Rained at intervals through the night, wind sout-west, blowing hard, showers passing all day.

August 4th, Musk Ox Lake.—Wind south-east, blowing very hard all day.

August 5th, South end Musk Ox-Lake.—Wind west.

August 6th, Portage.—Wind north-west.

August 7th, Aylmer Lake.—Wind south-west, fine day ; slight frost on grass and moss.

August 9th, Clinton Golden Lake.—Calm morning.

August 10th.—Wind west.

August 11th.—Wind north-west.

August 12th.—Wind northerly.

August 13th.—Wind south.

August 14th.—Wind south.

August 15th.—Wind north.

August 16th.—Wind light and southerly.

August 17th.—Calm.

August 18th, Great Slave Lake.—Wind south-west, rained heavily nearly all night and well into the day.

August 19th.—Wind north-west, but very light.

August 20th.—Wind west, but light.

August 21st.—Wind north.

CONCHOLOGY.

Edited by F. R. LATCHFORD, B.A.

The presence in Ottawa of the Rev. G. W. Taylor, and his enthusiasm as a student of mollusca life, led the Conchological branch to organize an excursion to the Laurentian lakes on September 22nd. Behind a fine team of bays driven by Landreville, five enthusiastic naturalists left town, as dawn was breaking through a heavy downpour of rain. The vehicle was uncovered, but rubber coats and tarpaulins successfully repelled the attacks of Jupiter Pluvius. With tales of flood and field, of wild adventure on the Fraser, Columbia and Peace, and the prairies of Sumass and Manitoba, the time passed pleasantly and rapidly. The mountains were reached before nine, and to please the botanists present, an expedition was led to a defile, into which the Walking-leaf Fern *Camptosoros rhizophyllus* has retreated from the vandals who have exterminated it nearer Ottawa. A few specimens showing the tip of the frond taking root were selected, and the remainder left to increase and multiply, in their own peculiar way. The graceful little *Asplenium trichomanes* and *Aspidium Braunii*, both rare species here, were also noticed. On the side of the mountain where these ferns are found, many land shells were taken. The journey was then resumed in the rain, but frequent halts were made, now to collect a fern or dainty moss, now a Catocala moth, and again a fine specimen of the Ginseng, *Aralia quinquefolia*, whose bright fruit though hidden in the dense foliage on the mountain side had caught the watchful eye

of Mr. Fletcher. The scenery along the route was very beautiful and was enjoyed despite the rain. The road ran round and up and down the old Laurentides, which were clothed to their summits with maples, birches and other deciduous trees, showing softly through the mist all the changeful hues of autumn. As day advanced the rain abated, the clouds broke up, and some descending, hung upon the breasts of the mountains, adding new beauties to the ever changing scene.

Meech's Lake was reached and a brief stop made in one of the intervals of brightness which were ever inspiring the more sanguine with hopes of fair weather; but the rain coming on again, the journey was resumed. Near Mr. Tilley's cottage is a bay where *Limnaea megasoma* was found some years ago, and here a halt was ordered, and fine specimens of the much desired shell was soon obtained. Like other precious things, their number was limited; and the search for them was attended with much difficulty. One of the party in his eagerness lost his foot-hold on a slippery log and took an involuntary plunge into the lake. When he recovered his breath he declared the water was warmer than the air, but no one was thus induced to test the veracity of his statement. The work of collecting went merrily on, resulting in upward of thirty examples of *L. megasoma*, *L Stagnalis* and *Physa Lordi* were also found. Lake Harrington was sighted about ten o'clock, but the mountain air had so whetted the appetites of the party, that it was unanimously decided to dine forthwith. Mr. Gillespie kindly placed his hospitable farm house at the disposal of the party. Boxes and baskets were opened, displaying all sorts of edible treasures, which, with tea freshly brewed and fragrant, soon disappeared from view. After the good dinner the weather brightened and the rain at last ceased to fall. Owing to a dam recently built across the outlet, the lake was found much above the ordinary level. Shells were few and far between along the shores. A group of islands nearly a mile up was said to afford numerous shells, but on visiting them in a boat, few specimens were found. *Unio complanatus*, *Limnaea Stagnalis*, *Physa Lordi*, *Planorbis hirsutus*, *Pl. Campanulatus* were however noted, and a plant, *Eriocaulon septangulare*, not known to occur nearer Ottawa than Masham.

Returning to the outlet near Alexander's Mill, search was made for *Anodonta undulata*, a fine form of which, resembling *A. Unadilla*

Dekay, was known to occur in the discharge from Meech's and other Laurentian lakes. For a time the stream afforded only *Physa Lordi*, and *U. complanatus*, but *A. undulata* was at last found. As the discovery of specimen after specimen was announced, one member of the party after another made his way into the water accoutered as he was; and soon the strange spectacle was presented, of five able bodied men, fully clothed, plunging their upper as well as nether limbs, into the stream and ejaculating at brief intervals, "I've another." "Every one to his trade, but this palls on me," was the remark of one of the natives, as he stood on the bridge and looked down upon the clam hunters. It would be of interest to know what he thought, and left unsaid. Notwithstanding his adverse criticism, the search was continued until the most avaricious conchologist expressed himself content. And well might he be! *A. undulata* was taken by the hundred, beautiful specimens in every stage of growth. Several *Magaritana undulata* were also found, the younger shells being of remarkable beauty. Time was flying, and as it was intended to visit another locality on Meech's lake before it became too dark for collecting, the return journey was begun at five o'clock, after another hearty meal. What with the rain and the plunging in mire and stream, every article of clothing was saturated. Fortunately the evening was warm and the road excellent. The desired point on Meech's lake was reached while it was yet daylight and a united advance was made into its waters. *L. megasoma* was again taken, and very large *Physa Lordi*. But one of the special objects of the excursion was the extraordinary form of *Planorbis bicarinatus* which Meech's lake and Brome lake of all the waters of America are alone known to furnish. About thirty-five specimens were obtained before a cloud settled down with darkness on the lake. The drive homeward was continued through a dense mist. Wet but happy, the party reached the city about nine, having collected forty one species of shells. The excursion was on the whole, one of the most successful ever made by the conchological branch of the club. L.

FAUNA OTTAWAENSIS.

Hymenoptera Phytophaga.

By W. Hague Harrington.

The subjoined list, of that important section of the Hymenoptera which is most injurious to plant life, is offered as a contribution to the knowledge of our local Fauna. The list was prepared last winter and the numbers given for each species are those of the insects then in my collection, irrespective of such specimens as may have been given away or exchanged. These numbers are an indication of the relative abundance of the species and of the sex or sexes represented. The captures of the season just closed have not been arranged, but it is improbable that any additions have been made to the species previously captured. When they have been carefully examined, any items of interest regarding them will be recorded. The dates quoted for each species are the earliest and latest shown on the labels attached to individuals of that species. All the specimens are not, however, dated, and so no dates can be given for several of the species. All the species have been collected since the organization of the Ottawa Field Naturalists Club, in the city or adjacent country, and several of the rarer species have been contributed by Mr. Fletcher and Prof. Guignard. Several of the species collected seemed apparently new to science and have been described by Provancher (Faune Entomologique du Canada, Vol. ii, Additions) or by the author (Canadian Entomologist Vols. xvi, xxv) and are those in the list of which types are indicated as in the collection.

Subsection Phyllophaga.

This division contains the species feeding upon the foliage of various plants, and consists of the family Tenthredinidæ, of which the adult insects are popularly, and appropriately known as Sawflies. The female has the ovipositor modified to form a more or less acutely toothed saw, with which a slit can be made in a leaf or twig for the reception of the egg. Some species have the saw feebly developed and make but a slight incision, or even (as the Gooseberry Sawfly) merely attach the egg

to the surface of the leaf. Other species have the instrument much stronger and are able to cut a groove even in the harder tissues, sufficient to entirely hide and protect the egg. The larvæ have a general resemblance to those of many Lepidoptera, and are often known as false-caterpillars. The greater number feed openly upon the leaves, but some produce galls, or are inquilinous in the galls of other insects, and others are leaf-miners, or infest buds, etc. The species feeding openly are protected from their enemies in many different ways: as by assimilating to the colour of the foliage, emitting disagreeable odours or secretions, raising and lashing the abdomen about, feeding at night or on the under surface of the leaves, constructing shelters, etc. The immediate neighborhood has already yielded about one hundred and fifty species of Sawflies, but the true value and affinities of many forms cannot be known until they have been determined by breeding, for the larvæ and food-plants of comparatively few species are yet known to us. A list of the species collected in 1889 is given in Canadian Entomologist Vol. xvii, p. 23.

TENTHREDINIDÆ.

Cimbex.

C. americana, Leach.—1 male, 1 female.

Var. *decemmaculata*, Leach.—2 males. May 11th.

Var. *alba*, Norton.—1 female.

Var. *LaPortei*, St. Farg.—3 males. June 16th.

This handsome and very variable insect is not common, but its larvæ are occasionally found on willow and elm.—They are yellow, with a black dorsal line, and a finely granulose apparence; when at rest they are coiled spirally on the leaf.

Trichiosoma.

T. triangulum, Kirby.—2 males and female. May 12th, July 28th.

Not a common insect, although the larvæ are not infrequent on willows. Seems to be more abundant farther north, as for instance at Sudbury.—Larvæ resemble those of Cimbex, but are green and without dorsal line.

ABIA.

A. Kennicotti, Norton.—2 females from Mr. Fletcher.

ZAREA.

Z. inflata, Norton (?)—1 female. May 11th.

This insect may be a var. of the preceding species, as the American genera and species are not well separated. It has the white band at base of abdomen which Cameron gives as distinguishing the British species of this genus from Abia.

ACORDULECERA.

A. dorsalis Say.—4 males, 13 females. May 16th, August 2nd.

Occurs on Hickory and Oak; the larvæ gregarious and rapidly skeletonizing the leaves.

HYLOTOMA.

H. McLeayi, Leach.—3 males, 8 females. May 10th, Aug. 2nd.
H. clavicornis, Fabr.—1 male, 5 females. June 13th, August 1st.
H. scapularis, Klug.—2 males, 3 females. June 10th, July 19th.

These species are found in the early part of the season on flowers of Service-berry, Choke-cherry, etc., and later on Spiræa and Goldenrod.

CLADIUS.

C. pectinicornis, Fourcr. (*C. isomera*, Harris.)—1 male, 8 females. May 24th, July 19th. This species (common in Europe) has been bred from larvæ feeding on roses and seems to be increasing in numbers. It is one of the three sawflies which are now well recognized as rose-pests.

PRIOPHORUS.

P. æqualis, Norton.—2 males, 7 females. July 24th.

Bred from larvæ, feeding on willows, and found also on poplar.

PRISTIPHORA.

P. scycophanta, Walsh.—1 male, 3 females. May 12th, June 26th.
P. grossulariæ, Walsh.—6 females. May 11th, June 28th.
P. identidem, Norton (?).—3 males. May 27th, July 12th.

These species are not separated very clearly and the last two should perhaps be combined

EUURA.

E. orbitalis, Norton.—6 males, 12 females. April, May.

These insects have been frequently bred from the galls on the stems of willows, and also from galls of *C. strobiloides*. Specimens vary considerably in size and coloration, but the differences do not seem to be great, or constant, enough to allow of separation, although following the descriptions they might be divided into almost as many species as have been erected by Walsh and Norton.

NEMATUS.

N. concolor, Norton.—2 females. April 23rd.
N. labradoris, Norton.—1 female.
N. malacus, Norton.—2 females. May 8th and 18th.
N. extensicornis, Norton.—8 males. May 16th, June 5th.
N. monela, Norton?—1 female. June 6th, (from Mr. Guignard.)
N. subalbatus, Norton?—9 females. May 28th, June 5th.
N. corniger, Norton.—16 males, 15 females. May 17th, August 8th.
N. pallicornis, Norton.—13 males, 19 females. May 9th, June 13th.
N. ventralis, Say.—2 males, 7 females. May 24th, July 1st.
N. saskatchewan, Norton. —2 females. May 28th, June 6th.
N. militaris, Cress.—1 female.
N. latifasciatus, Cress.—1 male, 1 female. July 7th, Alder.
N. erythrogaster, Norton.—1 males, 7 females. June 5th, August 8th.
N. Erichsonii, Hartig.—1 male, 11 females. May 19th, June 23rd.

This imported species has devasted the larch forests of the Maritime Provinces and Quebec, and in Ontario has been also so abundant as to annually defoliate this tree. Its increase seems, however, to have been slightly checked, and during the past season the trees suffered less, apparently.

N. pallidiventris, Fallèn?—2 males, 5 females. August 26th.

This is apparently an imported species, and has been found infesting ornamental willows on the Central Experimental Farm. The females were ovipositing on the date given. It differs in some respects from *pallidiventris* as described by Cameron, and may be a distinct species.

N. rufocinctus, Harr.—1 female. (Type) June 26th, Alder.
N. bivittatus, Norton.—2 females. May 17th, June 10th.
N. thoracicus, Harr.—1 female. (Type,) May 11th.
N. similaris, Norton.—1 female. June 26th, Acacia.
N. lineatus, Harr.—1 female. (Type,) May 5th.
N. ribesii, Scop.—8 females. April 23rd, July 1st.

The larvæ of this species devour the foliage of the cultivated currants and gooseberry, and do serious damage when the plants are neglected. A simple treatment with hellebore proves very efficacious in staying their ravages, and a small parasite which has been found recently to attack the eggs, may perhaps aid in lessening the numbers of the pest.

N. suadus, Cress.—2 females.
N. aureopectus, Norton.—6 females. May 10th, 30th.
N. pleuricus, Norton.—1 female. May 9th.
N. lateralis, Norton.—1 female. May 9th.
N. mendicus, Walsh.—1 male, 9 females. May 9th, June 26th. Willow.
N. s. pomum, Walsh.—male and female. From Willow galls.
N. gallicola, Steph. (*Messa hyalina*, Norton?).—16 females. June and July. The galls of this species are very abundant on willows during the entire season.
N. inquilinus, Walsh?—1 female. August 15th.
N. ocreatus, Harr.—1 female. May 16th. (Type).

In addition to the 32 species (?) enumerated, there are a number of specimens not determined. The genus Nematus is so extensive that many of the species cannot be satisfactorily determined. When more of the species have been carefully bred, and when a thorough study is made of the genus, many of the species will doubtless prove to be but variations. Very many of the commoner species feed on willows, so that feeding is easy; the most difficult part of the breeding is the carrying through the pupæ when buried in the earth.

Fenusa.

F. varipes, St. Farg.—21 females. June 9th, August 26th.

Also a European species, which has badly infested alders at the

Experimental Farm, and has been found on native alders in Dows Swamp. The larvæ are miners and form brown blotches in the upper surface of the leaves.

EMPHYTUS.

E. apertus, Norton.—2 males, 20 females. May 17th, August 18th.

E. strameniepes, Cress ?—1 female.

E. inornatus, Say.—1 male, *var.*

E. multicolor, Norton. (*Strongylogaster multicolor*, Norton ; *E. Hullensis* Prov.)—3 males, 5 females. June 3rd, 28th. (2 Types of *E. Hullensis*.)

E. canadensis, Kirby. (*E. pallipes*, Prov.)—8 females. May 24th, June 9th. Violets and Pansies.

E. mellipes, Norton.—2 males, 3 females. May 11th, June 12th.

E. cinctus, Linn. (*E. cinctipes*, Norton).—1 male (from Mr. Fletcher.)

This species has probably been introduced from Europe, and during the present year the larvæ have been noticed upon our garden roses, of which they promise to be another serious past.

HARPIPHORUS.

H. tarsatus, Say.—4 females. June 7th, July 19th.

Var. *varianus*, Norton.—5 males, 10 females. June 6th, 28th.

This fine species (rufous, or black, with white markings) occurs upon Cornels, growing along the Beaver Meadow, Hull.

H. semicornis, Say.—1 female. May 31st.

DOLERUS.

D. unicolor, Beauv.—12 males. April 18th, May 12th.

D. arvensis, Say.—10 females. May 6th, June 7th. (= *unicolor* ?)

D. sericeus, Say.—8 males, 2 females. April 23rd, May 27th.

D. collaris, Say.—5 females. May 10th, 30th.

D. aprilus, Norton.—12 males, 23 females. May 22th, Aug. 26th.

D. albifrons, Norton.—10 males, 7 females. May 24th, June 29th.

D. apricus, Norton.—2 females. May 24th, June 13th.

D. similis, Norton.—9 females. May 19th, June 24th.

D. bicolor, Beauv.—5 females. May 24th, 27th.

D. abdominalis, Norton.—2 males. May 21th, June 18th. (= *bicolor* ?)

Nearly all the species of Dolerus are abundant in Spring, and are attracted to the sap oozing from stumps, etc., and to the alder and willows when in bloom.

HEMICHROA.

H. americana, Prov. (*Dineura*)—1 female. June 26th. (Hull 1884.)

BLENNOCAMPA.

B. paupera, Prov.—3 females. May 8th, 9th.

B. parva, Cress.—1 female. June 10th.

B. carbonaria, Cress (?)—1 female. June 19th.

MONOPHADNUS.

M. bardus, Say.—1 male, 6 females. May 25th, June 23th.

The white larvæ of this handsome red-shouldered sawfly, feed on the foliage of the ash, and have sometimes completely stripped trees in this city.

H. medius, Norton.—2 males, 12 females. May 11th, July 12th.

H. rubi, Harris.—5 males, 8 females. May 12th, 27th.

The pale green, spiny larvæ of this species defoliate the wild and cultivated raspberry.

PHYMATOCERA.

P. fumipennis, Norton.—8 males, 10 females. May 17th, June 14th.

P. nigra, Harr.—12 females. (5 Types) May 10th, 31st.

P. montivaga Cress. (?)— 1 female.

HOPLOCAMPA.

H. halcyon, Norton.—3 males, 15 females. May 11th, 17th. Shadbush.

MONOSTEGIA.

M. rosæ, Harris.—16 females. May 19th, June 9th.

The slug-like larvæ of this species are very injurious to roses, and are more generally known than the larvæ of the two species (*C. pectinicornis*, and *E. cinctus*) already noted as infesting these favorite plants. The small black fly is very abundant in June.

M. maculata, Norton (*Emphytus*)—25 males, 63 females. May 1st, June 28th.

This species is a well-known pest of the strawberry, and its wing venation is very irregular (Insect Life Vol. 2. p. 227.)

M. ignota, Norton (?)—2 males. 2 females. May 27th, 31st.

SELANDRIA.

S. flavipes, Norton.—14 males, 12 females. May 24th, Aug. 8th.

A common species upon ferns, on which the larvæ feed.

SCIAPTERYX.

S. punctum, Prov.—2 males, 2 females. June 27th, July 8th.

ALLANTUS.

A. robustus, Prov.—1 female. (Type.)

A. basilaris, Say.—4 males, 13 females. June 28th, Aug. 7th.

This species is abundant in July upon goldenrod and spiræa, and is partially predaceous in its habits.

MACROPHYA.

M. flavicoxæ, Norton.—8 males, 28 females. May 30th, July 8th.

M. albilabris, Harr.—1 male. (Type. var *flavicoxæ*?)

M. externa, Say.—2 females. June 26th.

M. tibiator, Norton.—1 male, 1 female. June 28th.

M. contaminator, Prov.—4 females. June 26th, July 12th.

M. propinqua, Harr.—4 females. (Types.) July 5th, 26th.

M. nigra, Norton.—5 females. June 24th, 28th.

M. albomaculata, Norton.—1 male, 8 females. June 4th, July 5th.

M. trisyllaba, Norton.—9 males, 36 females. June 6th, Aug. 1st.

This is the most common of our species of Macrophya, and occurs abundantly upon nettles growing in damp woods.

M. varia, Norton.—2 females. June 20th, 28th.

M. trosula, Norton.—1 female. June 10th, (from Mr. Guignard 1885.)

M. fascialis, Norton.—2 females. June 26th, July 5th.

PACHYPROTASIS.

P. omega, Norton.—1 male, 4 females. June 28th, July 28th.

P. delta, Prov.—40 males, 24 females. May 31st, July 12th.

This species, abundant in swampy margins of woods, is very variable in wing venation, (Can. Ent. vol. XVIII, p. 32.)

P. varipicta, Harr.—2 males, 1 female. (Types.) June 7th, 10th.

TAXONUS.

T. nigrisoma, Norton —11 males, 2 females. May 24th, June 5th.

T. rufipes, Harr.—3 males. (2 Types.) May 8th, 18th.

T. dubitatus, Norton.— 19 males, 14 females. May 28th, July 19th.

T. albidopictus, Norton.—4 males, 20 females. May 24th, Aug. 2nd.

T. unicinctus, Norton.—3 females. May 27th, 30th.

STRONGYLOGASTER.

S. pallicoxus, Prov.—1 male, 13 females. (2 Types.) May 30th, June 23rd.

S. proximus, Prov.—3 females. (1 Type,) July 25th.

S. rufocinctus, Norton.—6 males, 5 females. June 13th, July 11th.

S. epicera, Say.—2 males, 7 females. May 29th, June 27th.

S. terminalis, Say.— 2 females. June 23rd, 28th.

S. apicalis, Say.—4 males, 9 females. June 13th, July 28th.

S. pallidicornis, Norton.—1 male, 2 females. July 18th, 26th.

S. longulus, Norton.—4 males. May 24th, June 3rd.

S. luctuosus, Prov.—1 male, 2 females. (1 Type,) May 22nd, 28th.

S. distans, Norton (?)—1 female. (taken alive from an ant.)

S. soriculatus, Prov.—1 male, 2 females. May 24th, June 3rd.

S. annulosus, Norton.—4 females. May 24th, June 3rd.

S. tacitus, Say.—2 males, 3 females. May 24th, August 8th.

PŒCILOSTOMA.

P. albosecta, Prov.—1 female. June 10th, Dow's Swamp.

TENTHREDO.

T. grandis, Norton.—5 males, 9 females. June 13th, July 19th..

Var. *nigricollis*, Kirby (?)—1 female. June 15th.

T. rufipes, Say.—10 females. June 2nd, August 2nd.

T. rufopectus, Norton.—5 males. 11 females, June 5th, July 1st.

T. lineata, Prov.—3 females. June 21st.

T. ventralis, Say.—7 females. June 23rd, August 2nd.

T. verticalis, Say.—6 males. 18 females, June 4th, July 26th.
T. basilaris, Prov.—5 females. June 9th, August 2nd.
T. semirubra, Norton.—1 female.
T. signata, Norton.—2 males. June 27th.
T. rufopediba, Norton.—3 males. June 28th, (= *signata* ?)
T. eximia, Norton.—1 male, 1 female. May 24th, June 28th.
T. semicornis, Harr.—1 male. June 9th, (Type from Mr. Guignard.)
T. mellina, Norton.—1 male, 5 females. June 12th, July 19th.
T. ruficolor, Norton.—2 females. May 24th, July 1st, (= *mellina* ?)

TENTHREDOPSIS.

T. atroviolacea, Norton.—9 males, 9 females. June 1st, June 30th.
T. 14-punctata, Norton.—2 males, 2 females. May 31st, June 7th.
T. Evansii, Harr.—1 female. (Mr. Fletcher.)(= *Tenthredo viridis*, Linn?
T. (?) *annulicornis*, Harr.—1 male, 1 female. (Types) May 28th, June 6th. Perhaps two species.

LOPHYRUS.

L. Lecontei, Fitch.—5 females. May 19th.

The larvæ of this species feed upon the red pine ; they are yellowish with black markings. Bred flies emerged in April.

L. abietis, Harris.—2 males, 8 females. June 12th, July 22nd.

This is a much commoner species, the larvæ feeding upon the spruce. They are greenish with darker longitudinal stripes. Cocoons much smaller and paler, frequently parasitized.

MONOCTENUS.

M. fulvus, Norton.—3 males, 6 females. May 7th, June 6th.

Larvæ larger and more yellowish, feeding upon cedar.

PAMPHILIUS. (Lyda.)

P. maculiventris, Norton.—3 males, 1 female. June 12th, 26th.
P. marginiventris, Cress.—2 females. May 7th, 24th. (= var. *maculiventris*. ?)
P. luteomaculatus, Cress.—3 females. May 24th. (= var. *maculiventris*?)
P. ruficeps, Harr.—1 female. May 31st. (Type ; = var. *brunniceps*, *Cr.*?)
P. perplexus, Cress.—4 males, 2 females. May 11th, 28th.

P. canadensis, Norton.—2 females. June 7th.
P. excavatus, Norton.—1 male.
P. quebecensis, Prov.—2 females. June 27th, 30th.
P. pallimaculus, Norton.—4 females. June 6th, 7th.
P. ocreatus, Say.—1 female.
P. rufofasciatus, Norton.—3 females. June 26th, July 26th.
P. cinctus, Harr.—1 female. June 28th. (Type.)
P. Harringtonii, Prov.—1 female. (Type.)
P. luteicornis, Norton.—1 male, 2 females. June 2nd, 12th.

Macroxyela.

M. infuscata, Norton.—1 female.

This specimen was taken near the city two years ago by my son then about nine years of age, and is the only one I have seen.

Xyela.

X. minor, Norton.—1 male, 10 females. June 8th, 16th. Spruce.

Subsection Xylophaga.

This limited division contains the few species which feed internally upon the pith, or woody tissues of the plants infested. The ovipositor of the female, instead of being saw-like, is more prolonged, and is so contructed that it forms a regular borer, which in the larger species can pierce even the solid wood of our forest trees, in which the eggs are deposited and in which the larvæ live. These larvæ are somewhat elongated white grubs, having only rudimentary legs and thus approaching more closely the ordinary footless grub of the Hymenoptera, than do saw-fly larvæ. The species of Xylophaga are all included in one family, the Uroceridæ, and only five genera are represented in Canada. The larvæ of Cephus infest the stems of grasses or the twigs and shoots of various shrubs; those of Oryssus and Xiphydria bore into the trunks of maple, willow, poplar, etc., those of Tremex inhabit chiefly old maples and beeches, while those of Urocerus confine their attacks to the conifers which they sometimes seriously injure.

UROCERIDÆ.

CEPHUS.

C. pygmæus, Linn.—1 female. (sent to, and identified by Mr. Ashmead.)

C. bimaculatus, Norton.—2 females. May 30th.

One of these was ovipositing in a twig of *Viburnum lentago.*

C. trimaculatus, Say.—1 female. June 16th.

ORYSSUS.

O. Sayi, Westwood.—1 male, 1 female. Maple.

var. *affinis*, Harris—6 males. May 29th. June 13th. Maple.

var. *terminalis*, Newm.—10 females. June 3rd, 23rd. Maple.

var. *occidentalis*, Cress.—1 male, 1 female. May 30th, 31st. Maple.

XIPHYDRIA.

X albicornis, Harris.—4 males, 15 females. June 16th, July 6.

This species frequently attacks maples planted in the city streets.

X. Provancheri, Cress.—1 female. June 15th. Maple. Hull.

X. rufiventris, Cress.—1 female. (from Mr. Fletcher.)

X. attenuata, Norton.—2 males. Basswood.

UROCERUS.

U. cyaneus, Fabr.—2 males, 9 females. Sept. 16th, Oct. 2nd.

U. albicornis, Fabr.—4 females. Aug. 22nd, 26th.

U. abdominalis, Harris.—12 males. June 22nd, Aug. 13th. Larch.

These are probably the males of *albicornis*, although so different.

U. flavicornis, Fabr.—1 female. (coll. Mr. Fletcher.)

TREMEX.

T. columba, Linn.—2 males, 17 females. July, Oct.

This is a common species which badly infests old maples and beeches, and frequently emerges from sticks of firewood. Females may often be found which have not been able to withdraw their ovipositors from the wood in which they were boring, and have been held there until they perished.

BOOK NOTICES.

Notes on the Gasteropoda of the Trenton limestone of Manitoba, with a description of one new species, by J. F. Whiteaves of the Geological Survey of Canada. *Canadian Record of Science*, April 1893, pp. 317-328.

This paper is one of a series on the Cambro-Silurian fossils of Manitoba. The author's reports on the Orthoceratites of the Winnipeg basin, published in the Royal Society's Transactions for 1891 and 1892, are well known, whilst the remainder of the fauna of these Palæozoic rocks will no doubt be shortly described.

Mr. Whiteaves has had access to all the collections made by officers of the Geological Survey; to specimens obtained during the Saskatchewan Exploring Expedition of 1858; to those collected by Hudson Bay officers and to notes on those of Sir John Richardson, and other Arctic explorers. The present report forms, therefore, an important contribution to the geological history of those interesting and important regions of Canada.

Amongst the collections received were those made by Prof. H. Y. Hind in 1858, by Dr. Selwyn in 1872, by Dr. Bell in 1879 and 1880, by Messrs MacCharles and Weston, in 1884; by Mr. Tyrell in 1889 and 1890, and by Messrs Dowling and Lambe in 1889-90. The collections are from the following localities:—East Selkirk, Lower Fort Garry and Nelson River (in Keewatin,) on the mainland and Big, Elk, Deer, Birch, Snake, Bereus, Jack Fish, Sturgeon, Black Bear and other islands in Lake Winnipeg. Sixteen species of Trenton Gasteropoda are recorded, as follows:—

Trenton Gasteropoda.

1. *Raphistoma lenticulare*, Hall.
2. *Pleurotomaria subconica*, Hall.
3. " *muralis*, D. D. Owen.
4. *Murchisonia Milleri*, Hall.
5. " *gracilis*, Hall.
6. " *bellicincta*, Hall, var. *teretiformis*, Billings.

7. *Bucania (Tremanotus ?) Buelli*, Whitf.
8. *Bucania sulcatina*, Emmons.
9. " *bidorsata*, Hall.
10. *Cyrtolites compressus*, Conrad.
11. *Eunema strigillatum*, Salter.
12. *Helicotoma planulata*, Salter.
13. *Trochonema umbilicatum*, Hall.
14. *Maclurea Manitobensis*, Whiteaves.
15. *Loxonema Winnipegense*, N. sp.
16. *Fusispira ventricosa*, Hall.

Of these, *Loxonema Winnipegense* is the only new form to Science, "The species is of considerable interest" Mr. Whiteaves remarks, "on account of its striking and close similarity to some of the most typical Jurassic species of *Pseudomelania*." The large operculum which was found associated with the *Maclurea Manitobensis*, Whiteaves, (Trans. Royal Society Canada, vol. VII., Sect 4., p. 75. pls., XII and XIII figs. 1 and 2.,) is of interest, in that it does not possess a muscular process such as is seen in the operculum of *Maclurea Logani*, Salter of this district. Of the sixteen species recorded, no less than eleven are forms which were more or less abundant in the old Cambro-Silurian seas about Ottawa, and whose remains we now find imbedded in the rocks of old Barrack Hill, of Hull and of the Black River and Trenton formations of the Ottawa Valley generally. The fauna as exemplified in the gasteropoda appears to be nearer Black River than Trenton, although the two belong to one and the same period in the history of this portion of the North American Continent.—H. M. Ami.

Report of the U. S. National Museum, under the Direction of the Smithsonian Institution, for the year ending June 30th, 1890.

This volume of 800 pages contains a most interesting collection of reports and scientific papers. In addition to the reports of the Assistant Secretary and of the Curators of the several departments of the Museum, there is a series of most valuable papers, discussing and illustrating the

collections therein. But brief mention can be made of a few of the papers, the first of which is by Robert Ridgeway on "The Humming Birds," covering 130 pages and illustrated by 46 plates of the many species enumerated. "The Methods of Fire Making," by Walter Hough gives the various ways in which primitive people secured the all essential fire. Prof. Romyn Hitchcock contributes two very interesting papers, one on the "Ainos of Japan," a race which at one time probably inhabited the whole empire, but which is now a scanty people in the island of Yezo; the other on the evidences of a race which may have preceeded the Ainos and which are designated as "The Ancient Pit Dwellers of Yezo. The first part of a "Handbook for the Department of Geology" appears and deals with Geognosy, or the materials of the earth's crust, by Geo. P. Merrill.—(Ed.)

Birds of Michigan.—Bulletin 94, Michigan Agricultural College. Prof. A. J. Cook.

The Michigan Experiment Station here furnishes to its supporters a very valuable catalogue of the birds recorded from the State, many of which are illustrated in part or in whole—The species recorded number 332, and as the fauna of Michigan agrees in general with that of Ontario the members of the club will find the work of Prof. Cook to be of much interest and value to them in the study of our own bird fauna.—(Ed.)

BOTANY.

Edited by W. Scott, B.A.

Veronica Buxbaumii at Quebec.—I have received from Miss Alice Bowen of Quebec, some nice specimens of the above pretty little Speedwell, which is such an attractive feature of the English hedgerows. "The plant was found in an old, neglected, garden flower-bed" at Quebec. This species is recorded by Macoun as a ballast plant from North Sydney, and Pictou, N. S., and by Burgess from Kingston and London, Ont.—J. F.

CONCHOLOGY.

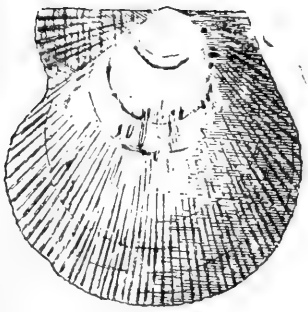
Edited by F. R. LATCHFORD, B.A.

Several hundred *Helix rufescens* and *H. Cantiana*, collected at Quebec, with probably a thousand eggs of the latter species, have been set out on the Exhibition Grounds west of Machinery Hall. The place selected is quite undisturbed, even when other portions of the grounds are thronged with people; and as it is easy of access frequent observations may be made of the success or failure of these shells to exist so far inland. Both species have made their way into Canada from England and are now as firmly established on Cape Diamond as the flag which they followed across the sea. *H. rufescens* abounds throughout the City of Quebec, at Levis, and on the Island of Orleans. *H. Cantiana* appears to be restricted to two localities on the escarpment of the Cape; and this may account for the fact that the shell escaped notice until 1885. It is not known to occur elsewhere in America, and its struggle for existence here will be watched with interest.—L.

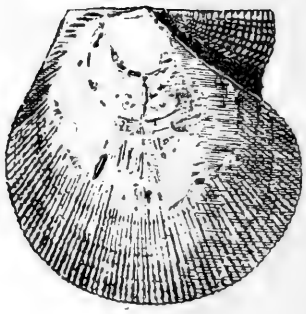
Another shell, *H. harpa*, small but beautiful and a native of our northern clime, though not hitherto known to occur in this vicinity, has also been introduced on the peninsula, near Machinery Hall. More than a hundred mature individuals from Ste. Petronille, on the Island of Orleans, have been placed among just such bracken and poplars, as they had been taken from a few days before.—L.

NOTICE TO MEMBERS.

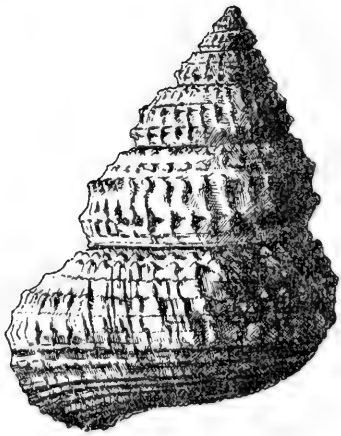
The Soiree Committee is about to arrange the programme of evening meetings for the winter season, and desires that any member who may wish to read a paper, or to have one presented, will without delay furnish the title of his proposed paper, and the date on which it will be completed. The Leaders of the several Branches, will be glad to have notes of any objects of special interest which have been observed during the past season, to assist them in preparing the reports of the Branches. The Treasurer finds that many members have apparently forgotten that the annual subscription fee is payable in advance, and that money is needed monthly for the payment of printer's bills and postage. (Ed.)



1



1 a.



2

2 a.

L. M. Lambe, del.

NOTES ON SOME MARINE INVERTEBRATA FROM THE COAST OF BRITISH COLUMBIA. 1

By J. F. Whiteaves.

Echinodermata.

Strongylocentrotus Franciscanus, A. Agassiz.

This littoral species was recorded by the writer as having been collected by Mr. James Richardson in 1874 at Sooke, in the Strait of De Fuca. Dr. G. M. Dawson found it to be the common sea urchin of the Queen Charlotte and Vancouver islands, and especially abundant in localities exposed to the open sea, although its name was inadvertently omitted in the published lists of Echinoidea in his 1878 and 1885 collections. Specimens of it were obtained at Qualicum, V. I., by Professor Macoun in 1889.

Mollusca.

Pelecypoda.

Pecten (Pseudamusium) Vancouverensis. (Sp. nov.)

Plate 1, figs. 1 and 1 a

Shell small, equivalved, compressed lenticular, both valves being equally convex, ovately subcircular in outline apart from the ears and rather oblique : valves extremely thin and fragile, translucent and almost transparent, pale horn colour with a slightly yellowish hue. Beaks placed a little behind the midlength ; hinge line straight and very long ; ears unequal in size, the posterior pair, which are much smaller than the anterior, alike, indistinctly defined and merging gradually and imperceptibly into the general convexity and marginal contour of that side of each valve ; anterior ears large, subtriangular, prolonged laterally and longer than high, distinctly defined, that of the left valve somewhat convex in outline above and concave below, that of the right valve with a deep and acutely angular byssal sinus at its base.

---

1. Communicated by permission of the Director of the Geological Survey Department.

Surface marked by densely crowded and exceedingly minute, irregular and rarely continuous, but on the whole radiating, simple or bifurcating raised lines, also by comparatively large, regularly disposed and distant squamose radii. In the centre of each valve the minute and non-squamose raised lines are essentially parallel to the larger squamose radii, but on the sides the former are disposed obliquely to the latter. The surface of the anterior ear of each valve is minutely cancellated with extremely minute raised lines, which are almost parallel to the hinge line, in addition to the coarser cross lines. The whole sculpture of the exterior of the test is far too minute to be clearly seen without the aid of a microscope or powerful simple lens, but under either of these a few faint concentric lines of growth are also visible.

Dimensions of the only specimen that the writer has seen: height, from beaks to base, 7.50 mm.; maximum length, 7.75 mm.; greatest thickness through the closed valves, 2.25 mm.

Forward Inlet, Quatsino Sound, Vancouver Island, in ten to twenty fathoms mud, Dr. G. M. Dawson, 1885: one living specimen.

In the list of specimens collected by Dr. Dawson in that year, the little shell upon which the foregoing description is based, was erroneously identified with the *Pecten Alaskensis* of Dall. A subsequent study of its characters, has led to the conclusion that it is much more nearly related to *Pecten vitreus*, Chemnitz, and *P. abyssorum*, Loven, from both of which it can be readily recognized by its very peculiar sculpture. *P. Alaskensis* has opaque and much thicker valves and different surface markings. Its posterior auricles are distinctly defined and its anterior auricles very much smaller in proportion to the size of the shell, than those of *P. Vancouverensis*. The credit of first distinguishing between the species last named and *P. Alaskensis* is due to the Rev. G. W. Taylor, of Victoria, V.I., who informs the writer that he has two specimens in his collection dredged in about ten fathoms sand, Departure Bay, near Nanaimo, in 1888.

CARDIUM (FULVIA) MODESTUM, Adams and Reeve.

The shell for which the name *Cardium Richardsoni* was proposed in the Canadian Naturalist for December, 1878, was described as a new

species almost entirely upon the authority of the late Dr. P. P. Carpenter. Dr. W. H. Dall, however, regards both the *Cardium* var. *centifilosum*, Carpenter, and *C. Richardsoni* as synonyms of *C. modestum.*

CUMINGIA CALIFORNICA, Conrad.

Barclay Sound, on the south west coast of Vancouver Island, Professor Macoun, 1887 : one perfect specimen.

MACOMA YOLDIFORMIS, Carpenter.

Forward Inlet, Quatsino Sound, in ten to twenty fathoms mud, Dr. G. M. Dawson, 1885 : one fresh and perfect right valve.

PSAMMOBIA RUBRORADIATA, Nuttall.

Barclay Sound, Vancouver Island, Professor Macoun, 1887 : four fresh valves. One dead shell of this species had previously been collected by Dr. Dawson in 1878 at the mouth of Cumshewa Harbour, Q.C.I.

GASTEROPODA.

EMARGINULA CRASSA, J. Sowerby.

An adult shell of this species, with the animal, was found in a jar containing large specimens of *Solaster Stimpsoni*, *S. Dawsoni*, *Cribrella læviuscula* and other starfishes characteristic of the British Columbia marine fauna, preserved in alcohol, the contents of which, except the alcohol, were stated by Dr. Dawson to have been dredged by him at the Queen Charlotte Islands in 1878.

PACHYPOMA INEQUALE, Martyn.

This shell, which is very common in the Vancouver region, was identified by Dr. P. P. Carpenter with *P. gibberosum*, Chemnitz (sp.), but Dr. Dall says that " Martyn's name is four years older," and therefore should be retained for it.

TURCICULA CIDARIS, A. Adams. (Sp.)

Plate 1, figs. 2 and 2 a.

Margarita Cidaris (A. Ad.) Carpenter. 1864. Ann. and Mag. Nat. Hist., 3rd series, vol. xiv, p. 426.

Solariella (Turcicula?) cidaris, Pilsbry. 1889. Cont. of Tryon's Man. Conch., vol. xi, p. 331.

Solariella cidaris, Williamson. 1892. Proc. U. S. Nat. Mus., vol. xv, p. 202, pl. xxii, fig. 4.

The only figure of this beautiful shell that has yet been published represents an enlarged ventral view of an apparently immature Californian specimen, twenty-eight millimetres in height, which is stated by Mrs. M. Burton Williamson (op. cit.) to have been dredged in deep water off the islands in San Pedro Bay by the U. S. Fish Commission. The Canadian specimen, of which two views are given on Plate 1, is the only adult shell that the writer has seen, and measures forty-six millimetres in height (or length) by about thirty-two in maximum breadth. It was dredged by Dr. Dawson, in 1885, in thirty fathoms, sand, gravel and dead shells, off False Head, Queen Charlotte Sound, where several smaller specimens were obtained, as already recorded on page 128 (Section 4) of the fourth volume of Transactions of the Royal Society of Canada. In the adult shell the outer lip is somewhat thickened and its nacreous interior is margined by a narrow white porcellanous rim.

BELA SCULPTURATA, Dall.

Bela sculpturata, Dall. 1886. Proc. U. S. Nat. Mus., p. 299, pl. iv, fig. 7.

"Queen Charlotte Islands and Vancouver district," Dall.

ODOSTOMIA SITKENSIS, Dall.

Dolomite Narrows, Queen Charlotte Islands, Dr. G M. Dawson, and since collected by Dr. Dawson in 1885 at False Bay, Lasqueti Island, as recorded in the fourth volume of Transactions of the Royal Society of Canada.

TRITON (PRIENE) OREGONENSIS, Redfield.

The radula of a Vancouver specimen of this species is essentially similar to that of *Triton* as figured by Wilton in Woodward's Manual of the Mollusca, and Fischer's Manuel de Conchyliologie, its dental formula being 6. 9. 6.

BUCCINUM POLARE, var. PERCRASSUM.

Near Victoria, V. I., J. Richardson, 1875, two dead specimens. Off False Head, Queen Charlotte Sound, in thirty fathoms, Dr. G. M. Dawson, 1885; one specimen. These three shells were named *Buccinum polare*, var. *compactum* by the writer, on the authority of Dr. Dall. The writer, however, has recently been informed by Dr. C. F. Newcombe, of Victoria, that, in a letter received by him on the second of November last, Dr. Dall writes that the word *compactum* is probably a *lapsus* for *percrassum*, and that his *B. polare*, var. *percrassum* was "figured and described in the new edition of Martini and Chemnitz's Conch. Cabinet, Suppl., p. 189, pl. 91, fig. 5." In the official report on the expedition to Point Barrow, Alaska, published at Washington in 1885, Dr. Dall contributes a chapter (vi) on the mollusca obtained. On page 180 of that volume, under the head *Buccinum polare*, Gray, Dr. Dall makes the following remarks. "I have seen two specimens of a singularly thick and short variety *percrassum* from the Arctic north of Bering Strait. It must be exceedingly rare; the upper whorls are smaller, less inflated and less turreted than in the normal form. The operculum is also proportionally larger and more oval. It may prove distinct from *polare*." But in the explanation of the plate of Point Barrow Mollusca, in that volume, fig. 9 is said to represent "*Buccinum plectrum*, Stm., *forma percrassa*, *minor*.

ONCHIDELLA BOREALIS, Dall.

North side of Queen Charlotte Sound, between tides, Dr. G. M. Dawson, 1885; several specimens.

EXPLANATION OF THE PLATE.

PLATE I.

PECTEN (PSEUDAMUSIUM) VANCOUVERENSIS.

Fig. 1. Side view of the type specimen, four times the natural size, and showing the left valve.

" 1 a. Another view of the same specimen, to show the right valve.

TURRICULA CIDARIS.

Fig. 2. Dorsal view of an adult shell of this species. Natural size.

" 2. a. Ventral view of the same, showing the aperture and operculum.

NOTES ON THE GEOLOGY AND PALÆONTOLOGY OF THE ROCKLAND QUARRIES AND VICINITY, IN THE COUNTY OF RUSSELL, ONTARIO, CANADA.

BY HENRY M. AMI, M.A., D. Sc.

On the 24th of June last, the OTTAWA FIELD NATURALISTS' CLUB held a very successful excursion to the new Rockland quarries. These are situated about two miles to the south-east of the village of Rockland, in the Township of Clarence, in the County of Russell, Ontario, and were opened with a view of obtaining the stone required for the construction of the Soulanges canal. This locality proved to be very interesting to the geologist, from the fact that six distinct Palæozoic formations were met and examined. Mr. Archibald Stewart, government contractor and proprietor of the new Rockland quarries, and Mr. W. C. Edwards, M. P. for Russell, had extended to the Ottawa naturalists a hearty invitation, and made them welcome. Everything went off well and the day was thoroughly enjoyed by all. Refreshments and conveyances were freely supplied by these two gentlemen, and the excursionists duly appreciating their kindness, unanimously thanked them for their hospitality.

GEOLOGICAL FEATURES OF ROCKLAND.

The following are the different geological formations met with at Rockland, between the mills on the Ottawa River front, and the new quarries, some two miles distant, in descending order. These formations succeed each other in regular order, as seen in the table, with only two unconformities, the first below the glacial drift, and the second below the Potsdam formation. They occupy that zone of country lying between the escarpment at the quarries and the Ottawa River. This escarpment is similar in origin and aspect, to the bluffs and escarpments at Ottawa, and formed at one time the southern shore or cliff-margin of the Pre-glacial stream which flowed from the west in almost precisely the same channel as does the Ottawa River at present.

The Calciferous and Chazy formations form the widest belts, whilst the Trenton, Black River and Chazy formations, are the most fossiliferous in the district.

GEOLOGICAL FORMATIONS AT ROCKLAND, CO. RUSSELL, ONTARIO.

System.	Formations.	Thickness in Feet.	Fossil Remains.
I. Post-Tertiary....	1. Fluviatile.....	Various	
	2. Leda clay.....	Rep. to 25 feet.....	None observed.
	3. Glacial clay, etc..	Various	
	HERE AN UNCONFORMITY OCCURS.		
II. Ordovician.....	4. Trenton.....	About 50 ft.....	Abundant.
	5. Black River.....	" 75 ft.....	Not rare.
	6. Chazy.....	" 60 ft.....	Abundant.
	7. Calciferous	" 50 ft.....	None observed.
	8. Potsdam.....	" 75 ft.....	ScolithusCanadensis.
	HERE THE SECOND UNCONFORMITY OCCURS.		
III. Archæan.....	9. Laurentian.....	Several thousand ft.	None observed.

THE LAURENTIAN OUTCROP.

The basal beds of the Potsdam formation are seen to lie unconformably over the denuded and rounded, or irregular surface of the Archæan or Laurentian rocks. These consist of rather coarsely crystalline gneisses and mica schists, along with hornblendic rocks, whose petrographical relations and characters deserve special study. They furnished the material which helped in the building up of the subsequent formations, the quartz of the Potsdam sandstones having been derived from the granitoid gneisses of this vicinity.

THE POTSDAM.

The Potsdam formation at Rockland Mills forms a more or less irregular zone of heavy bedded, light greyish blue or white colored sandstones, which at times become glassy in appearance and give the formation a truly quartzite character. Nevertheless, the grains of quartz may be easily detected, and are cemented together for the most part by silica.

Some of the bands carry iron pyrites, and weather rusty-coloured. The clear and white, or light coloured bands appear to be fit for glass making. The outcrop of this formation near the Ottawa River front, at the Rockland Mills, belongs to the lower portion of the Potsdam. The higher beds of the formation in the Ottawa Valley are finer grained, and have the grains of quartz in the sandstone less coherent, and the beds themselves are less massive and reduced in thickness, often presenting the well known tracks of *Protichnites* as at Montebello, Papineauville and above that again,* eight miles below the mouth of the South Indian River.

The Calciferous and Chazy.

These two formations occupy their regular and respective positions, one below the other, both as regards their geological and geographical relations at Rockland. The zone of farming or pasture land, between the escarpment at the quarries and the town, is occupied by these two formations, whilst the soil is made up to a great extent of the debris of the Chazy, which is the softest and most easily denuded and disintegrated formation in the district.

None of the characteristic fossils of the Calciferous formation were found on this occasion, but at the turn of the road on the hillside about 1½ miles south of Rockland the typical shales of the Chazy formation crop out and are fossiliferous. These overlie the fine-grained and compact limestones, on which Mr. Edwards' celebrated stock and breeding stables are built.

These limestones are characterized by the presence of concretions or inclusions of irregular masses of pink calcite varying in size and intensity of colour. There are two or three bands of these limestones, which, both in Nepean and elsewhere, have been utilized or described as "cement-rock." This is the same band of limestone which crops out at the Hull cement quarries, Skead's mill, Ont., also at Hog's Back, and again on a lot the property of Mr. T. M. Clark, of New Edinburgh close to Hemlock Lake.

The following species of fossils have been recognized by the writer in the dark and chocolate coloured and purple, calcareo-argillaceous

*Geology of Canada, 1863, p. 94.

shales of the Chazy and in the accompanying calcareous bands:

Fossils from the Chazy Beds.

1. Orthis imperator, Billings.
2. " borealis, Billings.
3. " platys, Billings.
4. Rhynchonella plena, Hall.
5. Raphistoma staminea, Conread.
6. Modiolopsis parviuscula, Billings.
7. Orthoceras antenor? Billings.

But little time was spent collecting here, which accounts for scarcity of forms.

Black River and Trenton Formations.

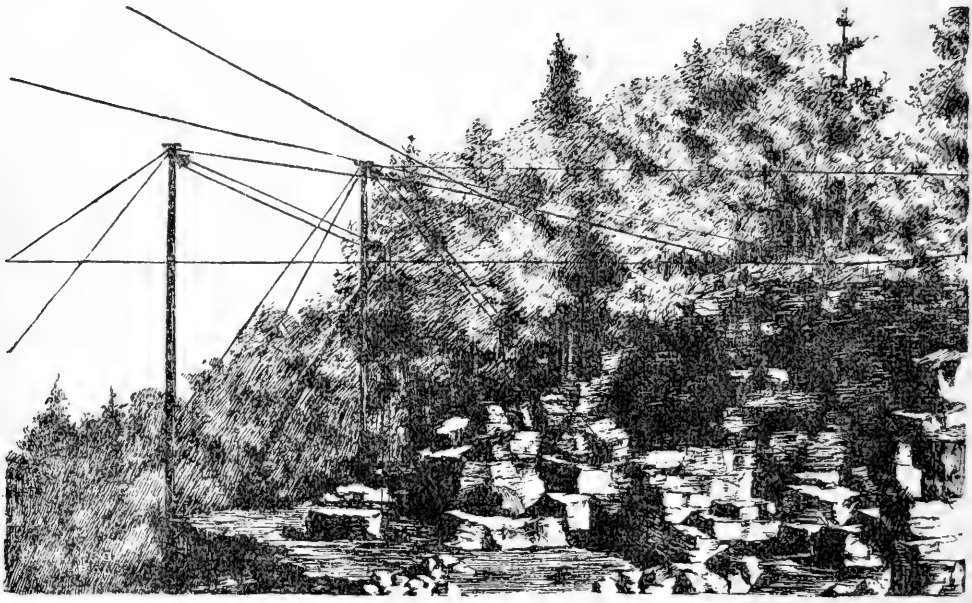
Following the measures in an ascending order the escarpment is met with next. This escarpment, which faces the north and presents its bold front to the Ottawa Valley at the quarries, belongs to the Black River and Trenton formations, or to the Trenton group as it is sometimes called.

The two formations pass imperceptibly from one into the other, only an arbitrary line can be drawn to separate them. The lower part of the escarpment at the quarries belongs to the Black River formation, whilst the upper portion is distinctly Trenton in *facies*. It was in the lower half at the level of the tramway and track, some 15 feet higher than the swamp facing the quarry, that the proprietor, Mr. Archie Stewart found a large coral mass, which he brought to the museum of the Geological Survey for identification. It proved to be the typical coral, *Columnaria Halli*, Nicholson. At a higher elevation, some fifty feet above the Columnaria horizon, masses of *Tetradium fibratum*, Safford, were found, which are considered characteristic Black River forms also, yet these were immediately followed by large colonies of *Prasopora Selwyni*, Nicholson, associated with orthoceratites and brachiopoda, of typical Trenton aspect.

The beds throughout the section proved to be highly fossiliferous, but especially so were those in the highest and thin-bedded portions of the escarpment. The beds were seen to vary in thickness, but

the heavier beds and more compact ones occupied the lower portion of the outcrop.

The following view of the quarry reproduced from a pen and ink sketch by Miss A. M. Living, of our club, gives a good general idea of the upper portion of the quarry, with some of the large blocks of quarried limestone to be taken down to their destination, the Soulanges Canal.



Along the western extremity of the quarry, large blocks of quarried and dressed limestone had been piled up and were examined, showing the character of the limestone, thickness of the beds and mode of occurrence. It was evident that a quarry similar to those of central Ontario, from which the material was obtained for the construction of the Trent Valley Canal, had been opened at Rockland, and that the rock was of superior quality. Some of the upper beds of the quarry were apparently more easily shattered, but the hard compact and heavy bedded strata of the lower two-thirds will no doubt afford excellent blocks for the canal.

Through the kindness and courtesy of Mr. Stewart, the writer has been furnished with information on the character of the limestones of the new Rockland quarries. The result of examinations and tests

made of the rock are herewith given, and refer to the chemical composition, to the crushing strength of the stone, and to the microscopical characters of the same, besides a note on the absorption of moisture by the same limestone.

1 and 2.—*Chemical composition and ratio of absorption*, determined by Dr. B. J. Harrington, of McGill College, Montreal.

CERTIFICATE OF DR. B. J. HARRINGTON.

"The specific gravity of the stone was found to be 2.704, and the weight of a cubic foot deduced from these figures 168.5 lbs.,(1 cubic foot of water being taken at 62.321 lbs). The analysis shows the stone to consist almost entirely of calcium carbonate, with a little insoluble matter and small quantities of the carbonates of magnesium and of iron. The exact figures are as follows :

Insoluble (including a little organic matter)	2.75
Calcium carbonate	94.70
Magnesium "	2.37
Ferrous	0.18
	100.00 "

As to the ratio of absorption of water by the limestone from Rockland, the following is an extract from a letter by Dr. Harrington dated 28th April, 1893 :

"The absorption of your specimen of limestone was almost *nil.* The exact figures were 0.03 of a part of water absorbed by 100 parts by weight of the stone. That is an absorption ratio of $\frac{1}{3333}$."

(Signed.) B. J. HARRINGTON.

McGill College, 31st March, 1893.

3. *Macroscopic and Microscopic Examination of the Rockland limestone, by Prof. A. P. Coleman, of the School of Practical Science, Toronto.*

The following is the text of a report by Dr. Coleman, of Toronto, entitled : "Examination of Building Stone for Mr. Archibald Stewart, Ottawa. The specimen sent for examination is a cube of dark grey bituminous limestone from a quarry at Rockland, Ontario. Microscopically the stone is compact in texture with included crystals of

calcite and a few fossils, chiefly fragments of brachiopods. A thin section examined with the microscope shows a compact ground mass of calcite with enclosed crystals of the same mineral, some obscure fossil forms (bryozoa, brachipod shells or crinoids), and some brown lines of bituminous matter.

Judged as a building material the specimen has all the characteristics of a durable stone. The dark-grey color will probably bleach to a lighter grey on exposure to the weather."

(Signed.) A. P. COLEMAN, PH. D.,
Prof. Metall. and Assaying.

School of Practical Science, Toronto, March 27th, 1893.

4. *Crushing strength per square inch determined by Prof. H. T. Bovey, M. A., LL.D., of the Physical Laboratories, McGill College.*

The following is an extract from a letter by Prof. Henry T. Bovey on two specimens of limestone from the Rockland quarries :—

Specimen A. Dimensions 2″ x 2.02″ x 2.01″.

Tested on bed.

Total crushing strength.....	92,000 lbs.
Crushing strength per square inch.....	22,772 "

Specimen B. Dimensions 2.01″ x 2.025″ x 2.01″.

Tested on edge.

Total crushing strength.....	60,000 lbs.
Crushing strength per square inch.....	14,741 "

Weight of stone as per sample A = 168.11 pounds per cubic foot.

(Signed.) HENRY T. BOVEY.

McGill College, Montreal, March 22nd, 1893.

It will thus appear from the combined results of the tests made both at the Toronto and Montreal laboratories, that the stone from the Rockland quarries is of a superior quality. When compared with the results obtained from similar severe tests of limestones of Canada and the United States—those of the Rockland limestone stand high. For the record of such tests, the reports published by the State Surveys of New York, Pennsylvania and Minnesota—besides many other valuable contributions contain the most extensive and comprehensive remarks.

Fossil Remains.

As it was remarked, before, the rocks of the quarry were very fossiliferous. On the occasiou of the excursion of the O. F. N. C. quite a number of interesting forms were collected and the following succession of zones was noticed in the rocks forming the escarpment of the quarry in descending order.

(1) Zone of *Leptæna sericea*, Sowerby.
(2) Zone of *Streptelasma corniculum*, Hall.
(3) Zone of *Prasopora Selwyni*, Nicholson.
(4) Zone of *Endoceras proteiforme*, Hall.
(5) Zone of *Tetradium fibratum*, Safford.
(6) Zone of *Columnaria Halli*, Nicholson.

No less than sixteen species of fossils were collected at the quarries as follows :—

1. Crinoidal fragments.
2. Tetradium fibratum, Safford.
3. Columnaria Halli, Nicholson.
4. Streptelasma corniculum, Hall.
5. Prasopora Selwyni, Nicholson.
6. ?Homotrypa similis, Foord.
7. Stictopora acuta, Hall.
8. Serpulites dissolutus, Billings.
9. Rafinesquina alternata, Conrad.
10. Orthis testudinaria, Dalman.
11. " tricenaria, Conrad.
12. Ctenodonta sp. indt. cf. C. abrupta, B.
13. Orthoceras sp.
14. Asaphus platycephalus, Stokes.
15. Endoceras proteiforme, Hall.
16. Calymene senaria, Conrad.

Most of these were collected by the writer, determined by himself; they represent a part of the fauna entombed in the rocks which occupy the face of the quarry. The horizon here is precisely the same as that at Wright's new quarries, Hull, near the C. P. R. station of that town.

Just previous to leaving the field, Dr. R. W. Ells, ex-president of our club, visited Rockland and the quarries adjoining. When at Clarence Creek, one and a half miles below Rockland, Ont., he made quite an extensive collection of fossils which the writer has examined only cursorily and the following forms are included in it :—

Fossils Collected by Dr. R. W. Ells at Clarence Creek, near Rockland, Ont., Sept., 1893.

1. Crinoidal fragments.
2. Stictopora acuta, Hall.
3. Prasopora Selwyni, Nicholson.
4. ? Monotrypella sp.
5. Discina or Trematis sp.
6. Crania sp. cf. C. sp.
7. Lingula quadrata, Eichwald.
8. Leptæna sericea, Sowerby.
9. Rafinesquina alternata, Conrad.
10. Streptorhynchus filitextum, Hall.
11. Orthis testudinaria, Dalman.
12. " pectinella, Conrad.
13. " sp. (? N. sp.)
14. " vel Anazyga sp.
15. Platystrophia biforata, v. lynx, Eich.
16. Bellerophon sulcatinus, Emmons.
17. Rhynchonella increbescens, Hall.
18. Calymene senaria, Conrad.
19. Cheirurus pleurexanthemus, Green.
20. Dalmanites callicephalus, Green.
21. Illænus sp (cf. I. Milleri or Trentonensis.)
22. Asaphus platycephalus, Stokes.
23. " megistos, Locke.
24. Trinucleus concentricus, Eaton.

Of these Nos. 5, 6, 7, 16, and 24 are of more than ordinary interest, especially the last form Trinucleus concentricus, Eaton, a small trilobite which is very common in the Trenton of Montreal and Montmorency,

but which has not, as far as I am aware, been recorded from the Ottawa district as yet.

From the foregoing remarks it is hoped that such general characters of the rock formations of Rockland can be gathered as will be of service to those interested in the quarry as well as others. The beds of the Lower Trenton—and those of the Black River formation almost everywhere in Eastern Canada—have been used as building material, whether for piers, bridges or canals, and proved highly satisfactory.

The Trent Valley Canal locks, as above stated, the piers for the Victoria Tubular bridge, the locks and improvements on the Lièvre River, and the locks on the Rideau Canal at Ottawa, have all been constructed with stone from the Trenton and Black River formations.

In the case of the Rideau Canal at Ottawa, the limestones constituting the upper half of the Trenton formation here are too nodular and concretionary for canal purposes, and if only blocks from the lower half had been used it would have saved the department thousands of dollars that were subsequently spent in repairs.

In conclusion, the writer begs to thank Mr. Archibald Stewart for this opportunity of examining the geological features at the quarry under such favorable auspices, also for the information as to tests and reports of results made by the gentleman above quoted.

BOOK NOTICES.

The Butterflies of North America. Third series, Part xiv, by W. H. Edwards.

The last part of Mr. Edward's magnificent work has been received. It is a most interesting number and will be read with interest by all Canadian Lepidopterists. The three plates are particularly fine. No. 1 shows *Neominois Ridingsii* in all its styles. This is a Coloradan species flying at high elevations. No 2 illustrates *Chionobas Æno* and its variation var. *Assimilis* in which the band on the underside of the secondaries is wanting or scarcely showing. Both the type and the variety fly together in Labrador and on the highest summits of the mountains of Colorado.

Plate 3 is of special interest to the members of our Club as it shows the fine species, *Ch. Macounii*, discovered by our indefatigable

member, Prof. John Macoun, and named after him by Mr. Edwards. The first specimens were caught at Nepigon on 28th June, 1884. It is a rare and short-lived insect and few specimens are known in collections. The only other known locality where specimens have been taken is Morley, at the eastern base of the Rocky Mountains, and here again strangely enough Prof. Macoun was the lucky captor. He took but 3 specimens, 2 males and a female, and no other collector has since found it there.

The number of collectors who have been to Nepigon to get *Chionobas Macounii* have given it a local celebrity, and the possibility of an entomologist being a rational and sane being is there allowed. The butterfly is there known as the "One-eyed Butterfly" from the fact that when at rest one of the large ocelli or eye-like spots beneath the upper wings is very conspicuous. This name, however, has given rise to most remarkable tales amongst the residents, and Indians. Most of these take the shape of descriptions of a wonderful insect with one large eye in front of its head. As few collectors, however, have obtained the butterfly, it is locally reported to be of fabulous value, "$100 a specimen," being a convenient sum to mention, that is the usual figure quoted as its value. Guided by the local descriptions of the "One-eyed Butterfly," I fear that would-be speculators would be a long time making their fortunes.

The letterpress of this part of Mr. Edward's work is very full and interesting, and on the whole it will probably be considered one of the best that has appeared.—J. F.

Catalogue of the Lepidopterous Super-family Noctuidæ found in Boreal America. John B. Smith, D. Sc., pp. 224, 8 vo., Washington, 1893. (Bulletin 44 U. S. National Museum.)

Under the above modest title a most valuable work has lately been been issued. It is not simply a list of species, but a complete bibliographical and synonymical catalogue, prepared by Dr. Smith with great labour during many years of special study.

A full preface explains the origin and purpose of the work, as well as some of the difficulties which it was necessary to overcome in its execution. There is a list of the authors and works cited, and an excellent index.

The author, date and original place of publication are given for every genus and species. Great care has been taken by the writer to examine, where possible, the types, and indication is given where these may be found. Published references are cited separately under the name of the species and the synonyms. Under the head of Habitat, Dr. Smith gives the distribution as far as known to him. Most references, however, to the 3,456,542 square miles of territory which are officially recognized as the Dominion of Canada (exclusive of Labrador and Newfoundland) are covered by the one word "Canada." This shows that few of our Canadian collectors have availed themselves of the generous offer made by Dr. Smith as advertised in all the Entomological Magazines, namely, that "he will name and return all material of this family sent to him, for the privilege of retaining such specimens as may be needed for description or for completing the collection of the United States National Museum."

As the author of the Catalogue has in preparation a Monograph of the whole of this family of moths, it is to be hoped that Canadian Entomologists will do all they can to assist him by sending him liberal supplies of material. The tendency of some to lock up in private collections rare and interesting specimens is much to be regretted. It is far better to send them to a specialist for study and subsequent deposition in a public museum where they will be not only of scientific value, but also available for study by others, and will have much greater chance of being preserved. The personal possession of rare or even unique specimens is after all a very small pleasure compared with that of knowing that they are in a place where they can be of use to many, and where the best care will be taken of them.

The large number of species included in the Noctuidæ, the close similarity between many of these, and on the other hand the wide variations which sometimes occur in the different specimens even of the same brood, make the study of this family very difficult. For this reason Dr. Smith's Catalogue will be gladly welcomed by Lepidopterists. It is a wonderful book and throws a flood of light on what was a hopeless chaos of impenetrable disorder.—J. F.

PROGRAMME.

1893——OTTAWA FIELD-NATURALISTS' CLUB—— 1894.

LECTURES AT 8 P.M. IN NORMAL SCHOOL, OTTAWA.

Dec. 12th.—Inaugural Address: The extinct Northern Sea-cow and early Russian Explorations in the North Pacific.
Dr. G. M. Dawson, C.M.G., F.R.S.

Jan. 9th.—Following a Planet. (*With lantern illustrations*)
A. McGill, B.A., B.Sc.

Jan. 23rd.—Biological Water Analysis. (*With lantern illustrations.*)
Dr. Wyatt Johnston, Montreal.

Feb. 6th.—How Rocks are Studied.
Frank Adams, Ph.D., (McGill College, Montreal.)

Feb. 26th.—The Transmutations of Nitrogen. (*With chemical experiments.*)..... Thos. Macfarlane, F.R.S.C.

Mch. 6th.—Ottawa Butterflies..... James Fletcher, F.R.S.C.

Notes on the Natural History of the Islands of Behring Sea..... James H. Macoun.

Mch. 20th. Annual Meeting at 4 p.m.

THE EXTINCT NORTHERN SEA-COW, AND EARLY RUSSIAN EXPLORATIONS IN THE NORTH PACIFIC.

By Dr. George M. Dawson, C.M.G., F.R.S., etc.

One object of the meetings of this club, is that of enabling its members and their friends to bring before the Society for explanation and discussion, subjects which they have been engaged in studying, or which may have came under their notice. Thus it has occurred to me that it may interest you, as naturalists, to review the main facts relating to the now extinct Manatee or Sea-Cow of the North Pacific. The collection of these facts has interested me particularly because, in 1891, I had an opportunity of visiting the former resorts of the animal and of procuring there a number of its bones. This animal is one of these—forming a very short list in all—which have disappeared completely within historic times.

The connection established in the title of my paper between the sea-cow and the early Russian explorations in the North Pacific, may appear to require explanation, but this explanation is found in the circumstance that the extermination of the animal chiefly resulted from these explorations, and in the fact that if left to itself, the sea-cow,—though evidently in its decadence—would in all probability be still reckoned as a member of the living world.

Everyone here must be familiar with the fact that a principle motive in the exploration and occupation of the northern part of North America was the trade in furs. Missionary enterprises may have actuated many of the early explorers, but some even of the missionaries, were not averse to profitable barter; while in the case of the great fur companies, this was the object of their existence. The Hudson's Bay Company was early in the field, and after the conquest of Canada the Montreal North-West Company superseded the older French trading companies, and first in competition with, afterwards in combination with the Hudson's Bay Company, pushed its trading posts and stations westward to the Pacific Ocean.

Furs and pelts of many kinds were obtained by these traders, but, throughout, the skin of the beaver may be stated to have been their

main pursuit, as it became their standard of value. In a manner precisely similar, the northern part of Asia was overrun by traders moving in an easterly direction. The Russian expeditions of conquest followed in the wake of the Russian fur-traders, and about the beginning of the last century, the Russians began to establish themselves on the shores of the Pacific Ocean.

For the Siberian merchants, the chief quest was that of the sable, and thus it is that the occupation of Siberia has been described as one gigantic sable hunt, beginning at the Ural Mountains and extending to the Eastern Ocean. This ocean—the Pacific—was reached by the valley of the Anadyr River, far to the north, and at Okotsk, on the sea of the same name. Between these places lay the remarkable volcanic peninsular of Kamtschatka. About 1696 its conquest began, and in some fifteen years it had been throughout rendered tributary to Russia; but the great ocean to the eastward, and what it might contain, still remained unknown.

The enormous extension which the Russian Empire had achieved in Asia, naturally attracted the special attention of its ruler, and in the last year of her reign, Peter the Great planned an expedition of explorations from the eastern Asiatic coast toward America. Before the expedition could be despatched the Czar died, but his consort, the Empress Catherine, anxious in all respects to carry out the wishes of her late husband, caused the preparations to be continued, and in 1725 Vitus Behring was despatched on this mission, in conformity with the original intention of the Emperor. Behring was a Dane, engaged in the Russian service. He left St. Petersburg provided with a corps of assistants and all the facilities which the government could furnish, to cross Siberia to Okotsk, which was to be his port of departure for the exploration of the unknown North Pacific.

It is unnecessary to follow his various journeys and the many delays which he experienced, nor is it relevant to the present subject to trace his first expedition from Okotsk by sea, in which he outlined the northern part of Asia toward Behring Straits. His celebrated voyage to the American continent, with which we are chiefly concerned, was not executed till the year 1741, when he left the Bay of Avacha, in

Kamtschatka, with two little vessels which had been built; one specially under his own command, the other under the command of his lieutenant, Chirikof. The two vessels shortly became separated, but in the end both captains sighted what is now known to have been the American continent.

Chirikof regained Kamtschatka before winter, but Behring and his ship's company of 70 men or more were less fortunate. The part of the coast seen by Behring was near Mount St. Elias, where his people landed on an island, now known as Kaye Island. Little time was given to exploration, for, having delayed long in searching to the south-eastward of Kamtschatka for a mythical land existing only on the maps of the day, the scarcity of provisions on board his ship began to weigh upon the commander. After taking on board some water, and without even meeting any of the inhabitants, sail was again made for the Asiatic coast. It was already past the middle of July, fogs and storms delayed the navigators, and in endeavoring to make a westerly course they encountered the great southward-bending chain of the Aleutian Islands. Short stoppages were made at several of these Islands, which it is now difficult to identify exactly, but in the end they passed clear of this archipelago and found themselves again steering westward across a trackless sea. The conditions were becoming desperate. Water was scarce and food was issued at reduced rations, while the crew were all more or less afflicted by scurvy. The commander himself had taken to his bed, and it is related that the two men necessary for the helm were led thither by two others scarcely in better condition than themselves.

Land was at length sighted, and it was assumed to be some part of the peninsula of Kamtschatka. All the difficulties of the return appeared to have passed, and for a brief period it was a time of congratulation and general joy. The vessel was already in a deplorable condition, and at a council of the officers it was decided that is would be necessary to land on the shores in sight whatever they might prove to be. The vessel was brought to an anchor, but before the landing could be effected in any regular way, a storm sprang up in which she was cast ashore, and though none of the crew were drowned, several of those already sick succumbed to the effects of the scurvy in the process of landing.

The distressed crew were once more ashore, but as castaways on an unknown land. They finally arrived at the conclusion that it was an unpeopled region, for the only animals at first seen were foxes, and these showed a complete fearlessness of man, of such a kind as to indicate that they had never before came in contact with him. There was no wood but driftwood on the island—for such it proved to be—and that was scanty. Thus, in order to shelter themselves from the inclemency of the weather, the survivors were reduced to digging holes in the sand, which they covered with sails.

So the winter was spent, and more men died, among them Behring himself. The island which they had reached was that since known as Behring Island, situated some 90 or 100 miles from the Kamtschatkan coast to which they had hoped to return.

Adapting themselves as well as they could to the circumstances, the crew found that the sea-otter which frequented the island afforded a source of food. During the winter a whale was also washed ashore which materially assisted in their sustenance; but before the end of their stay, it was discovered that the sea-cow, which frequented the shores in herds, afforded a much more toothsome and wholesome flesh than that of any of the other animals. A method of hunting the sea-cow was established, and it is largely to the existence of this animal that the ultimate salvation of a part of Behring's crew was due.

This brings us to the main subject of my paper, the sea-cow or manatee of the North Pacific; but before speaking further of the sea-cow itself, it will be in order to state that in the following summer—that of 1742—a new but much smaller vessel was constructed from the wreck of the original one, in which, setting sail in August, the survivors managed in ten days to return to Avacha Bay in Kamtschatka.

With them they brought some trophies from the newly discovered lands; amongst these the skins of the sea-otter, or sea-beaver as it was called by the Russians at the time; the pursuit of which was the moving cause of the numerous Russian expeditions of following years. A new avenue for the enterprise of the fur-traders had been opened up and skins even more valuable than those of the sable allured them to

embark on hazardous adventures among the islands of the Eastern Sea.

The sea-cow, which was thus in its last retreat accidentally discovered, is an animal possessed of the greatest interest to the zoologist. Nearly all we know now of its habits and appearances is derived from the descriptions of Steller, a naturalist who accompanied Behring's expedition, and who, though he shared to the full in its hardships and distress, still found time to note and write out his observations on the natural history of the new lands discovered. Muller, quoting from Steller's notes, writes :—

"I return to my design, to show how useful the Manati was to our ship's company with regard to their sustenance. Some of these animals have been caught, which from the snout to the point of the tail were from three to four fathoms long, and weighed 200 pouds, or 8,000 pounds. One was food enough to serve for a fortnight, and the flesh was very savoury like the best beef; that of the young ones was like veal. And the sick found themselves considerably better, when, instead of the hard beaver's [sea-otter's] flesh, they eat of the Manati, though it cost them more trouble to catch than one of the beavers. They never came on the land, but only approached the coast to eat sea-grass, which grows on the shore, or is thrown out by the sea. This good food may, perhaps, contribute a great deal to give the flesh a more agreeable taste than that of the other animals that live on fish. The young ones that weighed 1,200 pounds and upwards, remained sometimes at low water on the dry land between the rocks, which afforded a fine opportunity for killing them, but the old ones could be caught not otherwise than with harpoons, fixed to long ropes. Sometimes the ropes were broke, and the animal escaped before it could be struck a second time. This animal was seen as well in the winter as in the summer time. They melted some of the fat, with which, like hogs, they are covered from three to four inches thick, and used it as butter. Of the flesh, several casks full were pickled for ship's provision, which did excellent service on their return." *

---

* Voyages from Asia to America, Muller. Jeffery's translation, pp. 61-62.

Steller recognized the similarity of the sea-cow of the North Pacific to certain other animals already known; but, being possessed of imperfect information, he assumed that all these belonged to a single species. We now know that this was an erroneous conclusion, that this sea-cow was specifically and generically distinct from others of the group, and it is consequently very often known as Steller's sea-cow.

The sea-cows in fact form a peculiar group of the mammalia, which is now classed as a separate order and which shows little affinity to any other mammals, for though in its aquatic habits and in some other respects it resembles the whales and porpoises it is very different from these in anatomical structure. This is probably a very ancient group, for fossil remains referable to it are found in several geological formations in Europe, Africa and America; but in human times it appears to have dwindled, and to be verging on extinction from natural causes altogether apart from any specific attacks by man.

Within the historic period, this whole order of mammals has had but three living genera.—The Manatee proper, which inhabits the shores and estuaries of the Atlantic within the tropics. The Halicore or Dugong, found in the Red Sea, on the East Coast of Africa and in the Indian Seas as far east as Australia; and the Rhytina, of which but one species (*R. Stelleri*) appears to have existed. The last-mentioned is the sea-cow here specially referred to, that of the North Pacific.

It is very often the case, that ancient types of animals which have already played their part in the history of the world, are found in the last stages surviving in a few forms widely separated geographically. It is so in the present instance. The Halicore is separated by the length of the African continent from the Manatee of the Atlantic, while Steller's sea-cow was discovered, as we have seen, on a remote island of the North Pacific.

Early navigators had observed the Halicore and Manatee as animals of a strange and problematical character, and it is supposed that the habit of these animals in carrying the young under the fore limb may have given origin to the fabled mermaid. Thus when systematic names began to be applied by naturalists, those animals belonging to this order were designated *Sirenia*.

In this order the hind limbs are entirely wanting and the tail is expanded to a wide fin, like that of the whale. All its representatives which have come under the observation of man, appear to be slow, and unintelligent, if not actually stupid. They are herbivarous, living on marine algæ, or on aquatic plants growing in the estuaries of rivers. They are without means of defense, unable to escape easily by superior speed in the water, and incapable of locomotion ashore. More than this, in their search for food, they are frequently left stranded by the outgoing tide, when they are entirely helpless; while the flesh is always good for food, the fat produces an excellent oil and the skins are useful because of their thickness and strength. The inducements for their pursuit by man are thus very great.

Both the Manatee proper and the Halicore are provided with teeth, the now extinct *Rhytina* was toothless, the place of teeth being supplied by bony plates upon the jaws which served for the mastication of its soft food.

The discovery of the sea-cow and its utilization for food by Behring's crew have already been referred to. The short story of its extermination must now be told.

No sooner had the survivors of Behring's crew returned with specimens of rich furs, particularly that of the sea-otter, than Siberian traders began to build small vessels to revisit the new islands which had been discovered. These were no well equipped expeditions, for means and materials of all sorts were scarce and very primitive on the shores of the Sea of Okotsk. The craft employed at first were small and ill-constructed. Coxe writes of them :—"Most of the vessels which are equipped for these expeditions are two-masted; and commonly built without iron, and in general so badly constructed, that it is wonderful how they can weather so stormy a sea. They are called in Russian *Shitiki*, or sewed vessels, because the planks are sewed together with thongs of leather." *

In such crazy vessels the Russians by degrees extended their wanderings till the whole of the islands of the great Aleutian chain

* Account of the Russian Discoveries between Asia and America. p. 9.

became familiar to them. The adventurers were often absent for several years on a single cruise, wintering at some island and eventually, when in luck, returning with their accumulated furs to Kamtschatka or to Okotsk. Very frequently they were shipwrecked, and not one but several cases are known in which, like Behring's crew, the shipwrecked men reconstructed a vessel from the poor debris of that which had been cast away and in it returned to the Siberian coast. But whole crews often sailed never to be heard of again, or to be heard of only by subsequent voyagers as having been masacred by the natives.

The adventurers were both hunters and traders. They engaged themselves in the capture of sea-otters, foxes and other valuable skins and besides obtained them by barter from the natives. Under the guise of rendering these people subsidary to Russia, they also exacted a tribute of furs from them ; taking as much as they could and giving in return merely a paper receipt to the effect that tribute had been paid for the current year.

Coxe briefly describes the method of trade as follows :—"The Russians have for some years past been accustomed to repair to these islands, [the Aleutians,] in quest of furs, of which they have imposed a tax on the inhabitants. The manner of carrying on this trade is as follows. The Russians go in autumn to Behring's island and there winter ; they then employ themselves in catching the sea-cat, and afterwards the Seivutcha, or Sea-lion. The flesh of the otter is prepared for food and is esteemed very delicate. They carry the skins of these animals to the Eastern islands. Next summer they sail eastward to the Fox Islands ; and again lay their ships up for the winter. They then endeavor to procure, either by persuasion or force, the children of the inhabitants, particularly of the Tookoos, as hostages. This being accomplished, they deliver to the inhabitants fox-traps, and also skins for their boats, for which they expect in return furs and provisions during the winter. After obtaining from them a certain quantity of furs, by way of tax, for which they give quittances ; the Russians pay for the rest in beads, false pearls, goats wool, copper kettles, hatchets, etc. In the spring they get back their traps, and deliver up their hostages. They

dare not hunt alone, nor in small numbers, on account of the hatred of the natives." *

The whole story is a very painful one and most of it has lapsed beyond the possibility of recovery. The Russian traders were scarcely less barbarous than the Aleuts whom they eventually subdued and reduced into a scarcely disguised slavery. They were, however, provided with firearms, while the natives had, whether for defence or for attack, only spears, darts, and such like primitive weapons. We have imperfect accounts from the Russian point of view of these transactions, but none from that of the natives who were the principal sufferers. We gather and with difficulty, only the fact that the Aleutian Islands were originally occupied by a numerous population, which before many years had became reduced by slaughter and by disease, introduced by the conquerors, to very scanty proportions.

The Aleut race was decimated, but the fur trade continued, and has continued in one form or another up to the present day. Meanwhile the sea-cow became extinct, and it is to this fact particularly that I now wish to draw attention.

It soon became habitual for the Russian traders to resort in the first instance to Behring Island in order to lay up a supply of salted meat for the farther voyage to the Aleutian Islands. The good qualities of the flesh of the sea-cow rendered it the chief object of pursuit for this purpose, and thus it happened that this nearly defenceless animal was constantly sought after and hunted. We have already seen that its range was very limited. Within historic times it appears to have been practically confined to the Commander Islands—Behring and Copper Islands.—Tradition speaks of the occurrence of the animal on the Kamtschatkan coast, and investigators have found reason to believe that it at one time frequented also the northern islands of Japan and the northern coasts of China. Its bones have been found on Attu Island, the furthest west of the Aleutian archipelago, but it is not certain that these may not represent merely carcasses which have been washed ashore there. From the accounts of Steller, it would appear

*op. Cit. pp. 220—221.

that it was already maintaining itself with difficulty in its last unmolested retreat. The winter there was severe, and at that season the sea-cow became so thin that every bone was clearly visible. It appears by nature to have been intended for some less rigorous climate, but from all such places it had already been driven by man and other predaceous animals. Thus it proved easy to extinguish the survivors of this interesting and ancient but nearly effete race, and without any intention or knowledge of what they were about, this extinction was accomplished by the ignorant Russian traders.

In 1755, Jakovlev, a mining engineer who was sent to report on the occurrence of copper on Copper Island, noted that the sea-cow had already disappeared from that island, and according to the best information, the last of the race was killed on Behring Island, (which from the first knowledge had been its chief haunt) about the year 1768. Nordenskjold who visited Behring island in 1879, thought he had ascertained from enquiry among the Aleut people there that a single specimen of the sea-cow was seen on the coast as lately as 1854,* but Stejnejer, who visited the island more recently and who re-examined the same men with whom Nordenskjold had spoken, has shown that this was probably a mistake. †

Thus it happens, that at the present day Steller's sea-cow, instead of browsing still upon the kelp along the shores of Behring Island, is known to science only by its bones. When Nordenskjold visited the island he made a special search for remains of the sea-cow and found that the bones were occasionally discovered by the natives along the shores, generally in a low sandy tract slightly above the present high-water mark. By prodding in this sandy ground with iron instruments the presence of the buried bones might be detected, and in this way he secured enough to make up a nearly complete skeleton. Since that time other skeletons have been collected and a certain number of detached skulls, and there can be no doubt that more will be found from time to time.

---

*Voyage of the Vega. English Ed. Vol. II. pp. 272-2^o.

† Proc. U.S. Nat. Mus. Vol. VII. (1884) p. 181. American Naturalist Vol. XXI. p. 1047. Am. Geographical Soc. Bulletin, No. 4. 1886.

The history disclosed by geological research, apart from its purely physical aspects, is that of the progress of life upon the globe; the extinction of species after species of plants and animals and the introduction of new forms in their place. It is by means of the now ascertained stages of this process of change and replacement that the geologist is enabled to determine the age of any particular fossiliferous series of rocks which may come under his notice. But the scale of geological time is a very extended one, as compared with the progress of human events, and the number of animals which have been actually known to man and have since succumbed to process of change is very small. In almost every known case of the kind, man himself has assisted in giving the *coup de grace* and in completing the extermination of some animal which by reason of natural causes had already became very much restricted in its habitat.

This, as we have seen, was the case with the sea-cow. Its hour had very nearly struck before the appearance of man upon the scene.

A PLANORBIS NEW TO THE OTTAWA LIST.

By Geo. W. Taylor, Victoria, B.C.

While paying a short visit to Ottawa in September last, I was so fortunate as to discover about 40 specimens of a freshwater shell new to the local lists.

The species in question is *Planorbis nautilens* Linn, and the specimens, which are all of the variety *cristatus,* were found in the ponds on the right of the road as you pass the St. Louis Dam on the way to the Experimental Farm. The only other American specimens I have seen of this species (which by the way is common enough in the old country) are two that were found by the indefatigable Mr. Hanham in the neighbourhood of Hamilton.

It would be interesting to know how this species has been introduced at Ottawa, as introduced it must have been quite recently, for it could not have long existed undiscovered in a locality so well searched as the St. Louis' Ponds have been by the Ottawa Conchologists.

HYMENOPTERA PHYTOPHAGA, 1893.

By W. Hague Harrington.

Since the publication of my catalogue of the phytophagous hymenoptera of this locality, I have been able to examine the insects of this group which were captured by me last summer, and the annexed list will serve as a record of the season's work, and, at the same time, as a supplement to the previous paper. My collecting was restricted to the month of June and the first two weeks of August, and even during these periods the unusual number of wet days limited my outings considerably. Sawflies also seemed to be much less abundant than in some seasons, and several even of the commonest species were not observed. It will be seen that there are only 42 species in the list, or only about one half of the number recorded (*Canadian Entomologist*, vol. xxii, page 23) as captured here in 1889. Quite a number of the specimens were secured at the sub-excursions to the Mer Bleue and Casselman, and I find that at the latter place a specimen was taken which proves to be an addition to the published list, viz. *Monophadnus tiliæ*, which, as the name indicates, is known to occur upon the bass wood, in Canada and the United States, and of which the probable larvæ have been observed by me on the trees of this locality.

Trichiosoma triangulum Kirby.—1 female, Aug. 13, Race-course.

Zarea inflata, Norton.—1 female, July 31st. The occurence of a second specimen confirms this species which was doubtfully placed in former list.

Hylotoma McLeayi, Leach.—2 females, July 29, Hull, goldenrod.

" *clavicornis*, Fabr.—1 female, June 3, Mer Bleue; 2 do, June 14; 1 do. July 30, Hull.

Nematus subalbatus, Norton?—1 female.

" *corniger*, Norton.—2 males, June 10; 1 female, July 29.

" *erythrogaster*, Norton.—1 female, June 7; 1 do. July 30, Hull.

" sp. near preceding.—1 female, June 6, Hull.

" *Erichsonii*, Hartig.—Several females in tamarack swamp beyond Casselman on June 10th, Larvæ less abundant in this district apparently than in former years.

Nematus ribesii, Scop.—Abundant as usual in gardens.

Nematus mendicus, Walsh.—1 female, June 14, Willow.

Emphytus apertus, Norton.—Females, June 1, 7, July 27, 30; male July 29.

Emphytus canadensis, Kirby.—1 female, June 1, Hull.

" *cinctus*, Linn.—5 females, 1 male, bred in July from larvæ feeding in June upon rosebush in garden.

Dolerus aprilus, Norton.—4 females, June 10, July 29; 1 male, June 18.

" *similis*, Norton.—1 female, June 10.

Monophadnus bardus, Say.—1 female, May 30, city.

" *medius*, Norton.—1 female, June 24; 1 male, June 10.

" *tiliæ*, Norton.—1 female, June 10, Casselman.

Phymatocera fumipennis, Norton.—3 females, June 7; 1 male, June 1.

Monostegia rosæ, Harris.—Common in June.

Selandria flavipes, Norton.—3 females, June 10.

Allantus basilaris, Say.—19 females, 5 males; July 29, Aug. 5.

Macrophya albomaculata, Norton.—1 female, June 8; Billings Bridge.

" *trisyllaba*, Norton.—11 females, 2 males; June 14, July 30.

Pachyprotasis delta, Prov.—1 male, June 7; Hull.

Taxonus nigrisoma, Norton.— 2 females, 3 males; June 12.

" *dubitatus*, Norton.—2 females, June 12.

Strongylogaster pallicoxus, Prov.—1 female, June 8; 2 males June 1.

" *rufocinctus*, Norton.—1 female, June 24.

" *epicera*, Say.—1 male, June 1; Hull.

" *pallidicornis*, Norton.—1 male, June 17.

" *apicalis*, Say.—4 females, 1 male; June 14, 24.

Poecilostoma albosecta, Prov.—1 female, June 3; Mer Bleue.

Tenthredo rufopectus, Norton.—3 females, June 24.

" *ventralis*, Say.—1 female, July 30.

" *verticalis*, Say.—1 female, 1 male; June 24.

Tenthredopsis 14 punctata, Norton.—1 female, June 6.

Monoctenus fulvus, Norton.—2 females, 1 male. May 31 on ornamental cedars at Experimental Farm.

Pamphilius pallimaculus, Norton.— 1 female, June 18.

Oryssus Sayi, Westwood.—1 female, June 17. Poplar.

Xiphydria albicornis, Harris.—1 female, June 17.

Tremex columba, Linn.—1 female, Aug. 5.

ORNITHOLOGY.

Edited by A. G. KINGSTON.

Five specimens of *Uria Lomvia*, Brünnick's Murre, were shot near Ottawa on 20th November last. Four of these were shot on the Ottawa river near Templeton, and the other at the St. Louis Dam. There were about twenty birds in this flock. I learn from Dr. Brodie that several were seen in Toronto Bay.

G. R. WHITE.

Mr. Wintle, of Montreal, also writes us that "large numbers of Brünnick's Murre have visited this neighborhood this fall, and as far up the Ottawa River as St. Andrews." He also says that a correspondent in Toronto speaks of having examined thirty specimens taken there. They have also been reported by Mr. MacIlraith as occurring in some number at Hamilton.

The family of the Murres and Auks are essentially birds of the sea-coast, the above and several kindred species breeding commonly on the rocky shores and islands of the Gulf of St. Lawrence. The sole previous record of any member of the family at Ottawa is that of a Puffin (*Fratercula arctica*) in 1881, and even on the Great Lakes they are only known as rare and straggling visitors. Their invasion of our inland waters in such force as the above reports show is a matter well worthy of note.

BOOK NOTICE.

Monograph of the North American Proctotrypidæ; by William H. Ashmead. Bulletin of the U. S. National Museum, No. 45.

This volume of nearly 500 pages will rank with the most important that deal with the American Hymenoptera, and is an exhaustive and able monograph of a family previously but meagrely investigated on this continent. The systematic position of the family and its sub-divisions have been carefully considered and the arrangement is very skillfully carried out, by means of excellent synoptic tables. To Ottawa Naturalists the work has a special interest as it records about seventy

species from this locality, of which fully fifty are described as new species. The Proctotrypids form a family of more than ordinary interest, because all the members of it are parasites. Many of them infest the eggs of various orders of insects, and thus destroy many injurious forms ; others live upon the larvæ of small diptera, etc., and one sub-family particularly infests certain small Homoptera. Notwithstanding the small size of these insects (many being very minute) they exhibit numerous and interesting modifications of structure, and afford in general good characters for the separation of the numerous genera. The American species now known, chiefly through the labours of Mr. Ashmead, are about six hundred in number, placed in about one hundred and fifty genera and grouped in ten sub-families. In Canada but little attention has been given to the collection of these minute forms and but few species are recorded other than those furnished by Ottawa. Many of the smaller species hibernate in moss and can most easily be secured by sifting such material obtained from swampy localities. A bag of moss obtained in Dow's Swamp on Thanksgiving Day, the sifting of which was completed recently, yielded quite a large number of specimens, including several of the very small *Bæus minutus*. It is our intention to prepare a list of the Ottawa species for a future issue. Mr. Ashmead has much enhanced the value of his magnificent work by eighteen plates in which the anatomy of typical species, and the various genera are illustrated by nearly one hundred and fifty beautifully drawn figures. The preparation of these plates and of the voluminous text have required skilful and patient labours which can be best appreciated by students who have themselves attempted the collection, classification and description of similar micro-organisms ; labours which have their reward chiefly in the assurance of more accurate knowledge acquired and distributed during the years of their faithful performance.—Ed.

EDITORIAL NOTES.

Soirée No. 1—On December 12th our talented President, Dr. Dawson, delivered a most interesting Inaugural Address, which we have the pleasure of presenting to our readers in this number. A valuable

collection of bones of the extinct sea-cow, gathered during his explorations, was shown and added much to give those present a just conception of the size of the animal.

SOIRÉE No. 2.—On January 9th the lecturer of the evening was Mr. A. McGill, whose address was entitled "Following a Planet." The subject was introduced in a very happy manner, and skillfully planned to give the listeners a clear idea of the position and movements of the heavenly bodies. Jupiter was the planet selected and his present place in the heavens and the course he takes through the starry vault were indicated by specially prepared charts. The whole lecture was fully illustrated by lantern views prepared by Mr. McGill and shown by Mr. Babbington.

SOIRÉE No. 3.—The next lecture will be by Dr. Wyatt Johnston, of Montreal, on "The Living Matter in Drinking Water" and cannot fail to be of great value and interest to every one. The health of any community is largely dependent on the purity of its water supply, and it is therefore of great importance to know what organisms or substances produce such conditions as render water unfit for consumption.

LIBRARIAN.—It is with great regret that the Council have to announce the departure of our Librarian, Mr. W. Scott, B.A., who has gone to Toronto, where he has accepted a position in the Normal School. During his terms as Librarian Mr. Scott gave much time and attention, not only to the reception and care of exchanges, but to the distribution of the OTTAWA NATURALIST. As an ardent student of botany and a zealous collector he will be much missed at our "outings," and as a capable and forcible speaker and teacher he will also be missed at our "innings." We wish him success in his new duties and hope that he may infuse some life and activity into the Naturalists of the Queen City. During the remainder of the current Club year the duties of Librarian will be assumed by Mr. Cowley who has kindly consented at the request of the Council to undertake them.

CORRECTION.—In the programme (page 150,) the date given for Mr. Macfarlane's lecture should read Feb. 20th, (instead of 26th.) Please change this date on the programme which you have placed in a conspicuous place, so that you and your friends may not be in doubt as to the day.

FOLLOWING A PLANET.

By A. McGill, B. Sc., B.A.

(Read January 9th, 1894.)

It is by no means a difficult thing for anyone who will take the trouble to observe the heavens, say for half an hour each night on the consecutive clear nights of any month in the year, to assure himself that the stars which shine there maintain, with reference to each other, the same position in the sky, night after night. Perhaps the simplest and consequently the best observation to begin with, will be the recognition of the Great Dipper, not itself a complete constellation, but a very conspicuous group of seven stars in Ursa Major. So many people are familiar with the 'Dipper' that any one not himself able to identify it, will find no trouble in getting some friend to point it out for him—The stars are so arranged with reference to each other, that four of them are placed at the corners of a somewhat irregular rectangle—the bowl of the Dipper—while the remaining three extend outwards from one of the corners of the rectangle, nearly parallel to its long axis, and represent the handle. The middle one of these three is not exactly in line with the other two, so that the handle is slightly bent. It may be incidently mentioned here that this particular star is double, and is a very beautiful object as seen by a small telescope. A very short distance above it is a somewhat smaller star, visible to the naked eye—and popularly known as *Jack*, astride of the pole of the cart, when, what I have called the *Dipper*, is imagined as *Charles' Wain*, a very common name in some parts of England, for this group of stars.

Nothing can be more instructive or convincing to a beginner in star-gazing, than the continuous watching through one whole night—preferably a summer night, in our latitude—of this star group. If this be done it will be found that when the long axis of the Dipper is parallel to the horizon, a position which it is certain to take some time during the period of vigil, then the handle will be extended to the left hand side (west) of the observer, if the Dipper is *right side up*; or to his right hand side, (eastward) if the Dipper is *upside down*. It is in this latter position that it will be seen at twelve o'clock these nights, (middle of

February.) As the hours pass it will be noticed that while the stars hold the fixed positions stated in regard to each other, the position of the group as a whole changes with reference to the horizon. Three hours after the handle was pointed eastwards, it will be found directed upwards, and three hours later will point westwards. If, at the times of noting the position of the Dipper, a more or less general observation of the brighter and more remarkable of the other star groups has been made, it will be an easy matter to convince ourself that every star in the sky has been describing a circle, larger or smaller westwards, the circles described being smaller and smaller towards the north—until the eye is compelled to notice one particular star, which alone, of all the bright stars in the sky, maintains a fixed position no matter how long the vigil be kept up. This star will be found in the very same place night after night throughout the year, as well as hour after hour for any particular night. It marks one of the polar points of an axis, about which the celestial sphere revolves, and it is the *pole star*. It may be easily seen that a line joining the stars in the *front* of the Dipper, if produced, will pass nearly through the position of the pole star, and hence these stars are often called the *pointers*.

It is necessary to any intelligent conception of the stellar movements, that the phenomena just described be fully apprehended; but it is to another set of star groups that I wish to-night to ask your attention. Thus far we are supposed to have been directing our eyes northward. Let us turn our backs as exactly as we can to the position of the pole star, and so placed, look upwards and forwards. We are looking in the plane of our meridian, and if we look directly up to the zenith, we locate in the line of vision, a point on the celestial meridian just as far from the pole star (in circular degrees) as our angular distance from the pole of the earth—which for Ottawa is practically the same as our latitude, about 45°.

Measure off as well as you can towards the South, and in the line of the meridian, a second distance equal to this, and you are looking at a point in the equinoctial or celestial equator. The stars at this point are seen to describe the largest circle in their movement from the eastern to the western horizon. A particular interest attaches to the making

of this observation at, or about, the 21st of March, and again at the 22nd of September. At these times you not only look at a point of the equinoctial, but at a point of the ecliptic, for at these dates the two circles cut each other, and in the interval the ecliptic or circle in the heavens which the Sun describes in his annual progress, passes north of the equinoctial, while from September to March the Sun's path is south of the equinoctial. Now, it will be evident on a moment's thought that since the stars cannot be seen while the Sun is in the sky, we need not hope to see the point of intersection of ecliptic and equinoctial, (except by looking at the Sun himself,) while the Sun is at that node. But, if we will look at our meridian as already described at midnight on the 21st March, we shall see there the place which the Sun will occupy on the 22nd of the following September; and if we choose that date in September for a similar observation, we shall see the so-called, *Vernal* equinox; and although no bright stars are situated at the region in question, a little careful scrutiny will enable us to fix in our memory a pretty numerous group of small stars—the constellation *Pisces*. Had the observation been made in March, we should have found a very brilliant star (Spica) in the constellation Virgo then in the meridian. This constellation marks the position of the Autumnal equinox, and the position of the Sun in September, from which date until March following, his path is south of the celestial equator.

Astronomers have marked off in twelve groups the stars lying along the Sun's path, and within a zone extending about 8 degrees on each side of the line of his motion. These so called zodiacal constellations are for the most part very easy of identification but I can scarcely recommend the two which mark the Equinoctial points as the first which should be located, although as I have already remarked, they possess a very special interest to the astronomer. They happen to be less well defined by brilliant stars than most of the others; and at this time of the year Taurus, Gemini and Leo are no doubt the most readily fixed in the memory. The small groups Pleiades and Hyades in Taurus can never be forgotten by any one who has once recognized them. While Aldebaràn is a large red star forming one extremity of the V group known as Hyades. Leo is well marked by a sickle, in the handle of

which is the star Regulus, of the first magnitude. In summer nights the zodiacal constellations Scorpio and Sagittarius are very remarkable and beautiful. But perhaps the easiest way to note the position of the zodiacal constellations is to watch the progress of the Moon from night to night during any lunation. She describes, with sufficient accuracy for such purposes as this, the same path as the Sun, and in one thirteenth part of the Sun's period ; so that while the Sun takes about 30 days to pass from one of the zodiacal constellations to the next, the Moon covers the same space in little more than two days. If then the Moon's place in the zodiac be known when first she is seen (at the new), she will mark out the next constellation of the zodiac (eastwards) in about 55 hours from that time. Her brightness, especially at the full, makes it difficult to recognize the detail of the constellation in which she is situate ; but the constellations east and west of this one may be easily and satisfactorily examined.

Once the observer has made himself well acquainted with the belt in the heavens known as the zodiac, he will find no difficulty in assuring himself that the Moon is not the only celestial sphere which traverses this path. At different hours of the night and at different times of the year he will see the planets Jupiter, Saturn or Mars as very brilliant stars—differing only by the steadiness of their light from the other bright stars—in one or other part of the zodiac. At the present time Jupiter is the most brillant star in the sky, and is in the constellation Taurus, a little south of the Pleiades. But Jupiter, Saturn and Mars may easily be distinguished from the true stars by the fact that they change their places with regard to these. It is on this account that they are named *Planets* (wanderers), and it is a peculiarity of their movement to which I would specially ask your attention to-night. Speaking broadly, any of these planets will be seen to travel over the same course as the Moon, that is from west to east, among the zodiacal constellations—but, of course, with much greater slowness. If we could view the Earth's motion in the zodiac from the Sun as our station of observation, (and though this cannot be done in fact, it may easily be done with the aid of imagination), we should see the Earth complete the circle from Virgo, in March, to Leo, in the following February ; in

other words the Earth requires twelve months to pass across the faces of the twelve zodiacal constellations as seen from the Sun. If now from our heliocentric position we watch the journey of Jupiter around the same course, we should have to wait 11.86 years to see the course completed,—or while the Earth passes from one constellation to the next in a month, Jupiter takes about a year to travel over the same arc. This is partly due to the fact that his orbital velocity in miles per unit of time is to that of the Earth as 4 to 9, and partly to the much greater length of his orbit, which is a circle having a radius about five times that of the Earth's orbital radius. But, although the rates of motion would be very different, the directions would be the same ; from Libra to Scopio ; from Scorpio to Sagittarius, and so on eastward, just as in the case of the Moon. If now, still occupying the Sun's place, we were to watch the progress of both planets, it is evident that we should see the Earth make the complete circuit of the zodiac nearly twelve times while Jupiter made the journey once. And further, we should see the Earth pass Jupiter's place, say in Aries, in a particular year, while in the following year our planet would pass Jupiter in Taurus, and the next year in Gemini, and so on. Now Jupiter, as actually seen from the earth, does not journey regularly eastward, but appears, during a part of each year to retrograde, going from the east towards the west in the zodiac. The olden astronomy figured his path, as well as the paths of the other planets, as circles with loops on the circumference. These loops—or Epicycles—are twelve in the case of Jupiter ; and it is by no means difficult to understand how they explain the planet's peculiar and complicated motion, as seen from the earth. When, however, we adopt the Copernican theory which looks on the Sun as the centre of the planetry system, the explanation becomes still simpler. The best way to do this is to draw on a large sheet of paper two concentric circles of radii 1 and 5 respectively. These circles represent the orbits of our Earth and Jupiter, and their common centre is the Sun's place. Divide each circle into twelve equal arcs. The points of division will represent on the smaller circle the Earth's place at intervals of one month, and on the larger circle, Jupiter's place at intervals of one year. Subdivide any one of the arcs (of 30°) of the larger circle into 12 divis-

ions, and each of them will represent Jupiter's place at monthly intervals. Starting with any one of the positions of the Earth as January, name the next one February, the next March, and so on, in the direction from right to left, or the reverse way that the hands of a clock travel over its face. Do the same for the monthly places of Jupiter, and finally connect by straight lines the points of the same name in the two circles. The point on the smaller circle represents the station of the observer for that month, and the point on the larger circle is Jupiter's actual place for the same month. The line joining these points is the line of vision, and if it be prolonged beyond the larger circle to a considerable distance—the farther the better—an arc may be drawn there which will represent a portion of the region of the stars, an arc of the ecliptic. On extending all the lines to this arc in the order of the months, it will be found that they intersect and retrograde exactly as does the planet when followed by actual observation in the heavens; and the more accurately that the diagram is drawn to scale, the more exactly will the figures explain Jupiter's actual motion. Nothing can be more interesting or more instructive to a beginner, than the combination of actual observation of the planet, with a geometrical plotting of the motions on paper in this way.

NOTICE TO MEMBERS.

This number makes eleven issues of the NATURALIST and completes the Volume of 178 pages, besides the 24 pages of Flora Ottawaensis issued during the year.

The ANNUAL MEETING will be held in the Normal School on Tuesday, March 20th, at 4 15 p.m. and in the interest of the Club a large attendance is desired. Those who have not paid their subscriptions for the year will kindly forward the same to the Treasurer without delay

GEOLOGY.

Edited by H. M. Ami, M.A.

The Geological Society of America.—The fifth annual meeting of the Geological Society of America was held in Boston last December, 26th, 27th and 28th, under the auspices of the Boston Society of Natural History and of the Geological Department at Harvard University, Cambridge, Mass.

Principal Sir William Dawson, Emeritus Principal of McGill University, presided at the sessions for the greater part of the time, and was relieved by Prof. T. C. Chamberlain, of Chicago University, the new president-elect. Amongst the other Canadians present were: Mr. W. McInnes, Dr. F. D. Adams and Dr. H. M. Ami. Among the fellows recently elected are Messrs. T. C. Weston and E. D. Ingall, A.R.S.M., of the Geological Survey staff. A brief outline of the results of the meeting will be prepared for a future issue of the Naturalist.

Mr. Tyrrell's journey.—Mr. J. B. Tyrrell, of the Geological Survey staff, has just returned from his extended trip to the Western Extremity of Chesterfield Inlet. During his journey, Mr. Tyrrell and his staff endured many hardships but finally reached Fort Churchill on the Western Coast of Hudson's Bay where they were hospitably treated. Thence the party travelled southward until Selkirk and the C.P.R. line was struck, arriving home in Ottawa the second week in January—having completed a circuitous route embracing some 4,600 miles. About 800 miles of that distance were by previously unexplored rivers, lakes and rocky land, the home of the barren ground caribou.

Mr. Low's trip to Ungava Bay.—News has reached the director and other officers of the Geological Survey from Mr. A. P. Low, B. A. Sc., who left Ottawa last April, 1883, and crossed the Labrador Peninsula to Ungava Bay. From thence Mr. Low crossed to Hamilton Inlet on the East Coast where he will winter. In the spring he will retrace his steps and return to Ottawa in the fall of this year.

BOTANY.

Edited by W. Scott, B.A

Pellæa densa, *Hooker.*—In looking over some ferns and plants collected by me on the Guelph Dolomites of Durham, County Grey, Ontario, in 1883, I chanced to observe a fern which had not hitherto been noticed by me with care and which turns out to be interesting. Having taken it to Prof. Macoun for identification, he immediately recognised the same to be a specimen of *Pellæa densa*, Hook.

This note is intended merely to place on record the discovery of this little "cliff-brake" in the Province of Ontario. I found it at Durham near the saw-mill dam on the Little Saugeen River, in September, 1883, growing in the crevises and nooks of the Guelph dolomites there exposed.

The following notes on the geographical distribution of this plant may be found in Macoun's "Catalogue of Canadian Plants," Part V.

Acrogens, p. 261. "A rock species, confined so far as known to the provinces of Quebec and British Columbia, where it is rare. Found by Prof. Allen on Mount Albert, Shickshock Mountains, Gaspé, Que., in 1881, growing exposed to the sun on the steep walls of ravines, at 2000 to 3000 feet elevation. (*Eaton.*) Abundant on cliffs along the Fraser River above Yale and within the Cascade Mountains; notably at Chinaman's Bluff, on rocks, Sicamous, Shuswap Lake; and summit of Mount Finlayson, Vancouver Island, B.C. (Macoun.) Mount Finlayson, Vancouver Island, B.C. (Anderson.)"

From the above it can be readily seen that so far as known *Pellæa densa* has been found in Gaspé, Quebec and in British Columbia, two extreme points of the Dominion of Canada, and therefore it seemed an interesting fact to record this species from an intermediate station in Ontario. The habitat in Ontario is similar to that in other places.

H. M. Ami.

ENTOMOLOGY.

Edited by JAMES FLETCHER, F.R.S.C.

Corydalis cornutus. Several times last summer this insect was sent in by members for information as to its name and habits. This is not surprising, as it is one of the most striking in our insect fauna, and yet from its crepuscular habit of flight, but seldom observed. It is as remarkable and interesting in its earlier stages, as when it assumes the adult, or winged form. The larva passes its life in the water, and is a common inhabitant of our rivers, being quite abundant for instance in the Rideau. In this stage it lives nearly three years, and when fully grown is a dirty brown "crawler," with a squarish head armed with strong jaws. In addition to six legs, it has several tapering appendages on each side, which gives it some resemblance to much dreaded centipedes. It breathes during its aquatic existence, by means of tuft-like gills placed at the base of the lateral appendages. About June (of its third year) it becomes tired of its submarine life, and seeks change of scene, and may then be found under stones or drift wood, sometimes at quite a distance from the water. Forming a shallow cell it pupates, and about the first of July spreads its ample wings in heavy flight over the surface of the stream in which it erstwhile crept. The expanded wings measure almost six inches from tip to tip, but the heavy body of the insect causes it to be a feeble and awkward flier. The body of the adult much resembles that of the larva, but the male developes an enormous pair of horn-shaped mandibles, which give him a very formidable appearance. This species belongs to the Neuroptera, and is allied to our dragon-flies, as may be readily seen by examining the many veined wings. The larva is considered by fishermen to be an excellent bait, and has received in the United States a variety of names, among which the following are taken from Insect Life :—Dobsons, Crawlers, Amly, Conniption Bugs, Clipper, Water Grampus, Goggle Goy, Bogart, Crock, Hell Devils, Flip Flaps, Alligators, Ho Jack, Snake Doctor, Dragon and Hell Diver.—The adult is also known as the Hellgramite Fly.

W. H. H.

BOOK NOTICES.

Le Naturaliste Canadien—Vol. xxi, No. 1.—Chicoutimi.

We warmly welcome again to our table the monthly magazine founded by the Abbé Provancher, and by him continued for many years despite numerous difficulties and discouragements. Henceforth it will be published by his pupil and co-laborer, Abbé Victor-A. Huard, of Chicoutimi, a gentleman of well-known scientific attainments. The Naturaliste Canadien is the only scientific journal published in the French language on this continent, and therefore appeals to a large body of our people, who are not reached by other scientific publications. We sincerely trust, therefore, that it may receive a hearty support from all those who desire to see the truths and beauties of science brought before fresh audiences. All branches of Natural History will be discussed and an elementary treatise on Zoology has been commenced with separate pagination. The editor proposes also to continue the Faune Entomologique of his predecessor as opportunity permits. Ed.

The Biological Review of Ontario. Vol. 1, No. 1.

This is a new quarterly of sixteen pages, published by an apparently newly formed society; The Biological Society of Ontario. It contains several interesting articles on birds and insects. The necessity of this publication is however, not apparent, as any of the articles contained in it could have been contributed to existing publications such as the Ottawa Naturalist, and the Canadian Entomologist. There does not seem a demand at present for an addition to the scientific publications of Canada. It would be much better for all workers to unite in supporting those already firmly established. Local societies for the study of natural history can be made very useful in bringing workers together, and in fostering an interest in the carrying on of useful investigations, but in the majority of cases the labor and expense necessary to issue special publications might be more profitably employed. Ed.

Annual Meeting on Tuesday, March 20th, at 4.15 p.m.

CONTENTS.