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CONTENTS.

PAGE

1. Officers of the Ottawa Field-Naturalists' Club.... 3
2. List of Members of the Ottawa Field-Naturalists' Club 4
3. The Report of the Council of the Ottawa Field-Naturalists' Club for the year ending March 20, 1906 7
4. Treasurer's Statement for the year ending March 20, 1906 14
5. Notes on an Interesting Collection of Fossil Fruits from Vermont, in the Museum of the Geological Survey of Canada, by H. M. Ami 15
6. On the Structure of Roots, by Theo. Holm. 18
7. A May Morning with the Birds in New Brunswick, by W. H. Moore. 22
8. Spergula arvensis, by Jas. M. Macoun 24
9. Nature Study—No. 33, by S. B. Sinclair. 25

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Being Vol. XXII. of the

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OTTAWA FIELD-NATURALISTS' CLUB.

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1906.

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THE OTTAWA NATURALIST.

VOL. XX. OTTAWA, APRIL, 1906. No. 1

THE REPORT OF THE COUNCIL OF THE OTTAWA FIELD-NATURALISTS' CLUB FOR THE YEAR ENDING MARCH 20, 1906.

The past year has witnessed great interest in the work of the Club, as is shown by the large increase in membership. Sixty-two new ordinary members have been elected. The present membership is 293, composed of 285 ordinary members and eight corresponding members.

SOIRÉES.

The programme of Winter Soirées published in the December number of THE OTTAWA NATURALIST has been carried out with some slight omissions and changes in dates. The attendance at all the meetings has been most gratifying

Since the Normal School course has been lengthened to a year, the students have been able to engage in the field work of the Club during the spring and fall months and also to attend the winter soirées The result has been that the students, having become interested in the field work, have attended the soirées almost in a body. The Club realizes that through the teachers it has a most valuable medium of disseminating its influence, and therefore it keenly appreciates the interest that has been displayed throughout the year.

EXCURSIONS.

Sub-excursions were held as usual during the spring and early summer to localities in the immediate vicinity of Ottawa, viz.: Rockcliffe, Blueberry Point, Victoria Park, Leamy Lake, and Beaver Meadow. Rockcliffe Park and Beaver Meadow were again visited in October.

The Council favors the continuance of outdoor work throughout the year, and to that end had planned two snowshoe tramps, which, however, were cancelled for lack of snow. Three general excursions were held as follows: May 27, to Chelsea; June 10, to Carp; September 23, to Chelsea. The excursion to Chelsea on May 27 was perhaps the most largely attended excursion in the history of the Club, due to the fact that both the Royal Society and the Carleton County Teachers' Association met in Ottawa during that week. Such distinguished visitors as Dr. C. F. Hodge of Clark University, Dr. A. H. MacKay, Superintendent of Education for Nova Scotia, and Dr. G. U. Hay, editor of the Educational Review, were present and delivered able addresses. Detailed accounts of all the general excursions have appeared in THE OTTAWA NATURALIST.

THE OTTAWA NATURALIST.

Volume XIX of THE OTTAWA NATURALIST, the official organ of the Club, has been published under the editorship of Mr. J. M. Macoun. It consists of twelve numbers which contain in all 249 pages and four plates. The following are among the papers that appear in this volume:

1. A New Marine Sponge from the Pacific Coast of Canada. Lawrence M. Lambe, F.G.S.
2. Notes on Fresh-water Rhizopods. W. S. Odell.
3. Food Value of Certain Mushrooms. Prof. Shutt, M.A., and H. W. Charlton, B.A. Sc.
4. Popular Entomology. Arthur Gibson.
5. Glaciation of Mount Orford. R. Chalmers, LL.D.
6. Nesting of Night-hawk in Ottawa. Rev. G. Eifrig.
7. Notes on Fresh-water Shells from the Yukon Territory. Dr. J. F. Whiteaves.
8. Nature's Method of Re-seeding the Red and White Pine. P. Cox.
9. A Naturalist in the Frozen North. Andw. Halkett.
10. Eggs of the Scarlet Water-Mite. Prof. E. E. Prince.
11. Sthenopis thule at Ottawa. Arthur Gibson.
12. Bird Migration. Jas. Bouteiller.

13. Ont. Ornithological Notes (Winter 1904-05). A. B. Klugh.

14. Notes on the Fauna and Climate of the Lièvre River. E. E. Lemieux.

15. Why our Field and Roadside Weeds are introduced species. W. T. Macoun.

16. The Hair-eel (*Gordius aquaticus*). Prof E. E. Prince.

17. The Red-breasted Nuthatch. Wm. H. Moore.

18. On So-Called Silene Menziesii. Ed. L. Greene.

19. A New Northern Antennaria. Ed. L. Greene.

20. A New Goldenrod from Gaspé Peninsula M. L. Fernald.

21. Extracts from Diary of the late Robt. Elliott. W. E. Saunders.

22. Descriptions of New Species of Testudo and Baena with remarks on some Cretaceous forms. Lawr. M. Lambe.

23. Notes on Some British Columbia Mammals. Wm. Spreadborough.

24. The Fly Agaric, and its effects on Cattle. Norman Criddle.

25. Birds New to Ontario. W. Saunders.

26. Eggs of the Fresh-water Ling. Prof. Prince and Andrew Halkett.

27. Eupithecia Youngata. George W. Taylor.

28. Cultivation of Native Orchids. J. H. C. Dempsey.

In addition to these, there have been published several short notes, book reviews, accounts of branch meetings, etc

The series of articles on Nature Study, edited by Dr. Jas. Fletcher, has been continued. In this volume the following papers appear :

1. Nature Study. Dr. Sinclair.

2. The Clouded Sulphur Butterfly. Dr. Fletcher.

3. Short Introduction to some of our Common Birds. Rev. G. Eifrig.

5. Field Work at the Ottawa Normal School Summer Course for Teachers. A. E. Attwood.

4. Ottawa Summer School for Teachers. J. H. Putman.

5. Woolly-Bear Caterpillars. Arthur Gibson.

6. Nature Observations at Home. Prof. Lochhead.

7. Mother Nature and Her Boys. An Institute that brings them together. G. J. Atkinson.

8. The School Garden and the Country School. Geo. D. Fuller.

In all, some 30 articles on Nature Study have appeared in THE OTTAWA NATURALIST during the past three years. They are of a popular and decidedly practical nature, and have added much valuable material to the current literature on this subject. The papers published during the past year have all been contributed by scientists and educationists actively engaged in working out the best courses and methods in Nature Study. 5,500 of each of these papers have been printed in pamphlet form and distributed thoughout Canada ; 2,200 of these go to the teachers of Toronto, 500 to the Macdonald Institute of Guelph for use in the Nature Study Department of the Ontario Agricultural College, and 1,000 to Dr. Robertson, 500 of which are distributed among his Nature Study Instructors in various centres.

REPORTS OF BRANCHES.

Reports showing the work done throughout the year by the various branches have been read before the Club. The report of the Geological Branch has been printed in THE OTTAWA NATURALIST, and the other reports will appear at an early date. Most of the branches are now holding fortnightly or monthly meetings at the homes of the members for the purpose of discussing subjects of especial interest to the respective branches.

ENTOMOLOGICAL BRANCH.

The members of the Entomological Branch have made some notable additions to the local lists during the past summer. Mr. Arthur Gibson made, on July 6, the catch of the year, a perfect specimen of the very rare and local moth *Hepialus thule*, Strkr. Up to the present time this is the only specimen which is known with certainty to have been taken at any other place than Montreal, from which locality the species was originally described and where a few specimens are taken yearly. Mr. C. H. Young has continued his studies of the micro-lepidoptera and has added many new species to the Canadian fauna. All of these have been

described by Mr. W. D Kearfott, of Montclair, N.J., who is making a specialty of these beautiful insects. Mr. W. Metcalfe has continued his studies of the local hemiptera and has added many new records. Mr. J. W. Baldwin made a very remarkable capture of the West Indian moth, *Melipotis fasciolaris*, Hbn. It can only be surmised that the chrysalis of this handsome moth may have been introduced, as has been the case with many other insects, in a bunch of bananas. The Ottawa Fruit Exchange building is close to Mr. Baldwin's house, where the insect was taken in the garden. Six specimens of the handsome elater, *Pityobius anguinus*, Lec., figured in the first Transactions of the Club under the name of *Pityobius billingsii*, were taken by Messrs. Baldwin and Gibson at the electric light on the 28th June. A month later a fine female was taken by Dr. Fletcher, floating on the surface of water, into which it had fallen. Many other insects of more or less interest were taken during the summer and the interest in this branch of work has been kept up steadily. Good work has been done by the leaders in working out life-histories of beneficial and injurious insects.

GEOLOGICAL BRANCH.

Members of the Geological Branch have make special study of some interesting localities in the Ottawa district. The sands and gravels of McKay Lake have been examined and special study has been made of the geology of Strathcona Park, where the excavations in the Utica have afforded an exceilent opportunity for studying that formation; the Chazy at Rockcliffe has yielded an excellent series of slabs exhibiting tracks and trails of marine organisms. The most interesting local find, however, was the discovery of a large number of curved hornblende crystals in a vein of mica at Carp. These curved crystals were new to the geologists and hitherto unrecorded in Canada.

BOTANICAL BRANCH.

The Botanical Branch has held fortnightly meetings throughout the year except during the summer months. The most important matter taken up was the publication of a complete list of the plants of the Ottawa district. Since Dr. Fletcher's "Flora Ottawaensis" was published many new species have been added to

local list, and the work of specialists has made a thorough study of the local flora necessary. This list is to be issued as a publication of the Geological Survey. The Botanical Branch invite the co-operation of all local botanists in this work of revision, and would call special attention to the Rosaceæ ; the study of this large order of plants will certainly result in the addition of several species to the local list.

ZOOLOGICAL BRANCH.

The Zoological Branch held two very profitable meetings during the winter. At the first meeting Prof. Prince read an interesting paper on the function of the swim bladder of fishes, an outline of which appears in the report of the branch. At the second meeting Prof. Macoun pointed out the great amount of work that can be done in procuring specimens of the numerous species of small mammals to be found near Ottawa, and also pointed out the ease with which this could be done.

The report of the Zoological Branch contains a list prepared by Mr. Halkett of the fishes of the Ottawa district preserved in the Fisheries Museum with the localities were they were taken. It also records a number of interesting observations made by members of the branch during the year.

ORNITHOLOGICAL BRANCH.

The Ornithological Branch, although small, consists of a number of enthusiastic workers. Monthly meetings have been held since early last fall at which much systematic work has been planned. The vicinity of Ottawa is to be divided among the members of the branch for active field work, and the antiquated local list published by the Club many years ago is to be thoroughly worked over. Some interesting additions have already been made to the local records, such as the appearance of the Short-billed Marsh Wren, a breeding record of the Screech Owl, and the casual occurence of the Glaucous Gull. The Great Grey Owl, a rare visitor from the north, has been seen this winter. One specimen was secured in East Templeton and another near South March. One of these, a very fine specimen, is now in the collection of Rev. Mr. Eifrig.

Mr. W. E. Saunders of London, who is an active member of

the Club, has done valuable work in compiling a list of birds new to Ontario which have been taken in the Western Peninsula since the issuance of McIlwraith's revised work. This list appears in No. 11 of the volume of the OTTAWA NATURALIST just completed.

The Treasurer's Report shows a balance on hand of $61.62.

A Summer School for Teachers was held in Ottawa last July. Several members of the Club delivered lectures in the Nature Study Course and aided in the field work. Dr. White did practical field work with the class in Physical Geography. Mr. Putman delivered illustrated lectures and conducted experimental work in Botany, Mr. Attwood delivered lectures on minerals and did a great deal of field work, Dr. Fletcher gave two lectures on birds and two on insects, Prof. Prince lectured on Fish Life, Dr. Ami on Ferns, Dr. Saunders on Evergreens, Mr. R. B. Whyte on the pleasures of gardening and other members on various other subjects.

The Council desires to call the attention of the Club to the large number of unbound magazines in the library and would suggest the binding of such of these as a committee appointed to make a selection would consider most worthy of preservation.

The thanks of the Club are again due to Principal White for so kindly placing the Normal School at its disposal, and also to the press of the city for its efforts in furthering the work of the Club.

Respectfully submitted.

T. E. CLARKE,
Secretary.

The Library Committee, acting under instructions from the Council of the Club, has almost completed the arrangement of the periodicals in the Library with the object of having them bound. A good many numbers are missing, and the members who have borrowed them are asked to return them to the Library as soon as they conveniently can, so that the Committee may conclude its work. It is hoped that this notice will make it unnecessary to apply directly to those who have the borrowed numbers in their possession.

TREASURER'S STATEMENT FOR YEAR ENDING 20TH MARCH, 1906.

RECEIPTS.

Balance from previous year		$53 42
Subscriptions—1905-1906	$167 00	
Arrears	65 00	
		232 00
Advertisements in OTTAWA NATURALIST		75 60
Author's extras sold, including separates of Nature Study articles		106 08
OTTAWA NATURALISTS sold, including postage		6 62
Maps of Ottawa sold		85
Proceeds Gen. Excursion to Chelsea, May		21 90
Government Grant		200 00
		$696 48

EXPENDITURE.

Printing OTTAWA NATURALIST, Vol. XIX, 12 Nos., 249 pp.	286 20	
Illustrations	29 92	
Author's extras, including Nature Study separates	147 15	
Miscellaneous printing—wrappers, post cards, etc.	30 08	
	$493 35	
Postage	22 03	
Editor	50 00	
	$565 38	
Less 5 per cent. for cash on printers' accounts	24 30	
		541 08
Secretary		25 00
Treasurer		25 00
Soirée expenses		9 50
Library expenses (binding set of OTTAWA NATURALIST)		6 00
Sundry expenses, postage, etc.		28 28
Balance		61 62
		$696 48

Examined and found correct.

ARTHUR GIBSON, *Treasurer.*

R. B. WHYTE,
A. H. GALLUP, } *Auditors.*

Subscriptions for the new club year, beginning with this number of the NATURALIST, are now due, and should be paid to the Treasurer as soon as possible.

The Treasurer would direct attention to the advertisements in our new volume. Some of these appear for the first time, and members are specially asked to remember these different firms when making purchases. They are all good reliable firms, and, as they are helping the Club by giving advertisements, we should all make it a point to deal with them.

NOTES ON AN INTERESTING COLLECTION OF FOSSIL FRUITS FROM VERMONT, IN THE MUSEUM OF THE GEOLOGICAL SURVEY OF CANADA.*

By H. M. AMI, Geological Survey of Canada.

Amongst the specimens exhibited at the first January meeting of the Botanical Club was a collection of fossil fruits from Brandon, Vermont. These specimens appeared to have been in the collections of the Geological Survey Museum since the days of the late Sir William Logan, having been brought to his attention, it is thought, by the elder Hitchcock in the early fifties. It was in 1853 that these fossil fruits were recorded for the first time by President Edward Hitchcock, in the Amer. Jour. Sc., vol. xv, p. 95 (1853), as occurring in "a bed of brown coal connected with the white clays and brown hematite of the place," referring to Brandon, Vermont, which he had visited in the spring of 1852.

During the visit of the Geological Society of America held in Ottawa in December, 1905, Prof. G. H. Perkins, Director of the State Geological Survey, Vermont, was good enough to look over the collection of these fruits, which were shown to him by the writer, and he there and then undertook to identify every recognizable species, most of which he had himself recently studied, and more particularly described, not only before the Geological Society of America, at the Philadelphia meeting, but also in the Report of the State Geologist for Vermont for the years 1903-1904.

The geological horizon or formation to which these fruits have been referred by many geologists practically agree in ascribing them to the "Lignite Tertiary," the *Brandon Lignite* or Brandon formation, specially designating the horizon or formation to which they are referable. Professor Perkins is inclined to think them as "Miocene Tertiary" in age. Their age was compared by Edward Hitchcock with those of the fossil fruits from the London clay figured by Bowerbank, and he (Hitchcock) further states that "the Brandon deposit is the type of a Tertiary formation hitherto unrecognized as such extending from Canada to Alabama," adding: "This deposit belongs to the Pliocene or newer Tertiary."

* Published by permission of the Director of the Geol. Survey of Canada.

Lesquereux referred the species to the "Upper Tertiary," noting that they agreed specially with the flora of Oeningen, adding: "I have no doubt that the Brandon lignites belong to the same epoch as the upper bed of the lignite of the Tertiary." (Geol. of Vermont, p. 250. 1861.)

From 1861 to 1902, when Prof. F. H. Knowlton's paper on these Vermont lignites appeared in the *Torrey Bulletin* of November of that year, pp. 635-641, plate 25, in which that authority compared the Brandon lignite with the *Pityoxylon microporosum* of Schmalhausen from the Eocene of the Braunkohle of southwestern Russia, naming the Vermont form: *Pityoxylon microporosum Brandonianum*, nothing was written or published concerning these fruits. They are being studied by Dr. E. C. Jeffrey, of the Botanical Department at Harvard at the present time, and in a forthcoming Report of the State Geologist of Vermont it is confidently expected that Dr. Jeffrey's views will be given publicity. Meanwhile, writing of the lignite, Jeffrey states that it "is a species of *Lauroxylon* in a more or less good state of preservation. There is one small piece of coniferous wood and a good deal of dicotyledenous material in which only the medullary rays show any structure."

The shafts sunk through the clay to the lignites have been closed, as, also, the diggings for the Brandon paint in the clays themselves, so that it is practically out of the question now to obtain any more specimens of these fossil fruits from this locality. Formerly, as President Hitchcock pointed out, there were outcroppings of these lignites, but they have been covered up by the dumps and waste materials from the clay pits.

A paper on the "Brandon Clay" appears in the Report of the State Geologist for 1903-1904, by Prof. J. B. Woodworth, pp. 166-173, and in this is given an analysis of the lignite copied from the original description in 1861.

Volatile matter	4.50 %
Carbon	93.50 %
Ash	2.00 %
Total	100.00

Prof. Woodworth then gives notes on the various collections examined from the different Museums of the State of Vermont and

other New England Museums, points out the difficulties in comparing these fruits with those of to-day, indicating that "it is among the tropical and sub-tropical living species that we should expect to find that the most close allies to the Tertiary forms." He also compares a collection of Australian fruits in the University Museum at Harvard with those from Brandon, Vermont, and adds that they closely resemble them.

From pages 174 to 212 of the same valuable Report of the State Geologist of Vermont, Prof. G. H. Perkins himself describes these fruits and accompanies the descriptions with excellent illustrations on Plates lxxv, lxxvi, lxxvii, lxxviii, lxxix, lxxx and lxxxi.

The following is a list of the species identified by Prof. Perkins from the collection in the Geological Survey Museum at Ottawa, Canada, to which is added the number of specimens representing each species :

1. Glossocarpelites Brandonianus, Lesquereux. Fourteen specimens.
2. ,, elongatus, Perkins. Four specimens.
3. ,, obtusus, Perkins. Nine specimens.
4. ,, grandis, Perkins. Two specimens.
5. ,, parvus, Perkins. One specimen.
6. Monocarpelites elegans, Perkins. One specimen.
7. Bicarpelites Grayana. (Lesquereux, sp.). One specimen.
8. Nyssa ascoidea, Perkins. One specimen.
9. ,, Lescurii, C. H. Hitchcock. One specimen.
10. ,, elongata, Perkins. Two specimens.
11. Apeibopsis Heeri, Lesquereux. Six specimens.
12. ,, Gaudinii, Lesquereux. Fourteen specimens.
13. Aristolochia obscura, Lesquereux Eight specimens.
14. Aristolochites majus, Perkins. Five specimens.
25. Sapinoides Americanus, (Lesquereux) Perkins. Six specimens

In all, these fossil fruits, as determined by Prof. Perkins, have yielded sixty-eight specimens distributed in eight genera and fifteen species. They were all identified by Prof. G. H. Perkins, and the Geological Survey of Canada is under special obligations to him for his kindness in looking over the material submitted to him, which he so willingly classified.

As the Brandon formation of clays and lignites is supposed to cross the Canadian boundary, it has been deemed of interest to make a note of the collection which Sir William Logan had obtained years ago, and must serve to throw light upon the geological history of our Eastern Townships.

Ottawa, Jan. 25, 1906.

ON THE STRUCTURE OF ROOTS.

By THEO. HOLM.

It is a general belief that plant-roots exhibit but very few modifications in regard t function and structure, and almost as a rule the histology of this organ is silently passed by in works on plant-anatomy. Furthermore, it is a very common feature of herbarium specimens that the parts underground, for instance the roots, are either totally absent or poorly preserved. It is, therefore, often very difficult to study roots in herbaria, and the student is mostly obliged to secure the material himself and to make alcohol preparations. When roots are dried and pressed they may in some cases be made useful to histological research by being placed in boiling water and then preserved in strong alcohol, but many roots, especially the fleshy ones, loose their delicate structure to such an extent when they are dried and pressed, that they are not suitable for this purpose. If the herbalists would preserve parts of the various organs of plants in alcohol as an appendix to their herbaria, the plants might be studied more carefully and from other points of view than merely systematically.

To give some illustration of the various functions performed by roots, we might refer to a modern and very suggestive paper by our excellent friend Dr. August Rimbach,* in which the following four types are proposed: "nutritive," "attachment," "contractile," and "storage-roots."

Roots of the first type possess no pronounced power of resistance, since they have no mechanical tissues, nor are they contractile nor especially adapted "to store" nutritive matters. They are generally very slender and certain plants possess only this type, for instance: *Dentaria*, *Tulipa*, the *Gramineæ* and many others.

The second type, the attachment-roots, needs no further explanation, and these we know from the epiphytic *Bromeliaceæ*.

The contractile roots have th power of contracting, thus drawing the shoot deeper and deeper into the ground, as for instance: *Scilla*, *Crocus*, *Gladiolus*, some species of *Oxalis*, etc.

Storage-roots are, on the other hand, such roots as possess

* Berichte Deutsch. Bot. Gesellsch. Vol. 17. Berlin 1899.

a large persistent parenchyma in which nutritive matters are "stored." They often become tuberous by the excessive development of this parenchyma, and these are well known from the *Orchideæ : Orchis*, *Spiranthes*, *Platanthera*, etc., also fro *Hemerocallis*, *Aconitum*, *Delphinium*, etc.

The structure of such roots offers really a number of interesting modifications, which are very little known so far, and it would be an excellent study to undertake the investigation of their structures, instead of confining ourselves to the other organs alone. It is not, however, an easy matter to study such roots, but by beginning with the more simple types, for instance the annual a[illegible]ng the nutritive, the various tissues may be readily perceived and distinguished. The most difficult ones are the tuberous storage-roots, and these must always be studied at the various stages of their growth and during several seasons. There are, also, certain types which are called anomalous, as for instance the beet, which is quite difficult to understand, unless the successive stages have been observed.

With the object of giving some examples of different root-structures we may begin with an ordinary, annual nutritive root of *Streptopus roseus*, of which we have drawn part of a section on Plate I. In this drawing the central cylinder is complete, but the cortex and epidermis is only shown in part. The structure is as follows :

The epidermis (*Ep.*) consists of a single layer and many of the cells are extended into root-hairs (*Rh.*); beneath this tissue is another single layer, the cells of which are quite thickwalled, and this is the so-called exodermis (*Ex.*). The cell-walls are more or less suberized, thus the membranes are almost impermeable to water and render thereby an important protection to the interior tissues. In many cases the exodermis possesses, also, the power of contractility, which may be seen from tangential sections, where the radial cell-walls show foldings or undulations, which continue in the longitudinal direction of the root, resulting in contraction.

Inside the exodermis follows a parenchyma of several layers, the cortex (*C.*); it is in this tissue that nutritive matters are stored in storage-roots. The cells are often loosely connected, thus we

may frequently observe quite broad intercellular spaces, often to such an extent as deserving the term "lacunes," which are very common to roots of plants that grow in moist situations.

The innermost layer of the cortex is differentiated into an endodermis (*End*.), the structure and function of which suggests that of the exodermis, and forms a closed sheath around the central cylinder of the root.

Bordering directly on the endodermis, thus representing the outermost tissue of the cylinder, is a layer, and mostly a single one, of thinwalled cells, which is called the pericycle or pericambium (*P.*). The cell walls are never suberized nor do they show any foldings. It is a tissue of great importance, since the lateral roots become developed from this, and usually also the root-shoots.

Inside the pericycle we find the leptome (*L.*) with sieve-tubes and companion-cells, and the hadrome (*H.*) with the vessels. These two elements, the leptome and hadrome, are in the root arranged in separate groups, side by side, alternating with each other in contrast to the stem, where they are located in the same radius, the leptome outside, the hadrome inside. The vessels are of different width in proportion to their age, the narrowest being the earliest developed. The sieve-tubes and their companion-cells are, as already stated, located between the rays of the hadrome, and their delicate structure makes them readily distinguished from the thick-walled vessels and conjunctive tissue, the last of which occupies the centre of the root; it is parenchymatic and corresponds well with the pith of the stems.

This root represents the annual type, and no increase in thickness takes place, thus the root remains unchanged until it dies at the end of the season. But if we now examine perennial roots, we notice that an increase in thickness generally takes place which results in greatly modified structures of which the following is the most frequent and may be considered the normal.

The first sign of change in structure is to be observed in the central cylinder where a cambial tissue becomes formed in the shape of arches and on the inside of the leptome ; this cambial tissue thus originates in the conjunctive tissue bordering on the

leptome. The cambium commences then to develop new groups of leptome outwards and new groups of hadrome inwardly. By continued growth the cambial arches extend towards the pericycle and meet outside the rays of the hadrome, thus a completely closed ring of cambium becomes formed, and this is able to develop leptome and hadrome throughout its entire width. The original structure of the root has, thus, become very considerably changed, since the secondary groups of leptome are located in the same radius as the secondary hadrome, while the primary were arranged in alternation with each other. At this stage the structure is very much like that of a stem (Dicotyledones and Gymnosperms) except that the primordial hadromatic rays are yet to be observed. But besides resulting in the formation of secondary leptome and hadrome due to the cell-division of the cambial ring, the pericycle possesses, also, the power of developing secondary tissues by similar cell-divisions. This new tissue is, on the other hand, parenchymatic, and is called the secondary cortex, since it agrees in all respects with this particular tissue. It is easy to understand that the primary cortex with epidermis and endodermis are not able to follow the continued growth of the elements in the central cylinder, but become split, die off and are finally thrown off altogether, thus the secondary cortex formed by the pericycle takes the place of the primary.

We may pass now to the structure of the beet. In a fully developed root of this plant we notice in a cross-section a number of concentric rings, resembling the annual rings of a perennial, woody stem. However, these rings are all made in one summer, and by following their structure gradually from month to month, the structure is shown to have originated in a very different way from that of a stem. The fact is that the secondary cortex is here able to develop continuously new strata of leptome and hadrome separated by medullary rays in concentric rings and in centrifugal direction. As soon as one stratum of leptome and hadrome has performed its function for some time, it ceases to grow any further, and a renewed formation of another ring outside the first one takes place and so on, so that a number of rings are formed during the season; the most conspicuous portion of each of these

rings is the hadrome, which consists of a few lignified vessels, the only lignified elements of the root. The rings which we thus observe in the beet are not to be compared with the annual of a stem, since they are developed in one season and since they are developed independently of each other, while in the stem the annual rings depend upon the cell-divisions of the same cambium.

Brookland, D.C., January, 1906.

A MAY MORNING WITH THE BIRDS IN NEW BRUNSWICK.

By W. H. MOORE.

The morning was truly delightful. The pulse of Nature was throbbing in ecstacy under the genial rays of old Sol, who had seemingly neglected his charges here upon the earth for some days before. The northward sway of bird migration had been at a standstill for a few days, but upon this morning of May (1905) the wave was fast advancing.

A walk of about a mile was taken through woods and along a highway a short distance across clearings. Birds were plentiful in all places. In trees about the lawn near the house was a number of self-naming birds, namely, Tom-Peabody, known to the scientific world as *Zonotrichia albicollis*. In a thickly grown spruce by the side of the path, a pair of robins were building a nest, and just as I walked past, one came with a great mouthful of grass. In some hazel shrubbery, nearby, were a few song-sparrows, and one Mrs. Peabody, busily engaged searching among the stranded leaves. Among the young foliage of a small yellow birch beside a brook was a redstart flitting and tumbling after various insects, and now and then stopping to sing his song of thanksgiving for being permitted to be alive this beautiful Sunday morning. Among a growth of young conifers, was a Magnolia warbler singing to his mate, who was no doubt thinking what a good locality that would be in which to breed. A black-and-white warbler was a short distance farther along among a mixed growth

of maples, birches and conifers. His presence was first made known by his song of *wee-see, wee-see, wee-see*. Constantly there could be heard the lively, pleasing song of the purple finch, which at this time of year is singing its best. From numerous tall dead trees came the calling and tap-tap-tap, tap-tap-tap-tap of the yellow-bellied sapsucker. The beating tatoo of this species is more interrupted in its course than is the continuous roll of other woodpeckers. Twittering barn swallows were flying high in the air. Farther on a stop was made to write down some notes and take in the songs of one Cape May warbler, three hermit thrushes, four Magnolia warblers, one robin, one white-throated sparrow, three black-throated green warblers, two black-throated blue warblers, two ovenbirds, one junco, one goldfinch, and three Nashville warblers. After a short walk along an old lumber road, a stop is again made, and notes taken of such songs as some of the above, in addition to two Parula warblers, four least flycatchers, two purple martins and the voluminous songs of two winter wrens. As I sit here upon an old stump, the first olive-sided flycatcher of the season alights upon the topmost tower of a birch stub and calls out, *Look, I'm here*, or *Put me down*. The song of the olive-side when heard from a distance easily sounds *Take care*, with emphasis upon the first and last of the two syllables, the first note of *Look, I'm here* is heard only when one is near the bird.

The olive-side was answered by a chebee which had been present for some days and which enthusiastically called out *Go-back* or *Go-beck*. Thus it could be interpreted by the genus Homo, but among the aves it was probably a call of love, while for certain insecta it may have been a warning of danger. Some bird behind me gives a twittering, and, turning about, at length I discover in a tangle of raspberry, small maple sprouts and dead brush, a male Maryland yellow-throat while an olive-back thrush calls attention from another tangle nearby. A small flock of crows fly cawing past, just above the tree-tops, and in the distance is heard the calls of a pileated woodpecker.

As no chickadees had yet been heard, I whistle their love song of sweet weather, and am answered by the same notes from one

of these birds. In returning homeward the Blackburnian warbler is added to the list of birds observed in a walk of a mile. Through the meadow by the rear of the house were numerous chipping, Savanna and vesper sparrows, and a pair each of flicker, bluebird, white-bellied swallow, and several eave or cliff swallows. In a swamp by the edge of the clearing the waterthrush lives.

This was the banner day of the season, as eight new arrivals were recorded. Insects of many species were likewise alert; among numerous blooming plants were identified the white and blue violets, dandelion, goldthread, swamp honeysuckle and moosewood.

Scotch Lake, N.B.

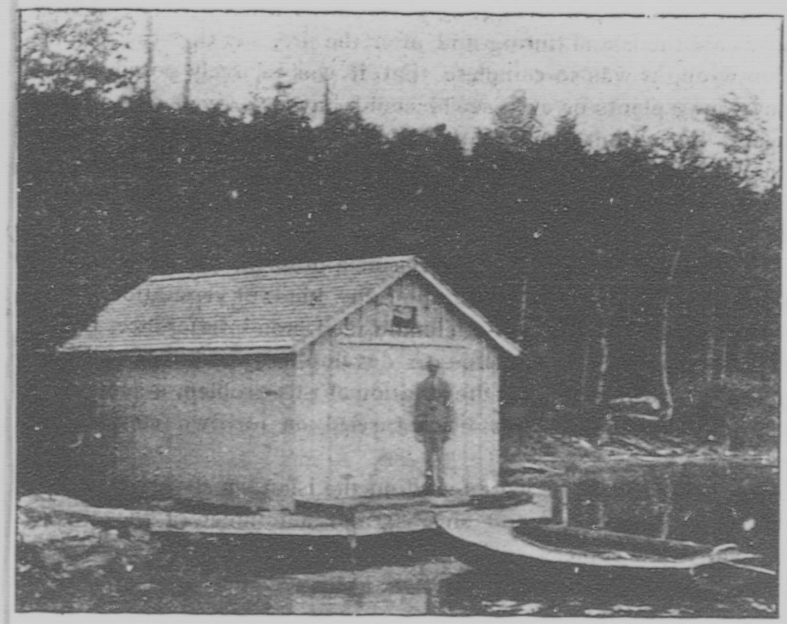
SPERGULA ARVENSIS, L. In *Rhodora* for August, 1905, Mr. M. L. Fernald notes the occurrence of *Spergula sativa*, Boenn., at New London, Conn. When examining the material of *S. arvensis* in the Gray Herbarium he found plants collected by Dr. James Fletcher ot Ottawa in 1892 and distributed in Halsted's American Weeds as *S. arvensis* that are *S. sativa*. I have just examined all the *Spergula* in the herbarium of the Geological Survey and find that the only representatives of *S. sativa* there are from Denmark and Norway, and are so labelled by the collectors. All our other specimens from Canada, the United States and Europe are *S. arvensis*, our Ottawa specimens being from Wakefield and Pickanock. It is possible that in Halsted's distribution he mixed material from some other locality with that received from Dr. Fletcher, but *S. sativa* should be looked for in this vicinity. *S. sativa* "has minutely punctulate, margined seeds, and in a living state can be distinguished by its decidedly viscous, dull grey-green leaves and branches; on the other hand, in *S. vulgaris* (*S. arvensis*) the seeds are obscurely margined, or totally devoid of wing, and beset with club-shaped papillæ, generally quite black in fully matured seeds."

JAS. M. MACOUN.

NATURE STUDY.—No. XXXIII.

DEFINITE PROBLEMS IN NATURE STUDY.

S. B. SINCLAIR, M.A., Ph.D.



HUNTO ISLAND, MUSKOKA, ONT.
Eighteen years of unassisted forest growth.

The following elementary experiment is submitted in the hope that it may be suggestive of others, and also emphasize the fundamental principle that in beginning Nature Study the main difficulty lies in selecting a suitable problem and making a definite and sequential study of the subject chosen.

FOREST DEVELOPMENT.

The island of Hunto in Portage Lake, twenty miles southeast of Parry Sound, Ontario, has an area of about seven acres, and, like other islands of the Muskoka region, is simply the summit of an upheaved mountain of Laurentian granite, the highest point being about 80 feet above the level of the surrounding lake.

About two-thirds of the surface is covered with soil varying from one inch to thirty inches in depth.

In the year 1887, the island, which was then beautifully wooded, was swept by a fire which completely destroyed all vegetation, except a few straggling pines at the water's edge. Those who saw the island during and after the fire, say that the desolation wrought was so complete that it was scarcely possible that any young plants or even seeds could have survived the intense heat. Since that time no new timber has been cut, no domestic animals have been on the island, and with the exception of a few hares, deer-mice and squirrels, there apparently has been nothing to interfere with the development of the smallest herb.

This situation seemed to present a problem which, if worked out, might cast some light upon the kind of vegetation which under similar conditions—of climate, soil, non-interference, etc.—might reasonably be expected to develop in a period of eighteen years, and with a view to the solution of this problem a somewhat careful investigation has been carried on for two consecutive summers.

Altogether there were found on the island forty-seven different varieties of trees and shrubs, and a number of these were evidently new comers. The following is a comparative statement of the height and circumference of a few of the largest trees in 1904 and 1905:

	1904		1905	
	Height feet.	Circ. inches.	Height feet.	Circ. inches.
Populus tremuloides, American Aspen-Poplar	35	12	37	14
Betula papyrifera, Paper or Canoe Birch	30	19	32	18
Prunus Pennsylvanica, Wild Red Cherry	29	16	30.5	16
Pinus Strobus, White Pine	22	13	24	13
Acer rubrum, Soft Red Maple	22	9	22	13
Quercus rubra, Red Oak, Black Oak	20	14	20	16
Thuya occidentalis, American Arbor-vitæ, White Cedar	20	14	20.6	16
Pinus resinosa, Red Pine	19	11	10.5	13
Larix Americana, American Larch, Tamarack	16	8	17.5	9.5
Quercus alba, White Oak	15	8	16.5	9.5
Abies balsamea, Balsam Fir	13.5	9	15	9.5
Tsuga Canadensis, Hemlock Spruce	11	5	11	8

The time and labor requisite for collecting, identifying and mounting specimens and for measuring trees in such an investigation is not great. Nor is the collection of specimens a necessary condition of satisfactory work. The study of the living organism from the genetic functional standpoint is of much greater value than the mechanical examination of dead specimens. One of the best features of such work is that it presents obstacles which furnish a natural stimulus to endeavor and which when overcome afford genuine satisfaction. Where serious difficulty is presented and individual observation and text-books prove inadequate, the Canadian Government has wisely made provision for all emergencies by providing trained specialists, who are able and willing to answer questions submitted to them and to whom inquiry can be sent postage free. In this connection my best thanks are due to Dr. Fletcher, of the Experimental Farm at Ottawa, who not only supervised the classification made, but also made a personal inspection of the locality studied.

The essential requirement of a university post-graduate dissertation is that it must add something, no matter how little, to the sum total of human knowledge. Measured by this criterion such an investigation as the foregoing, be it ever so limited in scope or unpretentious in character, at once becomes important, for one finds oneself doing that which has been done by no one else, and if the work be honestly performed and the records accurately kept, the information gained (although apparently trivial) may prove to be of genuine public service in future interpretation.

Another of the advantages of such definite research work is that it is adapted to the stage of development reached by the adult learner who, although he has omitted Nature Study in early life, has acquired as the result of natural growth and activity in other studies a scientific attitude of mind which causes him to appreciate the meaning and value of the laboratory method and to prefer it to a more superficial treatment.

The experience of the Ottawa Normal students in the study of birds affords practical illustration of this fact. For a number of years each student has been asked to learn the identification

and general characteristics of sixty species and to make a careful and thorough study of one species as regards life-history, life-relations, care, etc. The invariable opinion expressed by the students is that they find the intensive study more interesting than the more extended observation.

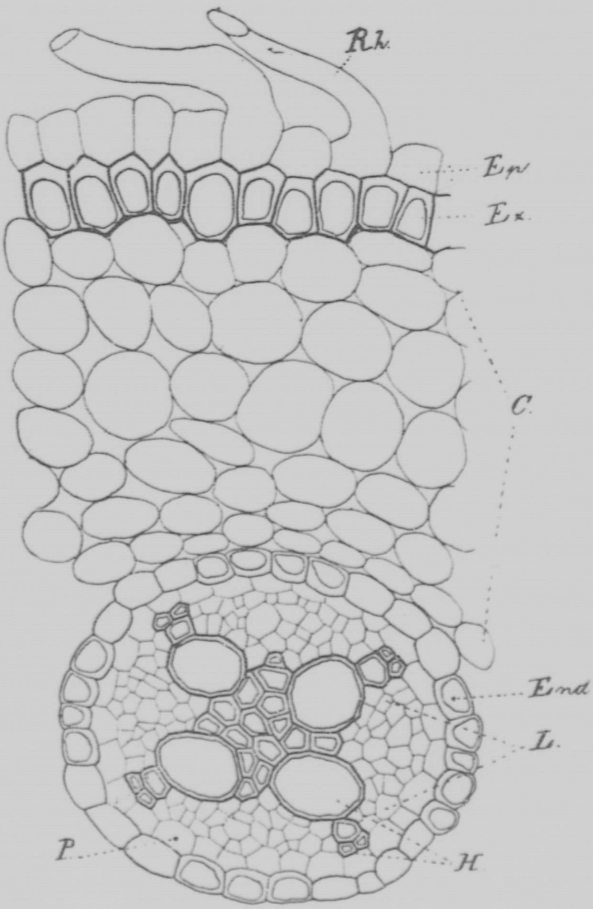
From the standpoint of the learner, the actual knowledge gained is of genuine value, being in a very especial sense his own. It is probable, however, that what may be called the *indirect* results of such an investigation are really of most worth to the student. The attention is sure to be attracted to a thousand interesting phenomena which otherwise would have passed unnoticed. For example, in the foregoing investigation certain kinds of trees were found to be grouped in favorable places in their own special habitats. There was a preponderance of ferns, fungi and mosses on the northern exposure where there was least evaporation, and swamp plants were found in the lowest parts of the island.

Many other interesting phenomena in connection with soil formation, heat and moisture conditions, were similarly incidentally noted.

Further, in such study one is sure to become impressed with the fact that the investigation of sequential life-history is more interesting than the study of a cross-section. "What have we here?" is seldom as productive a question as "How did it get here?" or "Whither does it tend?"

While carrying on the foregoing investigation, such problems as the following naturally suggest themselves: "How were the seeds brought to the island?" "In what order did the trees appear?" "What other trees will come and how will they come?" "Will the struggle for supremacy leave conditions as at present, *e.g.*, will the poplar continue to rule the pine?"

The narrow limits of such a paper will not admit of further reference to the more fascinating and productive studies of structure, function and life-relations. The interest in such work is always cumulative, the Nature Study attitude soon becomes habitual, and after that all is clear sailing.



Holm : On structure of roots.

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