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# THE OTTAWA NATURALIST.

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## THE OTTAWA NATURALIST

# THE OTTAWA NATURALIST.

VOL. XX.

OTTAWA, MAY, 1906.

No. 2

## LIST OF SOME FRESH-WATER SHELLS FROM NORTH-WESTERN ONTARIO AND KEEWATIN.\*

By J. F. WHITEAVES.

(A.) *From the English River, in North-western Ontario above Lac Seul; collected by W. McInnes, of the Geological Survey of Canada, in 1905.*

### PELECYPODA.

\**Sphaerium flavum*, Prime.

English River, below Manitou Fall; one specimen.

### GASTEROPODA.

*Planorbis (Pierosoma) corpulentus*, Say.

English River, below Manitou Fall; three specimens, the largest of which is fully an inch in its maximum diameter. The adult shell of this species, which corresponds to the variety *macrostomus* of *P. trivolvis*, has not yet been described nor figured.

(B.) *From various localities on the boundary between Ontario and Keewatin, or in Keewatin; collected by W. McInnes in 1905.*

### PELECYPODA.

*Lampsilis luteola* (Lamarck).

Albany River, between lakes St. Joseph and Eabemet; five specimens.

\* Communicated by permission of the Director of the Geological Survey Department. The species with an asterisk prefixed to their names, have been kindly determined by Dr. V. Sterki.

*Anodonta Kennicotti* (?) Lea. Var.

Lake St. Joseph, one specimen; Albany River, two specimens; and West Branch of the Winisk River, two specimens.

\**Sphaerium flavum*, Prime.

Root River, Lac Seul; one specimen.

*Sphaerium rhomboideum* (Say).

Lake St. Joseph, two specimens; and Albany River, three specimens.

\**Pisidium variabile*, Prime.

Lake St. Joseph, at two localities, three specimens from each; and Albany River, two specimens.

\**Pisidium Mainense*, Sterki.

Root River, nine specimens.

\**Pisidium "abditum"*, Haldeman."

Albany River, thirteen specimens.

\**Pisidium Roperi*, Sterki.

Albany River, five specimens.

\**Pisidium politum*, Sterki.

Root River, one specimen.

\**Pisidium rotundatum*, Prime.

Lake St. Joseph, one specimen.

\**Pisidium pauperculum*, var. *crystallense*, Sterki.

Root River, one specimen.

\**Pisidium splendidulum*, Sterki. Var.

Lake St. Joseph, at two localities; seven specimens.

\**Pisidium vesiculare*, Sterki.

Head of Lake St. Joseph, fourteen specimens.

\**Pisidium medianum*, Sterki.

Lake St. Joseph, one specimen.

\**Pisidium miltum*, Held. Small var.

Head of Lake St. Joseph, one specimen.

## GASTEROPODA.

*Valvata tricarinata*, Say.

Albany River, four specimens.

*Valvata sincera*, Say.

Lake St. Joseph, at two localities ; four specimens.\*

*Amnicola limosa*, Say.

Root River, several specimens.

*Limnæa stagnalis*, L.

Trout Lake, Severn River, Keewatin ; two specimens.

*Limnæa catascopium*, Say.

Albany River, six specimens ; and Trout Lake, two specimens.

*Planorbis (Helisoma) bicarinatus*, Say.

Albany River, one specimen.

*Planorbis (Gyraulus) albus*, Muller.

Albany River, four specimens ; and West Branch of the Winisk River, seven specimens.

*Physa heterostropha*, Say.

Albany River, three specimens.

*Ancylus parallelus*, Haldeman.

Root River, one specimen.

(C.) From Knce Lake, Keewatin, on the Hayes River route from Norway House to York Factory, in Lat. 55° N., and Long. 95° W. ; collected by O. O'Sullivan, of the Geological Survey of Canada, in 1905.

## PELECYPODA.

*Sphærium simile* (Say) ;

One adult and perfect specimen.

\**Sphærium emarginatum* (?) Prime.

(Or *S. stamineum*, Conrad, var.)

Several specimens.

\* *Pisidium fallax*, var. *errans*, Sterki.

One specimen.

GASTEROPODA.

*Annicola limosa*, Say.

One specimen.

*Limnea stagnalis*, L.

Three specimens (two broken in transit).

*Limnea catascopium*, Say.

Six specimens.

*Planorbis (Helisoma) bicarinatus*, Say.

Eight specimens.

*Planorbis (Pierosoma) trivolvis*, Say.

Three specimens.

*Planorbis (Pierosoma) corpulentus*, Say.

One large adult specimen (unfortunately broken in transit).

*Planorbis (Planorbella) campanulatus*, Say.

One specimen.

*Planorbis (Menetus) exacutus*, Say.

One specimen.

*Physa heterostropha*, Say.

Two specimens.

Ottawa, April 17, 1906.

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EARLY NESTING OF THE VESPER SPARROW.

To-day, May 1st, I found a Vesper Sparrow's nest containing three eggs. I was rather surprised at this find, as these birds very seldom have full sets in this district until about May 24th. The nest was built of grasses and stems, with a heavy lining of horse-hair, and was placed in a clump of dead grass one foot high in a field which was for the most part damp and marshy.

W. J. BROWN

Westmount, Que., May 2, 1906.



## THE MIGRATION OF BIRDS\*

Rev. C. W. G. EIFRIG, A. O. U.

The natural phenomenon of bird migration must appeal as interesting and mysterious to every thinking person, especially to the lover and observer of nature. But I fear the mysterious part of it must remain so to a greater or lesser extent, even after all that can be, has been said on it. A flood of new light, however, has been shed on this subject recently by the publications of the Biological Survey of the Department of Agriculture at Washington, D. C. This department has for about 20 years been sending out blank question sheets to competent ornithologists all over America, on which are to be noted the names of all the migrant birds passing through certain localities, the first and last dates when seen in spring and fall, etc. I may say also that a member of the Ottawa Field-Naturalists' Club has for many years been sending in these sheets, well filled out, from this section, namely that very competent and indefatigable ornithologist, Mr. George R. White. This vast amount of data and statistics on migration is now being systematically worked over and has already yielded highly interesting and unexpected results, as witness the writings of Prof. Wells W. Cook, of the Biological Survey, Washington. To these I am indebted for many of the statements I am here able to make.

The first question suggesting itself in regard to migration is: *Why* do birds migrate at all? *Why* do they leave us? Some will answer: "Because it would be too cold for them in winter." That this cannot be the whole reason we can at once see from the fact that the tiny Chickadee, the Snowflake, frequently the Pine Siskin and Redpoll remain with us all winter. Besides, some birds, also their young which never experienced a winter any-

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\*Lecture delivered before the Ottawa Field-Naturalists' Club, at the Normal School, Ottawa, Jan. 23, 1906.

Since this had not been written out before the lecture, it can not be reproduced in exactly the same form as delivered. There are many but slight omissions and alterations. The greater part of the introduction is also omitted.

where, begin to leave us in August, when there is no sign of cold. And why would they then leave again the warm Southland where there is no cold to be feared at any time? Some will say: "It is because their food gives out in winter." This is, of course, a better reason than the first, though the two are inter-related. But that even the very important food question cannot be the sole motive for their migrating can be seen from the fact, that many birds start away from here in August and early September when their food is most abundant, and the same can probably be said of the places they leave when returning north. So this point is somewhat mysterious. We have to fall back on instinct, which of course, while being a handy word to use, does not explain anything to us. The birds seem to have an instinctive desire for seclusion during their nesting time, which could not be obtained in the south, where the millions of birds from the north are crowded together with the teeming faunal life there resident. This, together with the evident love for the place where they were born, seems to be the motive, at least for the northward migration. Besides, we notice an instinct or impulse for migrating in other animals also, as among the lemmings, the salmon, eel, herring, etc.

Then we ask, "When do birds migrate?" No any one answer will suffice for this question. We have a spring migration, the birds travelling northward, and a fall migration, southward. Each extends over a long time, as some species come and go early, others late. There are probably only two months when no migration of any kind or at least wandering and roving about takes place, these being January and June, the latter the nesting month over a large part of the northern hemisphere. With us the beginning is made in the spring migration by the Prairie Horned Lark and the Crow, which come about the last week of February. During the second half of March come the Song Sparrow, Bluebird, Robin, Tree Swallow, etc., in April the Phoebe, Kingfisher, gulls, ducks, blackbirds, Meadowlark, etc., but May is the leading month in the spring migration. Then, huge waves of warblers, finches or sparrows, fly catchers and vireos come. The last migrant here is the Blackpoll Warbler, which can be heard into the first few days of June. The fall migration is started by some

warblers and shore birds as early as July, by more in August, but the bulk of it takes place in September; the number of birds decreasing rapidly during October, and a few bringing up the rear in November.

Now, as to the time of the *day* in which the migrations take place. The rule here seems to be: The weak-winged and timid birds, such as rails and some sandpipers, etc., birds finding their food under cover, as the warblers, some finches, thrushes, vireos, etc., migrate during the *night*, so they can rest during the day and find their food more easily than they could at night. Other birds, strong of wing, fearless, finding their food more in the open, as the blackbirds, the robin, etc., travel partly during the day or night, making use of either or both times to suit their pleasure. A third class, such having long wings, expert tireless fliers, which find their food while flying, as the swift, the swallows, also the gulls, terns, hawks, etc., travel by day exclusively, for apparent reasons.

Over what *distances* do their migrations take the birds? That is again extremely variable. When our Ruffed Grouse (*Bonasa umbellus togata*) leisurely walks from its summer haunts on top of one of the Laurentian hills to the north of us and goes down a mile into the nearest cedar or spruce swamp, that may also be called a migration. The same can be said, when some birds breeding in the Rocky Mountains near the summit or the timber line, leave these *quasi* boreal regions and by descending a mile or two enter the temperate or even subtropical zone. Some of our breeding birds go further, as the Purple Finch, Junco, etc., and winter 2-300 miles south in New York State. From that the distances increase rapidly to as much as 8,000 miles for one trip, as in the case of the Golden Plover, the Knot, the Eskimo Curlew and many more.

Over what *routes* do they travel? As a general rule we may say, that the birds breeding from Labrador and Ungava southward, go to Florida, as their first stage of migration, many species of course wintering north of that. Those breeding west of Hudson Bay and east of the Rocky Mountains in the great Mississippi water shed, go towards and to Louisiana. Those breeding in and west of the Rocky Mountains travel overland entirely into

Mexico. That there are many exceptions to this is evident. Thus, some Alaska birds, instead of joining the western or middle contingent, seem to travel to the east, as the Blackpoll Warbler; and the Bobolink, which has advanced from its eastern habitat as far west as Utah, has been shown to travel back east in migration, over the way its species originally extended its range westward, instead of going the shorter way by land into Mexico; thus adhering to family traditions. The same is done by the Wheatear, a European species, having come by way of Iceland and Greenland to Labrador, now breeding there. That migrates back to Europe over the same route the species has come. Now, how do those that want to go further south proceed from the Gulf coast? Not as we might suppose via the Greater and Lesser Antilles to South America, that being to our mind the easiest route; they would always be in sight of land, near food, etc. Of about 25 species which make a start over this route, only about six finish it to the South American main. Nor do a great many take another apparently easy route, *i.e.* from southern Florida to Cuba, on that island to its western point and then by a short flight of about 100 miles to Yucatan. No, one main route is from Florida to Cuba, thence to Jamaica, at both of which many species remain, and thence by a 500 mile flight over the Carribean Sea to South America. Another route is from northwestern Florida straight south to South or Central America or Yucatan. Another from Louisiana south and south-west to Mexico. These routes also seem to show that the birds cannot, as a rule, be greatly exhausted by long flights, otherwise they would dread them and rather make use of all the islands they could and travel from Louisiana, or at least from Texas by land into Mexico, which most birds scorn to do, thereby not even cutting off much distance or time. It has also been discovered by these late investigations, that some species coming north from Mexico, etc., do not alight as soon as they have land under them, but rather fly many miles inland before doing so.

An interesting question in connection with migration always has been, "*How do the birds find their way?*" It has been held that the configuration of the land below, the physical features of it, play an important role in this. That this can be true only to a slight extent, we can at once see, when we bear in mind tha

many birds migrate at night, some high up; that the young birds going the first time can have no knowledge and experience of the route; when they leave here in September the trees are yet full of leaves and the fields not empty, whereas the landscape looks entirely different in April or May, when no leaves are out and the fields are bare, etc. Some seem to follow the coast line or the rivers, especially day migrants, but this can not explain all. The solution of the problem seems to be, that they have a *sense of direction*, and their instinct—whatever that is—seems to impel them in the right, usually for them best direction. That they must have such a sense, we can see from the Carrier or Homing Pigeon. This may be put into a box, taken aboard a train and carried on it hundreds of miles to a place where it never has been, neither can it see the physical features of the way, yet on being liberated it will find its way back with most unerring directness.

At what *height* do the birds travel during migration? A balloonist has seen an eagle soaring about at a height of 9,000 ft.—which does not say it was migrating. Some observers have seen large bands of migrants at an altitude of 5,000 ft. An experimenter with kites has seen large migrations of ducks at from 1,300 to 1,500 ft. high. Many birds are killed by flying against lighthouses no more than 100 ft. high. So, no one answer can be given to this question. Some species always, and others perhaps only when the air is heavy and foggy, fly very low, not more than perhaps 100 ft. over all trees and houses. We can hear their voices plainly at night during migration. But the bulk of it seems to be going on at a *height of from 500 to 1,500 ft.* They want to stay below the lowest clouds. That they are sometimes bewildered and driven out of their course by fog and strong winds is equally certain.

At *what rate of speed* do the birds proceed southward and northward? That this must be very variable we can see at once when we look at the wings of the warbler, thrush or rail and at those of the swallows, gulls and hawks. If we divide the distances travelled by the number of days spent in migration, we obtain a rate of from about *25 to 150 miles a day.* This does, of course, not mean, that the birds get up into the air, fly straight ahead for a day and then are only so much farther on than the day before.

No, they can fly that fast and faster in an hour and probably do that at times, especially when crossing large bodies of water. It simply means that by either one long or several short flights interrupted by leisurely feeding in between, they proceed so far in a day. They take it very easy during the first days or weeks of their journey, accelerating the speed towards the end. That the relative position of the masses of birds, also those of one species, breeding at the various latitudes, is much changed and shifted, owing to difference in speed, can easily be imagined, also that the migrants of a southerly species may be overtaken and passed by more northerly ones. Thus the southern form of Maryland Yellowthroat is passed and left behind by its more northerly congeners.

That many casualties may occur during migration, that disaster overtakes single birds as well as whole flights, is not to be wondered at. When the air is heavy and full of fog the birds fly very low and then strike high objects, steeples and especially lighthouses. Prof. W. W. Cooke notes that one morning in May 150 dead birds were picked up at the foot of Washington Monument, 555 feet high. When the light on the Statue of Liberty in New York harbor was still burning, 700 dead birds a month was the usual crop of fatalities during migration, as reported by Chapman. Some time ago an item of news was making the round of the papers, that on two mornings during the last fall migration 6,000 birds had been killed against a lighthouse on the north coast of France. Even if there were only 600 it was bad enough. Or when birds flying northward, say over the Gulf of Mexico or Lake Erie, are met by a fierce gale from the north, that then hundreds, if not thousands are occasionally hurled into a watery grave, can well be understood, especially of the weaker-winged species. That some of the hawks reap a rich harvest during migration, especially the little Sharpshinned, Cooper's, Duck and Goshawk is also clear.

Now, as to some anomalies and curiosities of migration. Some of our hardy Canadian birds perform, instead of a migration in the accepted sense, a series of apparently aimless, eccentric roving and wanderings, not only southward, but in various directions and without all regularity. Thus the Pine Grosbeak and

Bohemian Waxwing may be present at a place in one winter and then not be seen again there for years. This case is more mysterious than the others. The same holds good of the Canada Jay, the various redpolls and the Pine Siskin, though in a lesser degree. Then there are the herons, which before starting south in fall from their breeding places, seem to go on a little excursion northward first, and are sometimes taken far north of their range. The extraordinary route of the Golden Plover (*Charadrius dominicus*) and several more shore birds should here be noted. These birds breed in the bleak lands near and beyond the Arctic circle. In August, when the young are able to fly well, they proceed from north-central Canada to Labrador, thence by easy stages to Nova Scotia, etc., from there south over the Atlantic Ocean, to the Bahamas, to South America, through Brazil, still south through Argentine to Patagonia, 8,000 miles. After a short stay in that dreary place, they proceed northward again, but by a different route, further west in South America, through Central America, into the wide Mississippi valley, and in that north to their breeding place, near the Arctic circle, 16,000 miles in all.

There are several other birds which go from and back to their breeding range by different routes. Thus I found the rare Cape May Warbler common in fall in western Maryland, but none in the spring. Another curious fact brought to light by the data accumulating at Washington is the case of the Nashville Warbler. This breeds here and northward and proceeds in fall southward with other warblers, travelling by easy stages, feeding in day time along the way, like any other well-behaved warbler would. But south of the southern boundary of Virginia it is practically unknown, only turning up again in its winter range, Mexico, near Vera Cruz. The only inference left seems to be, that it rises up high into the air at about the latitude of Virginia and flies without alighting again over all the intervening land and the Gulf. Who knows? The well known and abundant Chimney Swift offers another mystery. It moves southward in fall, its flocks becoming enormously large when they reach the Gulf coast. Then they disappear as though the Gulf had swallowed them, until they turn up again next March bright and cheerful as ever. Where they spent the winter months is a complete mystery so far, and the world is

rather thoroughly explored ornithologically, at least as far as large masses of birds are concerned. Nor are these the only unknown things in migration.

So we see that in spite of the large mass of data and statistics at hand, and the multitude of workers and observers, there is still much to be learned and better understood in that fascinating natural phenomenon: the migration of birds.

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 The "Auk"; my own notes.

BIRD NOTES.

PRAIRIE HORNED LARKS.—We first saw the Prairie Horned larks this year on March 4th, and as the season advanced they appeared to become more numerous. On April 1st, while walking across the country on Isle Jesus, we were surprised by seeing a lark flying about our heads. As the open country was practically bare of snow, we thought it not unlikely that the bird had a nest nearby. About 50 or 60 feet away we found the nest, which was snugly placed near a stone. The nest contained no eggs. On the same day we located another nest of this species on a hillside nearby, which was also empty.

On April 8th we visited these nests again, and they both contained full sets—four eggs in each. Later in the day we were successful in finding three other nests, two of which contained four eggs each and the other was just about ready for eggs.

All of these nests were placed in "bald-headed" fields, *i.e.*, in pastures where the dead grass was only about an inch high and was entirely free of weeds, etc. In the majority of cases the birds could not be seen when the nests were found. The young birds had begun to form in the eggs of two of the sets.

W. J. BROWN.

Westmount, Que., April 9, 1906.



## THE OTTAWA SPECIES OF ERIOPHORUM.

Mr. M. L. Fernald's revision of the genus *Eriophorum*\* has made some changes necessary in the names of the species growing in the vicinity of Ottawa. It is probable that one or two additional species or varieties may be found here and that collectors may know what species have been already recorded the following notes are published. The localities mentioned are those known to the writer. The numbers and collector names are those on the sheets in the herbarium of the Geological Survey.

## ERIOPHORUM CHAMISSONIS, C. A. Meyer.

*E. russeolum*, Fries.

Very abundant at the Mer Bleue, near Eastman's Springs, Ont., No. 11,496. (*John Macoun.*)

## ERIOPHORUM CALLITRIX, Chamisso.

*E. vaginatum* of local botanists.

Casselton, Ont., No. 10,302. (*John Macoun.*) Blackburn Station, Ont., near the Mer Bleue, No. 61,191. (*John Macoun.*) Also noted by Prof. Macoun in a bog near East Templeton, Que., and in a bog by Strachan's Lake, east of Cascade, Que.

## ERIOPHORUM GRACILE, Koch.

In meadows and peat bogs by McKay's Lake, at Dow's Swamp and Mer Bleue. Dow's Swamp, Nos. 32,240 and 61,193; Mer Bleue near Eastman's Springs, Ont., No. 11,495. (*John Macoun*)

## ERIOPHORUM VIRIDI-CARINATUM, (Engelm.) Fernald.

This species or *E. polystachion* is to be found in many bogs and boggy meadows around Ottawa, but our two herbarium sheets are both *E. viridi-carinatum*, Casselton, Ont., Nos. 32,267 and 61,152; in a swamp half a mile north of Tetreauville, Que. (*John Macoun.*)

\* *Rhodora*, Vol. VII, pp 81-92.

## ERIOPHORUM VIRGINICUM, L.

Rather rare around Ottawa; known from the Mer Bleue, Strachan Lake and East Templeton and formerly at the old race course. Boggy place, The Glebe, Ottawa, Ont., No. 7,573; Strachan Lake near Cascade, Que., No. 61,190. (*John Macoun.*)

The species to be looked for about Ottawa are *E. polystachion*, which is doubtless common in this vicinity though not represented in our herbarium, *E. tenellum* and *E. opacum*. The general characters of these three species and their nearest relatives, *E. viridi-carinatum*, *E. Callitrix* and *E. gracile* as indicated by Mr. Fernald are given below.

*E. POLYSTACHION.* Midrib of the scale prominent only below the membraneous tip; leaves triangular-channelled above the middle; the upper sheaths dark girdled at the summit.

*E. VIRIDI-CARINATUM.* Midrib of the scale prominent, extending to the tip; leaves flat, except at the very tip; the sheaths and bracts not dark-girdled.

*E. CALLITRIX.* Upper sheaths distinctly inflated: culm trigonous and (under lens) scabrous at tip; pits of the receptacle with obtusely angled lower walls.

*E. OPACUM.* Upper sheaths close or scarcely inflated: culm terete, glabrous at tip; pits of the receptacle with rounded lower walls.

*E. GRACILE.* Upper cauline leaf with the sheath longer than the blade.

*E. TENELLUM.* Upper cauline leaf with the sheath shorter than the blade.

*Scirpus Trichophorum*, Aschers & Cræbn. (*E. alpinum*, L.) has been found in several localities near Ottawa.

JAS. M. MACOUN.

## SUB-EXCURSION TO BLUEBERRY POINT.

John Burroughs says in one of his delightful little books that April is a good month to be born in, or to make any initiatory step, in fact. It gives you a good start, he says. Certainly the Field-Naturalists felt on assembling at Blueberry Point, Aylmer, on the afternoon of April 28th that an excellent start had been made.

It was the first outing of the season, unfavourable weather having cancelled previous arrangements for a trip to Rockcliffe. Almost 150 persons met at Blueberry Point, however, on the 28th, when the weather conditions were ideal. Some of the leaders of the various departments being absent the field-body resolved itself into very informal groups and devoted the afternoon mainly to gathering the trailing arbutus and hepatica. The latter in the blue, pink and white varieties, was found on every side dotting the brown sides of hillocks; the arbutus, although not properly in bloom, concealed many fragrant buds for the more patient seekers.

The unusually mild weather prevailing during the past winter, while probably quite acceptable to the majority of people, has had the effect of limiting swampy areas this spring, almost banishing the elusive salamander and other things that creep or scuttle about in lone lands—and so greatly disappointing the members interested in zoology.

The club members reassembling about five o'clock, the president, Mr. W. J. Wilson, having congratulated the club upon the successful nature of its first outing, asked Mr. Andrew Halkett to address the assemblage. A very informing talk was then given by Mr. Halkett who had in spite of adverse conditions secured a number of specimens, including the larva of mosquitoes, a wood-frog, contributed by Mr. Lemieux, water spiders, a centipede, beetles and ants. The lower animal life was shown to be very busily occupied preparing for the fuller life of the summer months.

Mr. A. MacNeill imparted then in a pleasantly original manner some subjects for thought, and touched happily upon the basic principle of the Naturalists' outings—the aim to come directly in touch with Nature in her manifold fascinating forms instead of

viewing her abstractedly, if learnedly, through books beset with sonorous scientific nomenclature.

Dr. Sinclair, in speaking of the arbutus seen on all sides, referred to the desire expressed from time to time that it be adapted as Canada's floral emblem. Its characteristics of fine fragrance, and beauty combined with hardy endurance, he described as particularly appropriate in a prospective emblem for the Dominion. The idea again presented seemed to win the entire approval of this particular assemblage of Canadians, as it did years ago that of the inhabitants of the Maritime Provinces. These already recognize as their emblem the little flower which bravely pushes aside the winter's snow to free its bloom, and which called forth from the Hon. Joseph Howe a memorable poem as a tribute.

K. H.

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#### REVIEW.

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MOSSES WITH A HAND-LENS. A NEW NATURE STUDY BOOK. 2ND EDITION INCLUDING THE HEPATICS. By A. J. Grout, Ph.D. 150 pages, 33 full page plates and over 150 cuts in the text. \$1.50 postpaid. Published by the author at 360 Lenox Road, Brooklyn, N.Y.

Such a book as this has long been needed by the amateur botanist. Specialists have more complete and pretentious works to aid them in their studies of mosses and liverworts, but a good non-technical book that will enable beginners to determine the common species of their neighborhood has long been needed. Prof. Grout's book supplies this need. It is non-technical but is written by a specialist. Its use will enable the Nature Study teacher to widely extend the scope of his work as mosses may be found in the woods even during the winter months, and many species lose little in color and general appearance if gathered in the autumn and stored in closet or cellar until wanted for study in the school-room. The descriptions are easily understood even by a beginner, and the illustrations are excellent reproductions of photographs or accurate drawings.

## NATURE STUDY—No. XXXIV.

## A CEMENT SIDEWALK.

By S. B. McCREADY, B.A., Professor of Nature Study, McDonald Institute, Guelph, Ontario.

In glancing over the topics that have been dealt with in this series of Nature Study articles in *THE OTTAWA NATURALIST* I find that more than half of them have been of a general pedagogical treatment, while twelve have been practical studies in plants, insects, birds, rocks and school gardens.

It is to be noted that this series portrays in a general way the history of the adoption of Nature Study in our school courses. At first, concern was about the need, the treatment, the courses, the practical value or the pedagogical value of it; latterly the tendency is towards practical, helpful directions for the teachers who have to work at the subject in our common schools. Nature Study stands to-day, with our progressive teachers, accepted as the leavening that will bring large vitality to worn out methods and subjects; what they are asking is for guidance to the recognition and the proper using of the materials.

With the purpose of emphasizing the proposition that the study is not limited in its field to biological or geological things, an outline of a lesson we had with our summer class is here submitted and worked out. A sidewalk had been in process of building for several days. No one had paid much attention to the work, the workmen or the process. This was, in part, owing to a multitude of other interests—chiefly biological—and, in part, to an unconcern that familiarity had bred.

When, however, attention was drawn to the subject, many propositions were opened up for investigating; the investigation was made by daily observation and inquiry. An engineer's work had been done in staking out the walk and making it level—the stakes were driven firmly in the ground and the top level marked with notches or nails. The top soil had been removed until a firm, gravelly bottom was reached; for most of the length of the trench a depth of a foot had been sufficient but where the ground was springy a greater depth was excavated. Into this trench, coarse gravel and broken brick was dumped and packed down. A plank

curb or mould to allow for a four foot walk was set firmly on this foundation · it was built high enough to hold four inches of cement composition.

The work itself well exemplified the principle of division of labor ; each man had his own particular part to play. There were ten men in the gang ; the foreman had a general oversight of all the work and workmen, and shared in the labor when opportunity or necessity arose ; wagons were employed in hauling gravel or sand from pits on the farm and also the cement from the railway car.

The first layer was a "grout" three inches in thickness. It was composed of one part of cement and eight parts of good clear sandy gravel. The largest stones permitted was of about a two inch diameter. Measurement of the proportions was not made with exactness but estimated in wheelbarrow loads. A layer of the gravel was spread on a "mixing-board" with a layer of cement over it, and a large pile built up in this way. Four men then shovelled it back and forth until it was thoroughly mixed. Preparatory to adding the water, it was shovelled into a large concave ring. Sufficient water was added so that after it was well mixed in the wet state, a handful would retain its form after squeezing. It was now shovelled into the moulds and packed firmly. It was not however allowed to lie in one continuous mass ; a large bladed knife was used for making a one-half inch cut every five feet, and this was filled with clear sand.

In the meantime, another cement mixture was being made on another "mixing-board". It was made of one part cement and two parts of clean gritty sand, and after complete mixing and proper wetting was quickly thrown in the mould to the depth of one inch, spread, packed, levelled off with a "straight-edge" and "floated" or smoothed with a wooden "float", a tool like a steel trowel in form. As a precaution against heaving by frost an indentation was made by means of a "divider" every five feet and immediately over the corresponding cut in the grout layer. This completed the sidewalk building, but in order to protect it against too rapidly drying it was covered with canvas for a few days.

The cement cost about \$1.85 a barrel at the mill. Freight and cartage were added to this cost. It was all shipped in bags,

as it was for immediate use; the bags weighed ninety pounds and four of them constitute a barrel. Some of the gravel was hauled by men who received \$3.50 a day for themselves and teams; being near the pit, eleven loads were hauled in a day's work; where the road was good and the haul out of the pit not difficult, a wagon box of one and one-half cubic yards' capacity was used. An estimate of the cost is made at a rate of 12 cents a square foot, although this particular walk however was built by day labor.

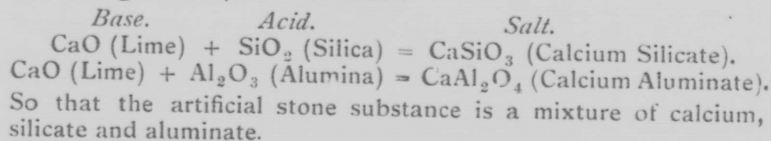
285½ ft.	length of 4 ft. walk	=	1,142 sq. ft.
17½	"	9½	" = 229½ "
10	"	6½	" = 65 "

Total, 1,436½ sq. ft. at 12 c. = \$172.37¼.

These measurements were made with a tape line; by "stepping-off" the length, and averaging one's pace, a close approximation of the actual cost was reached.

We afterwards secured some of the cement and examined for fineness, alkalinity, effect on skin, etc. Tests were made, too, of the strength of mixtures of different proportions. Some successful object and map modelling was done with it by some of the students. And in this connection it might be suggested that its use is so simple that some repair work on broken walls might be instituted in some schools as a legitimate Nature Study lesson on cement.

A word on the chemical constitution and action of Portland cement might be of interest and use. In general terms it is a combination of lime (CaO), silica (SiO<sub>2</sub>), alumina (Al<sub>2</sub>O<sub>3</sub>). The lime is furnished by marl and the other two by clay. For good setting qualities certain proportions are essential: 55 to 60% lime; 22 to 25% silica; 7% alumina. Sufficient and no excess of lime to combine with the other ingredients is the desideratum. Water permits the union and crystallization. In a simple form of equation it might be represented thus:



In the last report of the Bureau of Mines, part I, recently published by the Department of Lands and Mines of Ontario, there is a very complete account by Mr. P. Gillespie of the cement industry in this province. Some facts are here included from that report, not for the purpose of informing teachers of matters to be retailed to children, but rather to awaken interest in this line of

industry to the end that closer observation may be obtained in an increasing important method of building, which is one of the features of modern life. The report would make a valuable addition to any school library. Senior scholars, especially, would be interested in its accounts of the mineral and agricultural possibilities of New Ontario; they would also learn of the care taken by our Governments to furnish accurate information concerning our resources. Supplementing this, some of the classes might be directed to write, under the name of an appointed secretary, on some industrial or scientific matter that has been unanswered in class and which the authorities at Ottawa or Toronto are, as a rule, able and pleased to help in solving.

There are several brands of cement made in Canada as the "Star," "Hercules," "Saugeen," "Imperial," "Monarch," "National," "Giant," "Samson," "Raven," "Sun." The children might be led to observe what brands were being used in their district, and to enquire as to their origin. A cement map of Ontario, or indeed, one showing the cement structures of the locality might be made. And here it might be said the same line of observation and recording might be practiced in regard to agriculture, implements, waggons, buggies, wind-mills, sewing machines, bricks, shingles, graniteware, clocks, tools, etc.

This article has not been written for information, but as suggestive treatment of this or similar industries and employment of men. Many exercises will suggest themselves to one awakened to the "new teaching" that finds exercise for training children's powers of observation, for awakening wholesome sympathies and interest, for inciting to useful manual operations in the common things lying about us. Here are a few:—measuring a waggon box to find capacity; by weighing a cubic foot of gravel, estimate weight of load; consider how cities issue debentures for new sidewalks and how property owners pay for them; incorporating into their arithmetics questions which were *real* arithmetic questions because actually *worked* out by themselves; drawing a map and estimating the cost of any sidewalk, fence, drain or road in which the individual child or the school has an actual interest; drawing the tools used in the operation; getting figures from practical men regarding the area of walk that one barrel will make and making up arithmetic problems for class work; setting a mud foot-scraper in a cement block for school use; making a drinking trough for the birds. Indeed, the trouble to the teacher is in the great number of exercises and interests that arise and claim attention rather than in their fewness. It is in the proper selection of studies, that the Nature Study teacher shows her skill, no less than in her methods of presenting them.



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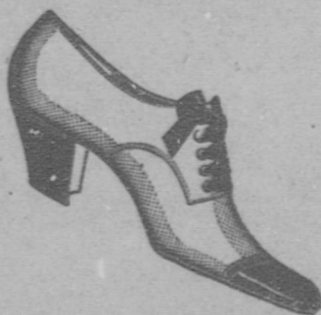
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