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THE OTTAWA NATURALIST.

VOL. XIX. OTTAWA, APRIL, 1905. No. 1

THE REPORT OF THE COUNCIL OF THE OTTAWA FIELD-NATURALISTS' CLUB FOR THE YEAR ENDING MARCH 19TH, 1905.

During the year twenty-nine ordinary members were added to the Club. The total membership is now 265, composed of 257 ordinary and eight corresponding members.

SOIRÉES.

The programme of Winter Soirées was published in the December number of THE OTTAWA NATURALIST, where the following announcement appears :

"The Soirée Committee considered it advisable to substitute for the formal lectures of the past a number of short popular talks each evening on the various branches of the Club's work, and the gentlemen named below have consented to speak on the subjects specified. More detailed particulars will be given through the public press before each meeting. On Zoology descriptions will be given of the life history, habits, etc., of the polar bear, fur seal, whales, star-fish, frogs, sea-urchins and other animals. The characteristic features of the Geology of the Ottawa district will be dealt with and special attention will be given to structural features as well as the history of the abundant fauna found in the rocks and clays. Ornithology, Entomology and Botany will be treated in a similar manner, each speaker giving the results of his personal observations."

Thus far the meetings have been held as published in the programme, and the successful soirées of this winter have fully justified the departure made by the Committee. Entertaining addresses have been given ; much new material has been presented ; and interesting discussions have always been provoked. One point strongly emphasized by several of the speakers is the great amount of work remaining to be done, even in the Ottawa district.

EXCURSIONS.

Sub-excursions were held as usual during the spring and early summer to localities in the immediate vicinity of Ottawa, viz :— Beechwood, Blueberry Point, Beaver Meadow, and Rockliffe. Sub-excursions were arranged for the fall months also, but were cancelled because of heavy rains or cold weather. Two general excursions were held during the season, the first to Casselman on May 21st, and the second to Chelsea a week later. The heavy rain of the preceding days was responsible for the small number who attended the excursion to Casselman. Those who went, however, represented almost all branches of the Club's work, and spent a very profitable field day. The excursion to Chelsea was attended by about 200 members and friends of the Club, who spent an ideal day in this most interesting locality. More detailed accounts of these outings have appeared in THE OTTAWA NATURALIST from time to time.

THE OTTAWA NATURALIST.

Volume XVIII of THE OTTAWA NATURALIST has been completed. It consists of twelve numbers which contain in all 227 pages and five plates.

The following are among the papers that appear in this volume :

The Canadian Species of Trocholites, by Dr. J. F. Whiteaves.

Warbler Songs and Notes, by Rev. G. Eifrig.

The Evening Grosbeak, by Rev. C. J. Young.

The Grasping Power of the Manus of Ornithomimus altus, by Lawrence M. Lambe.

Some Canadian Antennarias, by Edw. L. Greene.

Relationship between Weather and Plant Growth, by Dr. C. Guillet.

Nesting of Some Canadian Warblers, by Wm. F. Kells.

A White Pelican at Manotick, by Dr. J. F. Whiteaves.

On the Squamoso-parietal Crest of two species of Horned Dinosaurs from the Cretaceous of Alberta, by Lawrence M. Lambe.

The Mountain Bluebird in Manitoba, by Norman Criddle.

The Food Value of certain Mushrooms, by Prof. F. T. Shutt.

New Brunswick Warblers, by Wm. H. Moore.

Description of a new genus and species of Rugose Corals from the Silurian Rocks of Manitoba, by Dr. J. F. Whiteaves.

The Flora of the Peace River Region, by J. M. Macoun.

The British Association President's Address, by Prof. Prince.

Discovery of Eggs of Solitary Sandpiper, by Walter Raine.

Summer Warblers in Compton Co., by Lewis M. Terrill.

The Winter Fringillidæ of New Brunswick, by Wm. H. Moore.

Landslide on the Lièvre River, by Dr. A. E. Barlow.

Canine Intelligence, by Sir James Grant.

President's Address, by W. T. Macoun.

New British Columbia Rosaceæ, by Edw. L. Greene.

Some of the Rarer Plants of Wellington Co., collected by A. B. Klugh.

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. James Fletcher, has been continued, and 1,000 copies of each article have been printed and distributed among teachers throughout Canada. The papers have been contributed by Inspector Cowley; J. B. Wallis, Supervisor of Nature Study, Winnipeg; Rev. G. Eifrig; W. T. Macoun (two papers); Arthur Gibson; F. T. Shutt, M.A.; Dr. MacKay, Superintendent of Education for Nova Scotia, and A. E. Attwood, M.A. The subject of Nature Study is receiving a great deal of attention at the present day, and the articles that have appeared in THE OTTAWA NATURALIST during the past two years constitute a valuable contribution to the literature on this subject.

REPORTS OF BRANCHES.

The Geological Branch reports that the Leaders have attended the various excursions organized by the Council and assisted in pointing out and explaining the salient geological features to be seen in the various localities visited.

Several collections made by amateur collectors in the city and its environs have been brought from time to time to different members of the Geological Branch, and the specimens, whether minerals, rocks, or fossils have been determined so far as the time

and mode of preservation of the material brought allowed. In this way lists have been made and kept for future reference and use. Amongst the interesting localities from which fossils were obtained during the past year, Mackay's or Hemlock Lake may be mentioned. From the marine sands underlying the shell-marl deposit as well as the fresh-water gravels immediately underneath the shell-marl deposit, a number of *Portlandia arctica*, have been obtained. The specimens are usually small and in some respects suggest *Portlandia minuta.* However this boreal variety of *Portlandia arctica*, would scarcely be obtained in a series of sediments which were deposited at the close of the period of marine submergence, it would rather be found in the earliest deposit of the same period.

The Utica shales which were excavated in the vicinity of the Isolation Hospital have yielded an abundance of interesting forms, whilst the Trenton bluffs about Ottawa still teem with organic remains, many of which are no doubt undescribed. There is a great need now of a series of continuous sections carefully measured and described, prepared from the numerous and varied outcrops of these formations within the Ottawa district.

At the excursion to Casselman, along the line of the Canada Atlantic Railway, the Geological section descended the valley of of the South Nation River below the railway bridge to a point where the river takes the turn westward, and specimens of Trenton (Ordovician) fossils were obtained from the numerous outcrops of the limestones along the right bank. The species have been determined and lists kept for reference. Besides these about thirty small pieces and fragments of pottery were obtained from the old camping ground and village site of the aborigines of this country. Portions of pots and also of celts were collected with bits of charred wood and bark and charcoal, together with numerous bones, or rather fragments of bones, probably of some of the deer tribe. Some of the charred wood and bark found buried in the newest formation just below the turf, or even held within the interlacing fibres of the roots of the turf growing at this locality along the riverside, appear to indicate some forest fire that took place long ago whose charred remains are now found buried quite as deep as the sherds or bits of pottery. It would lead one to

suppose further or draw the conclusion that this forest fire must have taken place at some period when the aborigines were settled in the locality visited, a time probably remote from the present by several hundreds of years.

The markings on the pottery are very similar to those observed on the pots from the township of Eardley, in Quebec, north of Lake Deschênes, which area was inhabited during pre-historic times by the Hurons as well as the Iroquois, as various writers on the subject admit. (Consult Parkman, Sulte, Gérin, Sowter and other writers.) I have been informed that at the time when the Castleman family moved from the United States to Canada after the Revolution of 1776, a number of Iroquois Indians accompanied them and were faithful to their lord and master, to the point of strong rivalry and even engagements between them and the Hurons dwelling on the Papineau estates on the north shore of the Ottawa river, in the vicinity of the North Nation river.

The Ornithological Branch reports that several of the leaders of this branch have been active during the last year making observations of our birds in the field and duly recording their observations. It has been found, that the local breeding shrike is the newly made subspecies "Migrant Shrike" *Lanivs migrans*, the habits and nests of which have been studied. Among the rarer birds to be recorded from this neighborhood may be mentioned a Golden Eagle, captured near High Falls, Que., a Cormorant and a White Pelican, the latter two taken wthin a radius of several miles from Ottawa. The rare Bohemian Waxwing (*Ampelis garrulus*) has once again been seen by the Messrs. G. and E. White.

The Botanical Branch has done excellent work during the year. The semi-monthly meetings of the Branch began in the autumn and have been continued during the winter. Reports of these meetings, published in THE NATURALIST, are abundant evidence of the activity of the botanical members of the Club and of the value of their work. Botanical leaders were present at all the Club's excursions and as usual were kept busy determining specimens and explaining difficult points to students.

The Entomologists of the Club have been active and some of the leaders always took part in the various excursions, helping

those who wished to study insects and giving addresses at the close of each outing. Sub-excursions were held regularly throughout the season at which many desirable specimens were collected. The winter meetings of the Branch have been held regularly and have been successful. A large number of insects new to the Ottawa lists, or rarely collected, have been taken during the year. As in the past special attention has been directed to the working out of the life-histories of insects, and several important additions have been made to the known food plants of some species.

The leaders in Zoology report a most successful year. Their report which is too long for insertion here, will appear in the next number of THE OTTAWA NATURALIST.

The Treasurer's report shows a balance of $53.43.

The Club has had printed 250 copies in English and a like number in French of the clause in the Ontario statutes referring to the destruction of insectivorous birds and the penalty therefor. These are to be posted in conspicuous places at the outskirts of the city, and it is the intention of the Club to aid in enforcing the law.

The following tribute to the late Miss A. M. Harmon appears in the report of the President's address :

"It is with feelings of deep regret that we have to record the loss of a member of the Ottawa Field-Naturalists' Club who was always during the last twenty-two years of her lifetime one of the Club's most valued and best friends. I refer to Miss A. M. Harmon, whose sad death startled us not many weeks ago. If there was ever one who felt the thrill which Nature gives at times to those who know and feel her charms, Miss Harmon was one. She was one of the most faithful members of the Club, and attended regularly its excursions, soiriées and annual meetings. The Club will miss her kind face this winter, and I am sure will trust that her love for Nature is expanding in that broader field beyond the grave."

The thanks of the Club are due to Principal White of the Normal School for so kindly placing the rooms and lantern of the school at the disposal of the Club and his active interest in the Club's work, also to the press of the city for kindly inserting notices of meetings and excursions gratuitously.

T. E. CLARKE,
Secretary.

THE OTTAWA FIELD-NATURALISTS' CLUB.

The Treasurer's Statement for the year ending 21 March, 1905.

RECEIPTS.			EXPENDITURE.			
Balance from previous year..		$39 18	Printing OTTAWA NATURALIST, Vol. XVIII, 12 Nos., 227 pp....$285 80			
Subscriptions, 1904-05... $159			Illustrations	46 40		
Arrears. 71			Authors' Extras.	32 45		
		230 00	Nature Study Leaflets	24 00		
Advertisements		51 00	Miscellaneous printing: Wrappers, Post cards, etc.....	37 75		
Authors' Extras sold.....		2 00		426 40		
OTTAWA NATURALISTS sold .		13 55	Postage	20 42		
Map of Ottawa sold		05	Editor	50 00		
Net proceeds, General Excursion No. 2, to Chelsea		16 80		496 82		
Government grant		200 00	Less 5 % for cash on printers' accounts..	21 04		
					475 78	
			Soirée expenses.....		8 75	
			Sundry expenses, postage, etc		14 62	
			Balance.....		53 43	
		$552 58				$552 58

I regret to state that many members of the Club have allowed themselves to get into the habit of not paying their subscriptions until the receipt of a special appeal asking for funds. This costs the Club money, gives a great deal of trouble, and should not be necessary.

I, also, again draw the attention of the members to the advertisements on the cover of the NATURALIST, many of which appear in this number of Vol. XIX for the first time. It is hoped that members of the Club will bear these in mind, and make a point, as far as they conveniently can, of dealing with those who have been good enough to help the Club by advertising in our magazine.

ARTHUR GIBSON,
Treasurer.

Statement examined and found correct.

R. B. WHYTE,
J. BALLANTYNE, } *Auditors.*

A NEW RECENT MARINE SPONGE (*ESPERELLA BELLA-BELLENSIS*) FROM THE PACIFIC COAST OF CANADA. *

By LAWRENCE M. LAMBE, F.G.S., F.R.S.C., of the Geological Survey of Canada.

(With one plate.)

The Geological Survey of Canada has lately received from British Columbia a large cup-shaped sponge that is a welcome addition to its very representative collection of Canadian recent marine sponges from the Atlantic, Arctic and Pacific oceans. The specimen is interesting not only on account of its size but also because it belongs to an apparently undescribed species of the Monaxonid genus *Esperella*. It was obtained by purchase from Mr. F. Landsberg of Victoria, B.C., who states, in a letter to the writer, that it was brought to the surface in August of 1904, from a depth of about 300 fathoms, off Bella Bella, an indian village on the British Columbian coast, situated on Campbell island, and about 350 miles north of Victoria.

The sponge is large, cup-shaped, and expands widely above the short, stout stalk, the diameter of the almost circular rim exceeding the total height. The wall of the cup is relatively thin and the outer surface, in the dried state, the condition in which the specimen has been received, is rough.

The skeleton consists of an open irregular reticulation of coarse fibres that terminate outwardly, in the wall of the cup, at right angles to the surface. Within the cup the fibres lie quite evenly in the plane of the surface so that the inside surface is comparatively smooth. The fibres are much stouter in the lower part of the sponge, particularly in the stalk where they are disposed in a more nearly vertical direction.

The fibres are composed of stylote spicules with a fair proportion of spongin present. The surface membrane within the cup is strengthened by spicules lying in the plane of the membrane and forming at times loose fibres, the membrane of the outer surface holds similarly disposed spicules that more generally form, how-

* Communicated by permission of the Acting Director of the Geological Survey of Canada.

ever, definite fibres. The outer surface of the sponge is considerably abraded and little of the dermal membrane remains, but within the cup the membrane for the most part is preserved and exhibits numerous openings, from 1 to over 20 mm. across, leading from the interior of the wall.

The total height of the sponge is 407 mm. (16 inches), with a diameter at the rim above of 560 mm. (22 inches). The wall of the cup grows somewhat thinner as the rim is approached; it varies from nearly 30 to about 15 mm. through. The stalk is roughly lenticular in transverse section, and measures about 115 mm. (4½ inches) in the longer and about 65 mm. (2½ inches) in the shorter diameter.

The spicules are as follows: (*a*) *Megasclera*, of one kind, viz., stout, straight, smooth, sharply and rather abruptly pointed styli, thickest at mid-length; varying in length from .432 to .491 mm. with a maximum thickness of about .013 mm. (*b*) *Microsclera*, of two kinds. (1) Large palmate anisochelæ occurring abundantly in all parts of the sponge and often together in the form of rosettes particularly in the surface membrane; length varying from .085 to .091 mm. Numerous immature spicules of this kind are present. (2) Sigmata, simple and rather small; in length about .019 mm. Only a few examples of this form of spicule have been observed.

The most interesting features of this sponge are its symmetrical shape and its large size. As regards the spiculation it conforms to the general *Esperella* type of structure but the spicules are not of exactly the same size and shape as those of any species of the genus known to the writer. Bella Bella the village near which the sponge was obtained suggests the name by which the species may be known.

Explanation of Plate.

Figure 1.—Side view of *Esperella bellabellensis;* slightly less than one-fifth natural size.

Figure 2.—Stylus; × 136.

Figures 3, 3*a*.—Anisochelæ; × 272.

Figure 4.—Sigmata; × 272.

NOTES ON FRESH-WATER RHIZOPODS.

BY W. S. ODELL.

Rhiozpods take rank in the *Protozoa*, the simplest and lowest of the grand divisions of the animal kingdom ; and are themselves divided into the following orders: *Protoplasta*, *Heliozoa*, *Radiolaria*, *Foraminifera* and *Monera*. The genera *Radiolaria* and *Foraminifera* are marine, and are of great geological importance. Chalk is composed largely of shells of the latter; while deep-sea ooze is mainly formed of shells of *Radiolaria* and *Foraminifera*. But these notes deal only with fresh-water forms, so it is unnecessary to consider others here.

"What are Rizopods?" many will ask. They are the lowest animals in the scale of life, and are mostly microscopic, the largest forms being just visible to the naked eye or with a good pocket lens.

They consist of a soft mass of clear or granular jelly-like substance called protoplasm (the primitive material from which organic bodies are moulded) endowed with powers of motion, ingestion, digestion, secretion, excretion and reproduction: functions which ordinarily distinguish animal life of a higher order. The simplest kinds have no shell, but by far the greater number are provided with a shell-covering, frequently composed of grains of quartz sand, diatom cases, or sponge spicules, cemented together, exhibiting great variety in form, construction, and arrangement of stucture, often remarkable for great beauty. A description of a species of Amœba, viz., *A. proteus*, Rösel, the earliest described, and familiar to students of Natural History, only can be given here.

Amoeba is invisible to the naked eye, rarely exceeding $\frac{1}{4}$ mm. ($\frac{1}{100}$ in.) in diameter. Under the microscope it appears as a shapeless mass of jelly, nearly colorless ; composed of two parts, the central granular, called the endosarc, and containing the nuclei and contractile vesicles. Completely surrounding this is a transparent layer, or ectosarc. The animal is constantly changing its form. Often the changes are so slow as to be almost imperceptible but by examining at intervals, it will have altered so much

at the end of half an hour as to be hardly like the original. This movement is peculiar. At any part of the body the ectosarc is pushed out in the form of small finger-like processes called pseudopods: these increase in size, still consisting of ectosarc only; granules from the endosarc stream into it, and the projection comes to have the same construction as the rest of the Amoeba: every pseudopod protruded from one part of the body necessitates the withdrawal of an equal volume from some other part. The peculiar movements of Amœba may be imitated by taking a lump of dough or putty and sqneezing it between the fingers; as it is compressed in one direction it will elongate in another; regulating the pressure so as to cause the protrusion of narrow portions when the resemblance to the movement described, will be fairly close, but with this radical difference—the one is acted on, the other acts for itself. In the granular mass are darker spots which do not change their form while the protoplasm is flowing all around them. These are called "nuclei." "They are usually large, spherical, hyaline corpuscles, in most cases situated back of the middle of the animal" and are essential to life and reproduction. "In the clear space surrounding the granular matter is a space which widens slowly and then rapidly contracts. This is called the contractile vesicle, and probably serves for respiration by taking water laden with oxygen into the body; and for excretion, by forcing water laden with waste products out of the body;" but its true nature is not fully understood. Not only do Rhizopods move by means of pseudopods, but they capture food with them as well. This food consists of diatoms, desmids and other algæ, rotifers—in fact anything they can hold. Within the body the food is usually seen as small spherical masses, green, brownish or red. In capturing food the jelly mass spreads itself over the organism so as to envelop it, (protoplasm can unite with itself whenever the parts come into contact) closing over it thus bringing it into its midst. The digestible portions of the prey are extracted, digested, and then the insoluble parts are gradually squeezed to some part of the exterior and gradually forced out. This is the earliest condition in which the progress of digestion can be recognized.

The process of reproduction is by division, and is very simple. The nucleus first divides into two: the whole organism elongates,

the two nuclei at the same time travelling away from one another: next a slit appears in the drawn-out portion between the nuclei, this continues until the animal has become two seperate Amoebæ, each like the parent, but henceforth independent of each other; and leading a separate existence.

Rhizopods are more common than is generally supposed; they are to be found in the slime of submerged rocks, on pieces of wood, leaves etc., and especially in moist sphagnum; in fact in moist places almost everywhere.

The method of finding I have usually adopted is to plant a few sprays of *Anacharis* or *Myriophyllum* in a glass jar, in about an inch of slimy ooze from a pond or stream. After a week of so the shell-producing species will be found clinging to the sides of the jar near the top; the naked kind usually in the muddy bottom.

The study of the Rhizopods was first brought to the writer's notice while examining some water plants on which are usually found one or more species of Rotifers. At the base of a spray planted in a jar, was seen a layer ⅛ in. thick, of a milky, cloudy substance which, examined under the microscope contained vast numbers of one of the largest and most beautiful of the Rhizopods, viz. *Actinosphaerium Eichornii*.

The scrapings off slimy logs or rocks if placed in a saucer in water and allowed to settle, will be found also to contain many specimens.

In examining sphagnum strain through a fine sieve under a running water-tap, only collecting the sediment which passes through. If allowed to settle for half an hour, the material for examination falls to the bottom. The surplus water is drawn off and sediment placed in saucers covered with a piece of glass. This supply will afford ample material for microscopical examination all winter.

Of what use are Rizopods? They undoubtedly furnish food material for slightly higher organisms, Trumpet Animalcules *Stentors*, Annelids or water worms and wheel animalcules or Rotifers are repeatedly found containing them in their food. "They share with algæ and diatoms the important function of furnishing food for Crustacea, which in turn are eaten by fish." "They are

thus an indispensible factor in the economy of the organic life of fresh-water fishes."

These notes were made from work done only during winter months; from material collected before cold weather, preserved as before described. If work were done in summer when material is abundant everywhere, doubtless all the species, described by Dr. Leidy in his work on Rizopods, could be identified; and probably many new species added to it. This work opens up a fertile field for investigation to any one interested in microscopy.

The appended list is from species found at Ottawa: the classification that adopted by Dr Leidy.

RHIZOPODA.

HELIOZOA

Actinophrys
Sol, Ehr.

Actinosphærium
Eichornii, (Ehr.) Stein.

Clathrulina
elegans, Cienk.

Raphidiophrys
elegans, Hert & Less.

FILOSA.

PROTOPLASTA

Assulina
seminulua, (Ehr.) Leidy.

Cyphoderia
ampulla, (Ehr.) Leidy.

Euglypha
alveolata, Duj.
brachiata, Leidy.
ciliata, (Ehr.) Leidy.
cristata, Leidy.
mucronata, Leidy.

Placocysta
spinosa, (Carter) Leidy.

Sphenoderia
lenta, Schlumb.

Trinema
enchelys, (Ehr.) Leidy.

LOBOSA.

Amœba
proteus, Rösel.
radiosa, Ehr.
varrucosa, Ehr.
Arcella
dentata, Ehr.
discoides, Ehr.
mitrata, Leidy.
vulgaris, Ehr.
Centropyxis
aculeata, (Ehr.) Stein.
Diffulgia
acuminata, Ehr.
arcula
corona, Wallich.
constricta, (Ehr.) Leidy.
globulosa, Duj.
lobostoma, Leidy.
spiralis, Ehr.
pyriformis, Perty, var. vas, Leidy.
Hyalosphenia
elegans, Leidy.
papilio, Leidy.
Nebela
carinata, (Archer) Leidy.
collaris, (Ehr.) Leidy.
flabellulum, Leidy.
Quadrula
symmetrica, (Wallich) Schulze.

MEETING OF COUNCIL.—The first meeting of the new Council of the Club was held in the Normal School, March 30th, when the Standing Committees of Council for the year were struck and Leaders and Editors elected. Every member of the Council was present and several important matters relative to the Club's work during the coming year were discussed. The following new members were elected: Mr. John A. Grossbeck, Patterson, N.J., Miss Ross, Miss Wylie, Miss M. Wylie, and Miss F. Wright.

NATURE STUDY—No. XXII.

S. B. SINCLAIR, Ph. D.

THE SCHOOL TIME REQUIRED FOR NATURE STUDY.

One of the most serious objections urged against the introduction of Nature Study in Public Schools is that there is "no time for it."

Let us first consider ONE HOUR PER WEEK, the amount of time required. One of the most historic responsible pronouncements on the subject, is that made in 1892, in the report made by the famous Committee of Ten, p. 139, where the Natural History section recommend that "No less than one hour per week, divided into at least two periods per week, should be devoted throughout the whole school course below the High School to the study of plants and animals: that in this study no text books should be used, and that these observation lessons should, as far possible, be made the basis of or correlated with work in language, drawing and literature."

Twenty years ago the writer of this article made a somewhat careful observation and study of a number of schools in the United States, England and France, in which courses in Nature Study similar to those recently prescribed for Ontario Schools had been for years and still are in operation.

Since that time he has had opportunity for more extended observation and experiment, and his opinion is that an average of one hour of school time per week for Nature Study during the entire Public School course forms a satisfactory working hypothesis. Many of the most successful teachers of Nature Study give but few set lessons on the subject and vary the time and emphasis to accord with external conditions. For example, in the Spring when Nature seems to awaken from her winter sleep, more time may be devoted to the subject than during the winter months. Then too it is necessary to adjust the lessons to the school room conditions. For example, in a large rural school with many classes in charge of but one teacher, most of the work must be taken with combined classes or incidentally in connection with

other subjects. Speaking generally one half hour lesson per week may profitably be devoted in every class to some definite, sequential, subject of investigation, and the other half to general unrelated observation made as occasion demands. For example, yesterday in the Ottawa Model School a number of boys of about nine years of age, in the second grade, had a half hour lesson on seed planting and at its conclusion undertook to make the seeds which they had planted grow. During the next three or four weeks they will have a half hour lesson each week, devoted to a statement of the discoveries they have made regarding their plants and the difficulties they have met with, and also to a consideration of ways of overcoming these difficulties and to a fuller investigation of heat, light, soil and moisture conditions in relation to plant development. Another half hour per week will probably be occupied in the discussion of such phenomena as the coming of the birds and the melting of the snow, and to the explanation of Nature references found in the current class literature.

It may be urged that such work has always been done in schools. In reply it may be said that where such is the case the requirements of the new regulations are being carried out, and this is no doubt being done in an unostentatious and effective way in many schools. It is probable, however, that most readers of the NATURALIST have cause to remember with regret schools which they themselves attended, where more than one hour per week was wasted in memorizing abstract and meaningless definitions and records which have since been found to be incorrect, where no attention was ever paid to birds or plants, trees or flowers, the glory of the sunset or the matchless grandeur of the heavens or indeed to any of the living realities of existence outside the school room, and where instead of forming habits of observation and appreciation of the objects about them, the pupils formed habits which caused them to ignore all material things as commonplace and to move through realms of profoundest mystery and intense attractiveness with blind eyes and dormant sensibilities. It is to be feared also that such schools have not yet entirely disappeared from Ontario.

THE EDUCATIONAL VALUE OF NATURE STUDY JUSTIFIES RECOGNITION.

Let us next briefly inquire what Nature Study has to offer in consideration of the granting of time (even though it be but one hour per week) which is much needed for other important subjects. In this connection it is important to remember that Natural Science during the past fifty years has undergone a complete transformation as regards the attitude of the investigator, the methods of investigation, the nature of the facts learned, and the relative importance of the subject to the welfare of humanity. This is the fundamental reason why Nature Study has come to stay, and eventually to receive educational recognition even though all its present advocates were to keep silent. The time must come when all thinking men will agree that at every stage education must be naturalistic as well as humanistic if the best results are to be achieved. The advantages of Nature Study have been fully dealt with in previous articles, and I shall refer only briefly to them in passing. From the standpoint of physical health Nature Study has much to commend it. On the side of discipline the subject when properly treated affords an excellent gymnasium for the formation of desirable habits, of sense perception, memory, imagination and thought, and for emotional and volitional development. As a preparation for citizenship the knowledge, insight and power of appreciation gained from such study is indispensible. The theory that "the highest study of man is that which relates to his own nature and destiny and that the investigations of physical science are presumptuous and sterile," has given place to a more rational conception which realizes that man can be studied in the best way only when he is viewed in relation to his environment and to the needs of his fellow men. It is no longer considered *infra dig.* for an educated man to have a practical knowledge of manual activities and to take a lively interest in every day affairs.

PUBLIC SENTIMENT IN FAVOR OF NATURE STUDY.

While public sentiment is wisely conservative regarding the necessity of giving proper time and attention to the humanities and the mathematics and is opposed to extreme views, superficial

attainment and irrational methods, a careful study of various educational systems will reveal that there has been a steadily increasing public demand for a fair amount of Nature Study in elementary schools.

In England there are definite courses outlined for the various grades of the Board schools. The care and attention bestowed on the work is well exemplified in the Murché series of science readers and corresponding object lesson books, which contain a carefully elaborated sequence adapted to the respective grades.

Those who investigated the educational exhibits at the World's Fair expositions in Paris in 1890 and 1900 must have noted (as the writer did) the great improvement in the content and form of Nature Study in public schools in France and elsewhere during the intervening ten years.

The recommendation of the Committee of Ten quoted above shows the view held by the largest and most representative body of educators in the United States in 1892, and there is no general evidence of a disposition to reverse this decision.

At the Ontario Educational Association meeting held in Toronto last Easter, the course of Nature Study outlined in Paper No. 18 of THE OTTAWA NATURALIST for October, '04, was *unanimously* adopted. This association is composed of representatives from every department of educational work in Ontario.

NATURE STUDY REINFORCES OTHER STUDIES.

It will be found that one hour per week occupied in Nature Study is not really taken from other subjects if the work be properly correlated. For example, in objective drawing, the first step is to gain an accurate knowledge of the object to be drawn, and the time usually occupied in doing this is saved if the object has already been investigated in Nature Study lessons, and experience shows that children prefer to draw such objects rather than those with no previous interest.

In conclusion it may be said that there is good reason for the assertion that all things being equal a class which devotes an hour per week to Nature Study will do better work in other subjects and make more rapid progress than if they devoted their entire time to these subjects.

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AUTOMOBILES AND GASOLENE LAUNCHES

APR 10

THE OTTAWA NATURALIST.

VOL. XIX. OTTAWA, MAY, 1905. No. 2

ON THE FOOD VALUE OF CERTAIN MUSHROOMS.

(No. 2.)

By FRANK T. SHUTT, M.A., and H. W. CHARLTON, B.A.Sc.

In a preliminary note on the food value of certain mushrooms, which appeared in the number of THE OTTAWA NATURALIST for July, 1904; the writers presented the results of some partial analyses they had made of the following species:—The Grey Coprinus (*Coprinus atramentarius*), the Shaggy Coprinus (*Coprinus comatus*), and the Fairy ring Champignon (*Marasmius oreades*). These mushrooms were selected for investigation by reason of their more or less common occurrence, and the fact that they are highly prized for their excellent flavour.

To complete the analytical data given in the article referred to, as well as to extend the research, further and larger collections of the Shaggy Coprinus were made last summer and autumn and submitted to analysis. The results now presented will indicate the composition, more particularly as regards nitrogenous content, of this mushroom at various stages of growth and also furnish information respecting the relative food value of the umbrella and stalk.

In table No. 1, analytical data are given from the examination of *Coprinus comatus* taken (*a*) when quite young (a total length of 3½ inches); (*b*) somewhat older, but still edible. The mushrooms in collections (*c*) and (*d*) were the largest obtainable and many of them were beginning to turn black, but all as yet were in excellent condition for use. The analyses were made on the whole mushroom—stalk and umbrella.

TABLE No. I.

COPRINUS COMATUS —The Shaggy Coprinus or Horsetail Mushroom

	The Freshly Gathered Mushroom.				Water-free Substance.			
	Water.	Crude Protein.		Ash.	Crude Protein.		Ash.	Percentage of Crude Protein present as Albuminoids.
		Albuminoids.	Amides.		Albuminoids.	Amides.		
a.	91.24	1.94	1.94	1.36	22.14	22.15	15.52	50.0
b.	91.81	1.68	1.51	1.19	20.51	18.43	14.53	52.6
c.	92.33	1.63	1.25	1.20	21.25	16.29	15.64	56.6
d.	93.52	1.44	1.00	.70	22.22	15.43	10.80	59 0

DRY MATTER:—It is worthy of note that the percentage of dry matter decreases somewhat in the mushroom with age, i.e., as the condition of edible maturity is approached. This peculiarity no doubt is more strongly marked in the deliquescent mushrooms, but possibly does not exist to any degree in those varieties, such as the *Marasmius*, which can be gathered when mature and preserved for future use by simply drying. The data from *C. comatus* show a decline from 8.76% to 6.48% during its growth, *i.e.* from the very earliest stage to the condition usually considered as best for cooking.

PROTEIN:—The nitrogenous character of mushrooms was emphasized in our previous contribution on this subject. It is this feature which gives them their especial value as food. Although they do not contain more "dry matter" than many of our succulent vegetables, this dry matter, unlike that of the vegetables, consists of from one-third to one-half nitrogen compounds.

The nitrogen compounds in vegetable matter are grouped under the term Crude Protein, but by appropriate methods of analysis they may be differentiated into Albuminoids and Non-

albuminoids or Amides. The former are much the more valuable, since they particularly perform the function of repairing the waste of the body consequent upon daily activity and of building up its tissues. It is for this reason that the Albuminoids constitute the most important of the nutrients in all classes of foods.

Considering now our results, it will be seen that while the percentage of Crude Protein in the fresh material decreases as the mushrooms grow larger (from 3.88% to 2.41%), the proportion of Albuminoids suffers but little loss during growth. This is the more prominently brought out by the data on the water-free substance, which clearly show that the dry matter of the large and edibly mature mushroom is equally rich in the "flesh-formers" with that of the very young fungus. The last column of the table is instructive in pointing out that as growth advances the proportion of true Albuminoids in the Crude Protein increases.

Ash or Mineral Matter:—The ash constituents in the fresh material decrease with the age of the mushroom, namely, from 1.36% to .7%. This is not entirely due to the smaller proportion of dry matter in the older plant, for reference to the analysis of the water-free substance shows a falling off in ash from 15.5% to 10.8%. We may conclude from these results that it is more particularly during the earlier stages of growth that the mineral elements are absorbed.

Certain features in the foregoing results made it a matter of interest to ascertain what differences in composition might exist between the umbrella and the stalk—the analyses already discussed being made on the whole mushroom. Consequently, two gatherings were made, (*a*) of small and medium size and (*b*) of large and mature specimens, and the umbrellas and stalks, separately, submitted to examination.

TABLE No. II.

COPRINUS COMATUS—Analysis of Umbrellas and Stalks.

—	Freshly Gathered Mushrooms.				Water-free Substance.			
	Water	Crude Protein.		Ash.	Crude Protein.		Ash.	Percentage of Crude Protein present as Albuminoids.
		Albuminoids.	Amides.		Albuminoids.	Amides.		
a. Umbrella	91.97	2.10	1.47	.71	26.15	18.30	8.84	58.8
Stalk....	92.72	.77	1.19	.77	10.58	16.34	10.58	39.2
b. Umbrella	92.82	1.55	1.45	.82	21 58	20.20	11.42	55.0
Stalk....	91.73	1.45	.96	.89	17.53	7.98	10.75	60.1

These data are not, we regret to say, in all particulars thoroughly satisfactory, yet they may safely be considered as indicating that the umbrella is decidedly richer in albuminoids than the stalk, though the difference becomes less as the mushroom matures. They would further seem to show that as growth advances the umbrella decreases slightly in its nitrogen content while there is a concomitant increase in the value of the stalk.

Our work with *Coprinus atramentarius*, the Grey Coprinus or true Ink-cup, has not been so extensive as that with *C. comatus*, yet it may be of interest to insert for comparison with the data of Table 1, a recent analysis made by us of this most excellent mushroom collected in its edible condition :

Analysis of COPRINUS ATRAMENTARIUS.

Constituent.	Fresh Material.	Water-free Substance.
Water	93.31	—
Albuminoids	1.02	15.43
Amides	.71	10.74
Ash	.77	11.49

Percentage of Crude Protein present as Albuminoids, 58.9.

Though containing practically the same amount of dry matter as the mature *C. comatus*, it is evident that this species is decidedly inferior as regards its albuminoid content, a result which confirms the conclusion reached in our previous examination.

In our preliminary note we remarked that the consumption of mushrooms was much restricted by the dread that many persons have of gathering by mistake poisonous species, popularly known as toadstools. There is, unfortunately, no rule which may generally apply to distinguish the edible from the dangerous mushrooms, and thus it is not surprising that this dread is widespread. It is not necessary, however, to be well versed in cryptogamic botany before venturing to collect mushrooms. The differences between many of the edible and non-edible varieties may not on first acquaintance be very great, but on further scrutiny and practice, assisted at the outset by the instruction of "one who knows", the identification of the more commonly occurring edible forms becomes a matter of little difficulty. When in addition to their qualifications as a delicacy it is remembered that mushrooms possess a comparatively speaking high food value (as made evident by their protein content), it would seem well worth while to devote some time and pains to the acquirement of this knowledge.

Canadian Botanical Exchange Bureau.—This bureau is organized for the purpose of aiding public schools, high schools teachers and others interested in botany in making collections of Canadian plants. Full particulars of the conditions under which exchanges may be made will be sent inquirers by Mr. Geo. L. Fisher, Box 983, St. Thomas, Ont.

POPULAR ENTOMOLOGY.

HALISIDOTA TUSSOCK MOTHS.

By ARTHUR GIBSON.

Among the insects which occur at Ottawa more or less commonly every season, are three different kinds of arctian moths belonging to the genus *Halisidota.* They are all of about the same size, measuring, when the wings have been expanded, from one and a half to two inches, and not one of the three would probably ever be picked out in a collection of insects as being specially attractive, or as possessing any particular or striking beauty. In the realm of nature, however, it is by no means only the so-called attractive or beautiful objects that are studied ; all have their place in this interesting world of ours, and even the smallest or most inconspicuous-looking insect will be found worthy of some thought and investigation biologically.

The genus *Halisidota*, according to the latest revision, is not an extensive one in North America, there being only eight species found north of Mexico. The majority of these are southern or western in range, but, as above stated, three of them, viz., *H. tessellaris*, S. & A., *H. maculata*, Harr., and *H. caryæ*, Harr., may be found in the Ottawa district almost any season.

The moths of these three species emerge from their cocoons during the month of June, and, being nocturnal in habit, only fly at night. Like all insects they vary in numbers with the seasons. Some years the moths are noticeably abundant, others the reverse, but, as a rule, these insects may be collected any season in either the larval or adult states of their existence.

The perfect insects, as is the case with hundreds of other kinds of moths, are attracted to lights, and everyone has noticed on warm, close evenings, during the months of June and July, the swarms of insects of all kinds which fly around the electric lights, particularly those in the outskirts of cities and towns. The attraction which these arc lights have for insects is well known to the entomologist, and anyone desirous of securing moths for study can easily collect ample material during almost any warm evening from May till October.

The caterpillars of these Halisidotas are general feeders, and all have been found here at Ottawa feeding on oak, elm, willow, basswood, ash, etc. They become full grown in autumn, and after wandering about in search of a suitable place to make their winter home, each caterpillar spins an oblong-oval cocoon composed of the hairs from its body, interwoven with some silk. Soon after completing its cocoon, it changes to a reddish-brown object, called the pupa, and while in this state it gradually transforms into the perfect insect, the moth emerging the following June. These cocoons may often be found in open woods in spring, under pieces of old plank, dry logs, or even flat slabs of stone, which in some way have been disturbed or dislodged. After having collected these cocoons and brought them home to watch for the appearance of the moths, it often happens that one is surprised to see in the box, or breeding cage, in which they have been placed, a large fly somewhat like the ordinary house fly except in size, or a still larger kind of fly, in the sense of being longer, viz., one of the hymenoptera, instead of what we expected to see—the perfect insect or moth. To one who studies insects, however, this is not always a disappointment, as a knowledge of our parasitic, or beneficial species, is of much value, and were it not for these parasitic forms, some kinds of which prey to such a marked extent upon our native species of injurious insects, these latter would soon multiply enormously, and quickly destroy all vegetation.

The Checkered Halisidota, *H. tessellaris*, S. & A., is slightly larger than the other two species found at Ottawa, and expands, when the wings have been spread, about two inches. It is a delicate looking moth with semi-transparent wings, of a buff color. The forewings, which are narrower, making them appear more pointed than in *maculata* and *caryæ*, are checkered with five irregular transverse bands, margined narrowly with black, the 2nd, 4th and 5th of which extend right across the wing. The shoulder covers and collar of the thorax are the same color as the wings, but are margined on the inside with greenish-blue. Down the centre of the thorax is a stripe of the same greenish-blue. The balance of the thorax, the upper surface of the abdomen and the legs are yellowish-orange.

The caterpillar of the Checkered Halisidota, when full grown, is over an inch in length, with a black head, the body covered with hairs of a delicate buff-yellow color. In front are four dorsal blackish pencils, or conspicuous tufts, besides which are two pairs of shorter lateral white tufts, and, near the end of the body, a pair of whitish tufts. At Ottawa the basswood seems to be a favorite food plant of the larvæ, although they are often found on a number of other trees, such as hickory, walnut, beech, and frequently on fruit trees, to which, however, they do no serious harm. These caterpillars have, also, been recorded as a nuisance on shade trees in cities in New Jersey, but in Canada no complaint of this nature has, I think, been made.

Halisidota maculata, Harris. (Original.)

The Spotted Halisidota, *H. maculata*, Harr., is a more conspicuous moth than *tessellaris*. The forewings are ochre-yellow, spotted with blotches of dark brown, the outer of which form a distinct band across the wing. The other blotches form four partial transverse bands, the 2nd, 3rd and 4th of which join, in most specimens, in the centre of the wing, forming one large blotch. The body is of much the same color as the forewings, and just behind the collar are two oblique stripes, which converge and almost form a V-shaped mark. The hindwings are paler than the forewings, translucent, and without spots.

The larva of this species is larger and quite different from the preceding. The body is black, covered with tufts of bright-yellow and black hairs, the black tufts being on the four anterior and three posterior segments, and the yellow tufts on the remaining segments. The latter are centered down the middle of the back with a row of black tufts. We have not found this caterpillar as commonly, at Ottawa, as the other two species. The oak is probably the favorite food plant, and some writers speak of the species as "The Oak Tussock Moth."

Halisidota caryæ, Harris. (Original)

The Hickory Halisidota, *H. caryæ*, Harr., is quite different from either of the foregoing. The ground color of the forewings is ochre-yellow, but is heavily dusted with brown scales. On the forewings are five, more or less, transverse bands, or rows of spots, joined together. The outer two rows of these are pearly, the others mostly the ground color of the wings, edged with brown. The hindwings are semi transparent, the same as in the Checkered Halisidota. The body is of about the same color as the wings, the shoulder covers of the thorax being margined with brown on the inside.

The caterpillar of the Hickory Halisidota is the commonest larva of the genus, which we have in this district. It has a black head and the body is clothed with dense tufts of white hairs, with a ridge of black hairs down the centre of the back, and two pairs of long black pencils on the 1st and 7th abdominal segment. When full grown it is about one and a half inches in length.

The female moth lays her eggs in a cluster on the underside of a leaf, and the young caterpillars in their earlier stages have the habit of congregating. As they approach maturity, however, they separate, and wander off by themselves. During the past summer the writer had a brood of these caterpillars under observation, some of which were kept in glass jars. An interesting point noted was that when the caterpillars, in their last stage, were being returned to the jars, after these had been cleaned, if they happened to drop against the sides of the jars, they were able at once to hold on to the glass by their feet, instead of dropping to the bottom.

When disturbed all of these *Halisidota* caterpillars have the habit of falling to the ground and curling up, remaining in such position for some little time. They can, therefore, be collected easily from the trees, or bushes upon which they feed, by simply holding, with one hand, an inverted umbrella under the food plant and tapping the branches or twigs with a light stick held with the other hand.

THE GLACIATION OF MOUNT ORFORD, P Q.

By R. CHALMERS, LL.D.

In a paper recently published by Prof. C. H. Hitchcock of Dartmouth College, Hanover, N. H., on the *Glaciation of the Green Mountains*,* he brings up anew the question of the glaciation of Mount Orford, and reiterates his former belief that it was overridden by ice from the Laurentides during the glacial period. As the writer ascended this mountain in 1896 and spent some time in an examination of its higher slopes and summit, the results of which led him to an entirely different conclusion, which is briefly stated in an official report issued in 1898,† a few remarks and explanations seem now to be required.

Mount Orford is one of the isolated summits of the Sutton range, or north-east extension of the Green Mountains into Canada, and is situated near the northern end of Lake Memphremagog. The altitude has been ascertained by the Geological Survey of Canada, (Ells, Giroux and the writer) to be 2,860 feet above sea level. On the summit there are patches of bare rock. From the highest of these there is a magnificent view of the lake and surrounding country on a clear day. A flag-staff has been erected here for the guidance of mountain climbers, and a foot-path leads up to it on the south-west slope.

In climbing this mountain I took a guide with me who was familiar with the trails, and instead of following the beaten path I went round to the north-west side mounting the slope along an untrodden route. My object in doing this was to observe the glaciation on the stoss, or struck side, and to ascertain how high the ice ascended it, and whether it really overrode the mountain top. Though we had a very difficult climb, through woods, and over ledges, boulders and fallen trees, the ascent was successfully accomplished. On the way up we noted striæ and grooves, boulder-clay, and crystalline boulders, till we reached an elevation of about 1,800 feet. At a point 2,080 feet high, however, I thought I detected grooves, but I see by my notes made on the spot, that they are marked *doubtful*. Above this no glacial marks,

* Argos and Patriot Press, Montpelier, Vt. 1904.

† Annual Report, Geol. Survey of Canada, Vol. X, 1898, p. 30 j and p. 46 j.

boulder-clay, or crystalline boulders were observed. Reaching the north-west and west brow of the mountain summit we found the rock surface broken, jagged and angular, instead of worn and rounded as it should be if ice had passed over it. Continuing thence to the highest point on which the flag-staff stands, parts of it were found to be bare rock, while bushes and stunted trees grew in the hollows and crevices. Striking evidences of decay are apparent on every hand, the rock being everywhere rent and fractured. A broad weathered chasm with angular blocks in it which have fallen from the sides, crosses the summit in the direction of S. 40° E. and N. 40° W. mag. ; but there was no sign of glaciation here. The rents and cracks in the rock surface referred to are sometimes parallel to the chasm and sometimes not, and when the sharp edges of the smaller and finer cracks become weathered they resemble glacial grooves. In other places however, the surface of the rock is uneven, lumpy and without any appearance of planation. No boulders of gneiss or granite were observed on this part of the summit The whole aspect of the mountain is that of one rapidly crumbling to ruins, the nature of the rock, an altered diabase, being such that in an exposed position, it could not have retained glacial marks for the length of time which has elapsed since the glacial period, even if it had once been overridden by ice.

Prof. Hitchcock reports that in October, 1897, he ascended this mountain, and at the Boston meeting of the *American Association for the Advancement of Science* in 1898,* he gave the results of his examination, making the altitude 5,000 feet, and stating, as already mentioned, that ice had passed entirely over it striating the summit and distributing boulders of Laurentian gneiss upon it, etc. But any one, understanding glacial geology, who has been on the higher part and around the mountain cannot avoid seeing that if he were there at all his examination must have been very imperfect. I am constrained to believe that Prof. H. never was on the highest part of this mountain, but only reached its upper slopes.

In regard to Owl's Head, a mountain 16 miles to the south of Mount Orford, and 2,400 feet high, Prof. Hitchcock remarks, "I may say that I have examined the summit of this mountain and

* Proc. of the A. A. A. of Science, 1898, p. 292.

found no striæ, because the rock has deteriorated and the glacial surface destroyed." If glacial marks could be destroyed in this way on the summit of a mountain 2,400 feet high is it likely they would be preserved on one 2,850 feet high, the rocks being practically the same in both ?

The Canadian Record of Science for 1900-92,* also contains a criticism of my work on Mount Orford by Prof. J. A. Dresser, of Richmond, P Q., in a short paper entitled *Note on the Glaciation of Mount Orford.* In this note, after quoting my statement about the mountain having been glaciated only to a height of 1,800 feet, he says: "From these conclusions it is evident that the observations on which they were based did not include that dome-shaped part of the summit of the mountain which is apparently its highest point." ..... "Here, near the point where a flag-staff has stood for the past few years, a fine-grained and much altered diabase is distinctly striated, and the whole eminence has a generally—smoothed and rounded appearance." Though Prof. Dresser writes so confidently he is not a glacialist, and in his desire to support his friend Prof. Hitchcock, has evidently fallen into the error of supposing that the weathered grooves and ruts in the dome-shaped part of the mountain summit, described by me, are glacial striæ. As regards this, however, he can console himself with the thought that he is not alone in making this mistake, for Prof. Hitchcock, if he ever were there at all, has fallen into the same error. In another paragraph Prof. Dresser says:—"Reasoning from this limit of the height reached by the ice-sheet, viz., 1,800 feet, Mr. Chalmers shows that if it passed over the range of hills along the United States boundary line, some 2,000 feet in height, as was probably the case, that those hills must have stood relatively lower than at present. This hypothesis is then applied to the explanation of certain high-level terraces near the international boundary line, and the deformation of gravel beds around Lake Memphremagog and along the Coaticook and Salmon rivers. But in view of the evidence of ice-action at a much greater altitude than 1,800 feet, the hypothesis may no longer be needed," etc.

This gratuitous comment shows Prof. Dresser to be quite

Can. Record of Science. Vol. VIII, 1900-92, pp. 223-25.

innocent of any knowledge of the subject under discussion, and of the reasons why an hypothesis of this kind should be considered necessary. It is surprising how many writers on glacial questions there are who do not seem to know that a moving glacier, like running water, cannot flow higher than its source. According to the views of these scientists there would appear to be no difficulty in ice flowing from the Laurentides, which are only 1,500 to 2,000 feet high, over the north-east Appalachians 2,500 to 5,000 feet high or more. The hypothesis of a greater elevation and a vast sheet of ice in the Laurentian region has, of course, been advanced, but this does not satisfy the conditions of the problem, in fact it is merely one hypothesis brought forward in support of another. If we admit the principle of oscillations at all, is it not just as reasonable to assume that these took place in the Appalachians as in the Laurentides? To suppose the former to have been a stable region in the glacial period, while the latter was rising and falling, as has been done by the advocates of great glaciers, does not seem probable, and moreover, the evidence adduced in support of such a condition of things is of little or no value. But the limits of this note will not permit me to go into further details at present. I may remark, however, that in my official work, while broaching several hypotheses, I have been conservative; and in regard to the glaciation of the St. Lawrence valley, I have taken existing levels as those which may, after all, have obtained in the early part of the Pleistocene period. These, I found sufficient, at all events, to enable me to explain the striation and transport of boulders in south-eastern Quebec up to the international boundary.

NESTING OF THE NIGHT-HAWK IN OTTAWA

A BIT OF NATURE-STUDY ON ONE'S OWN HOUSETOP.

By G. EIFRIG.

The first night-hawks or bullbats (*Chordeiles virginianus*) of the season 1904 that came to my notice, I saw sailing about over the eastern part of the city on May 11th. This interesting bird has of late years changed its nesting habits to accommodate itself to the encroachments of civilization. Many individuals of the species have forsaken their natural nesting or rather breeding places—since they build no nests whatever—that is, dry open fields and rocky ledges, and now simply deposit their usual set of two eggs on some of the many flat-roofed houses in the cities. My house having a so-called deck-roof, with a balustrade around the gravel-covered "deck," I wondered whether this might not prove attractive enough for one of the night-hawk couples to go to housekeeping on it. However, on account of an absence from the city I did not get to look until May 28th. As I lifted the cover from the manhole leading up to the deck, away flew a night-hawk from the gravel. I looked at the place vacated by her, but for several minutes saw no eggs, until I finally discovered one right before me, where I had been looking all the time. It measured 1.20 x .86 in., the ground color was dull olive-gray, irregularly blotched and spotted with blackish-brown and thus being very difficult to detect among the variously colored gravel.

The bird had not flown far, but squatted lengthwise, as this bird and the whippoorwill usually do, on one of the ridges of the roof nearby. No other egg was laid, perhaps, because the bird evidently had been hurt on one wing; some of the greater wing coverts over the secondaries were missing as through a pebble or bullet had passed through, which however, did not incapacitate her from flying. After several visits she did no longer fly off, but allowed of close approach, and as a perfectly quiet sitter before a camera, though only three feet away, would have delighted any photographer. The male, much more conspicuous and pretty than his demure little mate by reason of the white band across the throat and the white spots on wings and tail, would sometimes

come from some nearby large willows or houses and utter some queer rattling or clucking notes of alarm or protest. In the evenings, when the air was full of bullbats performing their marvellous aerial evolutions and incidentally catching their insect prey, this male bird would sometimes dart down right near to me, producing the loud booming for which these birds are known, the female even then sitting at my feet.

The female was faithfully brooding her solitary egg, rain or shine, early in the morning and late in the evening until the morning of June 11th, when, before my eyes, out of the shell a young tiny bullbat emerged into the world. It was covered with grayish down, some black being sprinkled over all, and this combination of neutral tints made it again difficult to detect in the gravel. It was able to wabble about immediately. The mother now lost some of her former good nature, she hissed with wide open mouth—which in these birds is really cavernous—in the most startling manner. During the next three days she always brooded her offspring whenever I looked at them; as late as 10 o'clock in the evening the mother was there. The feeding must have taken place later in the night. The youngster grew fast and gave every promise of becoming a valiant boomer amongst his kind, when, alas, a stroke of bad fortune blasted my and, I suppose, more so the faithful mother's hopes—if night-hawks ever have any. As the lives of Ernest Thompson Seton's animals end in tragedy, so did this one. When I looked up on the morning of June 14th, the mother was there, appearing different than before, however; disconsolate it seemed; but the young one was gone. The lower bar of the balustrade being several inches above the platform, the young bird had fallen from it onto the steep roof, and I found its lifeless little body in the grass below. The old bird stayed about the roof for a few days longer, as though still hoping for the appearance of her offspring, and then she disappeared.

A week or so after this I again noticed a night-hawk prowling around my roof. On June 29th I looked on the platform above and found another female bullbat sitting on her eggs. These were greener and more densely spotted than the former one, and, like this one, laid on the bare roof between the gravel without any nesting material whatever. It was not the same bird as before, as

could easily be seen. Perhaps this one too had suffered some misfortune at her first nesting place, because this was certainly too late to be her first attempt. I found this bird off her eggs the first time on July 4th at 8 o'clock p.m., but she soon came after I had come near the eggs. The male also flitted around me, noiselessly, like a huge moth. In the greatest heat at mid-day, when the gravel and tarred platform about her exhaled still more heat, this faithful bird was always sitting on her eggs. On July 11th her labors were rewarded by the appearance of two healthy looking young birds, looking like pepper and salt as the one before. To prevent a recurrence of the tragedy aforesaid, I had placed boards along the open under border of the balustrade. The young ones were lively, trying to get away from a person already on the second day. The old one showed correspondingly bad temper. When she was not brooding them, she would always be next to them, always in such a position that her shadow fell over the small birds, which during the hot noonday hours certainly must have been a great protection for them. Whether this was "purposely" or accidentally done, who knows? July 17th, the young showed the first signs of feathers; the male from nearby showed much wrath when the young were approached. On July 22nd one of the young had more feathers than the other; was also livelier, sturdier. By July 26th their downy natal dress was entirely replaced by feathers. The next day the more precocious young one had gone from the platform and the other one almost flew into my face. However, even now, when all dangers seemed to be over, one of the young, and that the stronger one, nearly came to grief. It must have perched low down somewhere, for all at once a neighboring cat was seen carrying it in the mouth. When chased she dropped it and it had luckily not been damaged. The next morning, July 28th, all three were again assembled on the deck of the roof, but at our approach they all flew away. They remained about for a few more days, when they disappeared, most probably on their long migration southward, which is begun early by some of these birds.

Like the first, these two latter ones were also fed at night only, and when we consider how quickly they grew and matured, we can imagine what an enormous amount of food, and this all noxious insect food, must be supplied by the old ones. They are worthy of every protection in our cities and should not be made the target of the air-gun and sling-shot of the boys on the street.

NATURE STUDY—No. XXIII.

THE CLOUDED SULPHUR BUTTERFLY (*Colias philodice*, Godt.)

A NATURE STUDY.

By JAMES FLETCHER, Ottawa.

Fig. 1.—Male.

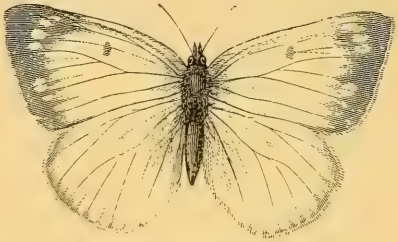

Fig. 2.—Female.

In Nature Study work a few common objects studied thoroughly as to their essential and salient points will be of more use than a large number of disconnected facts relating to many different objects. The limitations of work undertaken must be clearly defined both as to method and aims. These must be thought out by the teacher beforehand and must be kept constantly in mind. With a view to directing the attention of teachers and others to a convenient exercise in studying insect life which is available to all, I would suggest that the common Clouded Sulphur Butterfly offers special advantages. The butterfly is striking in appearance and interesting in habits ; it is common in all parts of Canada east of the prairies. It appears early in the year, and the various members of the pea and clover family upon which the caterpillars feed occur everywhere. Eggs of this butterfly can be secured with the greatest ease, and as its whole life-history, from the egg to the perfect butterfly takes only about one month no one need tire of the exercise before it is completed. The beauty of the egg, the rapid development of the caterpillar and the various changes as it passes from moult to moult, from the time of hatching until it reaches full growth, will be found exceedingly interesting to all who will observe them, but the fascination of watching the change from caterpillar to chrysalis and then the gradual appearance of color and its increasing intensity day by day as the butterfly forms inside the shell, must be a source of keenest delight and wonder

to all studunts who have watched the young caterpillar from the time it left the egg to that period. For such, few human experiences can equal the delightful suspense of watching for the bursting forth of the perfect insect from its frail chrysalis prison, through the walls of which the colors of the butterfly have been plainly visible for several hours.

The exercise suggested is simply to procure eggs of the Clouded Sulphur Butterfly and watch the development of the caterpillars through all stages to the perfect insect. To do this all the apparatus necessary is two or three 6-inch flower pots, a yard or two of mosquito netting, a few feet of wire and some india rubber bands.

The first thing to do is to transplant into the flower pots good strong plants of Alsike or of common white clover. Any clover will do but these kinds are convenient to handle on account of their smaller growth. This should be done early in May and the plants will be well established by the middle of the month, when the first specimens of the Clouded Sulphur Butterfly may be seen flying hurriedly along roadsides and over meadows. On catching a few of these it will be at once noticed that there are among them two patterns of ornamentation on the wings. These indicate the sexes. The males (Fig. 1) have a regular black margin to all the wings, while the females (Fig. 2) have the margin of the upper wings much wider with some yellow spots inclosed.

Having caught two or three females put them inside a cage made over the potted clover plants by first bending two pieces of wire 18 inches long into hoops, and having crossed them at right angles over the plants, push the ends down into the earth. Over this framework stretch a piece of mosquito netting and keep it in place by putting an elastic band arouud the rim of the flower pot. The cage is now ready and by raising one edge of the netting the butterflies can be slipped into it, care being taken not to injure them in any way. The cage must then be placed in some shady place out of doors. In a couple of days, if the females are ready to lay, the exquisitively beautiful pale yellow, striated, spindle-shaped eggs will be seen standing erect on the upper surface of the leaves. From this time on the notebook must be kept close at hand, and changes worth recording will occur every day. The

eggs, which on the day they are laid are of a delicate waxy yellow, by the second day have changed to deep pink. On the third day they are crimson, but by evening have darkened to lead color. On the next day they are almost black and the young caterpillars emerge. The first sign of the young caterpillar will be its jaws as it eats its way out through the delicate egg shell. This operation will take about an hour, after which its first meal is generally made from its own egg shell. The young caterpillar is about one-twelfth of an inch long, olive green in color and has a black head. Under a magnifying glass it will be seen that each segment has five transverse creases and that each ridge between these has several black dots upon it from which rise short club-shaped hairs or processes. These hairs are arranged somewhat regularly in rows across the body. When quite young the little caterpillar spins a pathway of silk on the surface of the leaf, along which it walks out to feed and then retires to the centre of the leaf to rest. Throughout its life it resembles very much the color of the leaf upon which it feeds and is doubtless by this, as well as by its habit of dropping to the ground when disturbed, much protected from its enemies. Three days after hatching it has increased so much in size that its skin has become too tight for it. It then stops feeding and remains with the body hunched up on its silk platform for about a day preparing for its first moult. Gradually the tiny black head projects from the body and close behind it a new head may be seen beneath the translucent skin. The black ocelli, or simple eyes, of which there are five on each side of the head, are very conspicuous. When the proper time comes the skin bursts down the middle of the back close behind the head, and with a series of muscular contortions, the old skin is worked backwards and our caterpillar walks out arrayed in a new suit. The last part of the operation is getting rid of the old head case, which it does by twisting its head from side to side against the food plant. It will now be seen that the skin is of a much brighter green and the head is also green instead of black. After this first moult the length of the body is about one eighth of an inch. This stage lasts for three or four days and as the next moult is approached the caterpillar again becomes sluggish and, as before, ceases feeding. After the second moult the length is about one-third of an inch. The color has become darker. the sides are marked more distinctly with a faintish whitish stripe and there is a

dark green stripe down the back. The caterpillars as they grow larger become more voracious and the leaves of our first clover plant, if we have more than a dozen caterpillars feeding upon it, will now probably be much eaten. When the caterpillars have ceased feeding preparatory to the third moult, some of them may be removed to a fresh plant. This is done, not by taking them from their silken mats, but by cutting off the whole leaf upon which they are resting and dropping it in among the leaves of the other food plant. After the third moult they will crawl up on to the leaves of the new plant and will be seen to have improved in appearance. They are now three-fifths of an inch in length, the lateral stripe is more distinct and marked with red on some of the front segments. In some specimens black lunate spots occur beneath the stripe. In the next and final stage the colors are more intense, the body being dark velvety green above and a crimson line runs down the centre of the side stripe on which the breathing pores or spiracles are situated. When full grown these caterpillars are over an inch in length; they then begin to wander from the food plant, unless confined in a gauze cage, and look for a suitable place to change to the chrysalis condition. There a mat of silk is spun over the surface with a button of pink silk at one end. The hind feet are attached to the button and the front legs are hooked into the silk of the mat. After resting for some hours the caterpillar spins a very slender girdle from side to side of its body, and then slips it over its head and rests upon it. While the girdle is being spun it is passed several times over a small cushion-shaped organ beneath the neck of the caterpillar, evidently to strengthen the cord.

Fig. 3.

The chrysalis is about an inch long, somewhat, but not quite, like Fig. 3, is apple-green in color and has a yellow stripe down each side. About six days after it is formed the color of the future butterfly begins to show, and the exciting period of watching for the perfect insect begins. As a rule about the ninth day the critical moment arrives, and lucky is the watcher who is fortunate enough to see the emergence of the butterfly.

The above account gives only in a general way the life-history of the Clouded Sulphur Butterfly ; there are many other points of interest which will be discovered by an observant student, some of which have beeh purposely left untold. In addition there is always much variation in the way in which, even in the same brood, some individuals develop when compared with others. Noting these differences demands just such an attitude of mind as Nature study calls for, together with close observation and constant attention so as to cultivate the powers of perception.

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THE OTTAWA NATURALIST.

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NOTES ON SOME FRESH-WATER SHELLS FROM THE YUKON TERRITORY.

By J. F. WHITEAVES.*

Among the zoological collections in the Museum of the Geological Survey of Canada, there are a few fresh-water shells from the Yukon Territory, which have not yet been reported upon, though they are by no means devoid of interest to the student of the geographical distribution of the mollusca.

Most of these shells were collected by the late Dr. G. M. Dawson, in 1887, at four localities, viz., from Frances Lake, at the head of the Liard River; from Finlayson Lake, between Frances Lake and the Pelly River; at the Lewes River; and from Lake Marsh or "Mud Lake," one of the tributaries of the Lewes River. The remainder were collected by Mr. Joseph Keele in 1904, from the Stewart River, near Mayo River.

The Cycladidæ in these collections have been kindly determined by Dr. V. Sterki, and most of the Gasteropoda by Dr. W. H. Dall. The species represented in them are apparently as follows.

PELECYPODA.

Sphærium Walkeri Sterki.

Frances Lake, one valve; and Finlayson Lake, two perfect specimens. In 1904 Mr. W. McInnes collected a few living shells, which were referred to this species by Dr. Sterki, from the Attawapiskat River, Keewatin. The types of *S. Walkeri* are from Lake Michigan.

* This paper and the following one are reprinted from 'The Nautilus' for May, 1905.

Pisidium Idahoense Roper.

Stewart River, near Mayo River; one dead but perfect specimen and an odd valve. Dr. Sterki writes that the "anterior part of the hinge of the former is reversed."

Pisidium compressum Prime.

Stewart River, near Mayo River; one specimen. Mr. McInnes has recently collected specimens of this species at Ozhiski Lake, Attawapiskat River; at Kawinogans River, a branch of the Attawapiskat; and at the Winisk River, Keewatin.

Pisidium variabile Prime, var.

Stewart River, near Mayo River; two specimens. Mr. McInnes has recently collected three specimens on the Kawinogans River, which Dr. Sterki has identified with this species.

Pisidium scutellatum Sterki.

Frances Lake, fry only; one specimen. Dr. Sterki has recognized a few specimens of *P. scutellatum* in collections made by Mr. McInnes last year at Ozhiski Lake, and the Kawinogans River, Keewatin.

GASTEROPODA.

Valvata mergella Westerlund (Dall).

Stewart River, near Mayo River; two specimens

Valvata Lewisii Currier (Dall).

Valvata sincera of Haldeman, C. B. Adams, Dek and many subsequent American writers, but, acc *V. sincera* of Say.

Valvata striata of Lewis, but not of Philippi.

Frances Lake, ten specimens, and Finlayson mens. Presumably similar specimens were previ W. G. Binney, in 1865, under the name *V. si* been collected by Major Kennicott from the Pe Mackenzie, and Great Slave Lake. Frances and both belong to the Upper Mackenzie drainage sy

Elsewhere in Canada, *V. Lewisii*, as recen Dall, is now known to occur at many localitie Alberta, and as far to the north-eastward as Fort

A few specimens in the Museum of the Canadian Survey, which Dall thinks are "probably the true *V. sincera* of Say, or a variety of it," were collected on the island of Anticosti by Professor Macoun in 1884, and on the Attawapiskat and Kawinogans rivers by Mr. McInnes in 1904. Those from the Kawinogans River have the outer half of the last volution free and partially uncoiled.

Limnæa stagnalis appressa Say.

Stewart River, near Mayo River; two specimens.

Limnæa Randolphii Baker.

Frances Lake, eleven fine and large specimens; Finlayson Lake, eleven specimens, mostly immature; Lewes River, one small specimen; and Lake Marsh, Lewes River, seventeen fine and mostly adult shells.

Limnæa palustris Muller.

Frances Lake, two specimens.

Limnæa Vahlii Beck (Dall).

Frances Lane, nine specimens; Finlayson Lake, twelve specimens.

Limnæa arctica Lea (Dall).

=*Limnæa Pingelii* Beck, var. (Dall).

Stewart River, near Mayo River, two specimens.

Planorbis trivolvis Say.

Stewart River, near Mayo River, seven specimens of a rather large, depressed and thin-shelled form of this species, with the spiral angulation obsolete.

Segmentina armigera Say.

Stewart River, near Mayo River; one specimen.

Physa sp. indet.

Finlayson Lake; one very immature specimen.

Ottawa, April 5, 1905.

LISTS OF A FEW SPECIES OF LAND AND FRESH-WATER SHELLS FROM THE IMMEDIATE VICINITY OF JAMES BAY, HUDSON BAY.

By J. F. WHITEAVES.

The shells referred to in the following lists were collected by Messrs. O. O'Sullivan and W. Spreadborough, at three localities near James Bay, on behalf of the Geological Survey of Canada, and are now in its Museum :

1. From two miles above the mouth of the Harricanaw River, Hannah Bay, collected July 1, 1904.

(A. *Land Shells.*)

Cochlicopa lubrica (Muller). Several specimens.

Vitrina limpida Gould. Eight specimens.

Zonitoides arboreus (Say). Two specimens.

Pyramidula striatella (Anthony). Four specimens.

Succinea retusa Lea (*S. ovalis* Gould non Say). Several specimens.

(B. *Fresh-water Shells.*)

Limnæa stagnalis appressa. Ten specimens.

Limnæa Vahlii Beck (teste Dall). Eleven specimens.

Limnæa truncatula Muller (teste Dall). Several specimens.

Bulinus hypnorum (L.). Eight specimens.

Planorbis trivolvis Say. Two specimens.

2. From the mouth of the Moose River, about a mile below Moose Factory, collected July 15, 1904.

Lampsilis luteolus (Lamarck). Two specimens.

Anodonta marginata Say (= *A fragilis* Lamarck). Three specimens.

3. From the mouth of the Albany River, about a mile below Fort Albany, collected July 25, 1904.

Planorbis albus Muller (= *P. hirsutus* Gould). Several specimens.

Ottawa, April 8, 1905.

NATURE'S METHOD OF RE-SEEDING TO WHITE AND RED PINE.

By P. Cox, Chatham, N.B.

The discussion on "Conifers" at the meeting of the Botanical Branch of the Ottawa Field-Naturalists' Club, as published in the February number of THE NATURALIST, was very interesting. For many years I have observed the methods of Nature in the work of re-forestation, and in a few words shall give you the results.

White and Red Pine do not spring up immediately after a fire. Other plants, such as the birches, maples, poplars, willows, cherry *(Prunus pennsylvanica)*, shrubbery of various kinds, trailing plants, grasses, mosses, liverworts, etc., soon take possession of the fire-swept area, to be followed in a few years by the Conifers, including the pines. The Northern or Scrub Pine *(Pinus Banksiana)* is, to a certain extent, an exception ; for in some districts, especially "barrens" more or less sodden in spring and early summer, it follows almost on the heels of a fire, and its foliage is generally, on such a soil, yellowish, as remarked by Mr. Hamilton in the discussion,—a character I have failed to notice in the case of the White and Red Pine.

How are burnt areas re-seeded to the latter ? Under ordinary forest conditions, Prof. Macoun is, I believe, quite right in ascribing to seed-bearing cones, buried by squirrels and other animals, a share in the work ; but the re-seeding of burnt districts can hardly be thus explained ; for, the surface mould and soil being swept off, the seeds of buried cones brought near the surface would be apt to germinate under the influence of light and heat, and re-seeding on the heels of the fire would be expected. Such, according to my observation, does not happen. It would seem as if the White and Red Pine are not alkali-loving plants, and their seeds do not germinate and thrive in a soil impregnated with the soluble constituents of ashes, but require much vegetable mould and half decomposed wood—a fact observed by Messrs. W. T. Macoun and Elwes in the traverse from Kingsmere to the Gatineau. This view seems further strengthened by the fact that the first young White and Red Pines appearing on a burnt district are

almost invariably found growing on rotten trunks and stumps which had in part escaped the conflagration.

The leaching of the surface soil, the gradual consumption of the alkaline constituents by the first growth, and the resulting addition of the necessary vegetable matter will, in a few years, prepare the burnt area for the pines, whose seeds are doubtless wind-sown. Some such conditions seem to regulate the reappearance of the spruces also, and I once observed the Hemlock *(Tsuga Canadensis)* re-occupying its old site after a period of ten or twelve years.

BOTANICAL NOTE.

Erythronium albidum. A nice specimen of this flower has been received from an anonymous correspondent, "E. U. O. M," of Belleville, Ont., who states that the root was originally collected at Massassaga Point, Bay of Quinte, in 1896. Every year since one flower and two leaves only have been produced. The flower in this species is white, faintly tinged with violet or blue. It is smaller than the common American Dog's-tooth Violet or Adder's Tongue *(Erythronium americanum)* and the leaves are not prettily mottled with brown, as in that species. In Macoun's Catalogue of Canadian Plants it is recorded that, although the species is apparently rare in Ontario, it was abundant in 1878 in a rich low wood two miles east of Belleville, between the Grand Trunk Railway and the Bay of Quinte. Dr. Burgess also found the species on steep clay banks of the River Thames at the "Cove," London, Ont.

J. F.

BOTANICAL CLUB OF CANADA.—The undersigned will be obliged to any botanists who have taken exact dates of the flowering of native plants in the Ottawa district this spring, if they will communicate to him, with a view of making the Ottawa Report to the Botanical Club as complete as possible.

J. FLETCHER, *Sec'y for the Province of Ontario.*

ZOOLOGY.

The Banded Pocket-mouse.
(Perognathus fasciatus.)

A good specimen of a small rodent, which Dr. C. H. Merriam has identified with this species, has recently been presented to the Museum of the Geological Survey of Canada by Mr. Norman Criddle, who caught it at Aweme, Manitoba, in June, 1904.

The pocket-mice are not very dissimilar to the common house mice, in size and shape ; but the former, as their name implies, are provided with cheek pouches, which open externally, and their fur also is very distinctive both in its coloration and texture. Beddard places the pocket-mice next to the kangaroo rats, in the family *Heteromyidæ* ; but Lyddeker says that they can be distinguished therefrom "by the presence of roots to their molar teeth," and adds that most of the pocket-mice are "brownish above and white beneath, with a tawny stripe on the flanks, dividing the dark from the light area." Their hind limbs are described as "scarcely saltatorial," and their fur as "coarse and bristly."

The type of the genus *Perognathus* (*pera*, pouch ; and *gnathos*, jaw) is *P. fasciatus ;* both the genus and its genotype were first described by Maximilian, Prince of Wied, in 1839.

Audubon and Bachman's brief and altogether unsatisfactory Latin diagnosis of the specific characters of *P. fasciatus*, published in 1856, when freely translated, reads—yellowish gray, white below, with a pale yellow lateral stripe. Baird's definition of its specific characters, published in 1857, is as follows : "Considerably larger than the house mouse. Tail as long as body without the head. Antitragus" (the inner lobe of the ear, opposite the tragus) "conspicuously lobed. Soles naked. Above reddish yellow closely lined with black ; fore legs all round, feet and under parts white; a pale reddish yellow immaculate band on each side."

P. fasciatus is said to occur in Mexico, Dakota, Kansas and Manitoba. At least six species of this genus are now known, most of which are inhabitants of the western parts of North America.

Ottawa, April 26, 1905. J. F. Whiteaves.

REPORT OF THE ZOOLOGICAL BRANCH, 1904.

The leaders in Zoology have again to report that, while much useful work in this branch of biological science has been done by various members of the Club, there is little of such novelty or importance to record as to justify detailed notice in this annual report. The fact that Ornithology, Entomology and Conchology are dealt with in separate reports, precluding reference to them in the Zoological report, seriously confines the field, so far as important seasonal observations go, as the mammals, fishes, etc., offer themselves less readily to continuous study by naturalists resident in a city. Still the field is a most inviting and promising one, and, as pointed out in previous reports, there are many lines of work which are open to those desirous of adding to our stock of zoological knowledge.

The Hudson's Bay expedition which returned last fall, after fifteen months' exploration in the Arctic waters of Canada, made some interesting contributions to Dominion zoology.

In the Report of the Department of Marine and Fisheries just issued the following resumé is given of the preliminary account furnished by Mr. Andrew Halkett, naturalist on board the SS. "Neptune."

Mammals.—The mammals observed were limited to four orders, the Carnivora, the Rodentia, the Ruminantia, and the Cetacea; and embrace the Atlantic Walrus (*Odobanus rosmarus*), the Ringed Seal (*Pagomys fœtidus*), the Harp Seal (*Pagophilus groenlandicus*), the Hooded Seal (*Crystophora cristata*), the Polar Bear (*Thalartos maritimus*), the Barren-ground Wolf (*Canis albus*), the Esquimo Dog (*Canis familiaris borealis*), the Arctic Fox, (*Vulpes lagopus*), the Polar Hare (*Lepus arcticus*), certain small rodents, such as Marmots and Lemmings, the Musk Ox (*Ovibos moschatus*), the Barren-ground Caribou (*Rangifer arcticus*), the Right Whale (*Balœna mysticetus*), and the Beluga or White Whale (*Delphinapterus catadon*).

Specimens of the skins of several of the mammals, suitable for mounting, were preserved, with a series of skulls, bones, teeth, etc.

Birds.—The skins of about thirty species of birds, embracing over one hundred specimens, were preserved; these include, among others, the Lapland Longspur (*Calcarius lapponicus*), the Snow Bunting (*Passerina nivalis*), the Red Poll (*Acanthis linarius*), the American Raven (*Corvus corax principalis*), the Horned or Shore Lark (*Octocoris alpestris*), birds of prey, various shore birds, including the Red Phalarope (*Crymophilus fulicarius*), the Whistling Swan (*Olor columbianus*), Hutchin's Goose (*Branta canadensis hutchinsii*), the Snow Goose or Wavy (*Chen hyperborea*), the Eider Duck (*Somateria mollisima*), the King Eider (*S. spectabitis*), the Long-tailed Duck or Souwester (*Harelda hyemalis*), the Arctic Tern (*Sterna paradisæa*), various gulls (*Laridæ*), Jægers (*Stercorarius*), the Murre or Brunnich's Guillemot, (*Uria lomvia*), the Sea Pigeon (*Cepphus mandti*), the Red-throated Diver (*Urinator lumme*), and the Black-throated Diver (*U. arcticus*).

Numerous birds' eggs, some of them in sets, a series of birds' nests and avian anatomical preparations were also collected.

Various other species of birds were observed, such as the American Titlark (*Anthus pensilvanicus*), the Rock Ptarmigan (*Lagopus rupestris*), and the Dovekie (*Alle alle*).

Fishes.—The fishes observed, or collected, were various Salmonoids and Codfish (*Gadus callarius*), together with a specimen each of *Lycodes* and *Gymnelis* (dredged), two specimens each of two species of Blennioids (dredged), a Sand-launce (*Ammodytes*). Cottoids or Sculpins, a species of fresh water Stickleback (*Pygosteus*) and a Basking Shark (*Somniosus microcephalus*).

Specimens of various species of insects and of marine invertebrates were obtained, and, when determined, these will form a peculiurly interesting collection.

In this connection, it is appropriate to note that this season and during the last two or three seasons specimens of the Swingletail or Thresher Shark (*Alopias vulpes*, Gmelin), have been captured in the waters of eastern Nova Scotia. The species has been hitherto uncommon or unrecorded in these more northerly waters. The Great White Shark or Man eater (*Carcharodon carcharias*, Linn.,) has also been observed more frequently by the sealers in the Gulf of St. Lawrence in recent years. The Mackerel Shark (*Lamna cornubica*, Gmelin,) and the Sand Shark (*Carcharias*

littoralis, Mitchell) have been taken, and unprecedentedly vast schools of Picked Dog-fish or Bone-dogs (*Squalus acanthias*, Linn.) have infested the whole of our Atlantic coast from Gaspé southward. Can it be that our eastern shores are undergoing some change rendering the sea warmer and more attractive to these fishes which usually prefer more southerly habitats? The distribution of species is a most fascinating study and one to which our local zoologists might profitably devote more attention in the future.

E. E. PRINCE.
ANDREW HALKETT,
W. S. ODELL.

CORRESPONDENCE.

The Editor OTTAWA NATURALIST.

SIR,—I am making a special study of the Carices (sedges) of Ontario, and should be very grateful for the co-operation of all Ontario botanists.

It would greatly advance our knowledge, if everybody at all interested in plants would collect all the sedges they come across this summer and fall. They should collect the whole plant, roots and all in duplicate, place a label bearing a number, the locality, date of collection and collector's name in each paper, and press for about four days. This is all the drying sedges need.

At the end of the season mail one lot of duplicates to me (flat, not rolled) marked "Sample Post." I shall be glad to refund the postage and will, upon determining the specimens, send a list of the numbers with the name of the species against them.

One important point to be borne in mind about sedges is that they must be collected in full fruit, that is, when the achene (seed) is fully formed and hardening.

All specimens received will be fully credited to their collector in anything I publish on them.

Yours truly,

A. B. KLUGH.

Guelph, Ont.

The Editor OTTAWA NATURALIST.

SIR,—My attention has just been drawn to an article in the last number of THE NATURALIST by R. Chalmers, LL.D., on "The Glaciation of Mount Orford." This article is in the form of a reply to our recent paper by Professor C. H. Hitchcock, Dartmouth College, Hanover, N.H., on "The Glaciation of the Green Mountain Range" (Report of the State Geologist of Vermont, 1903-4, Burlington, Vt.), and to a brief note on the subject of Mount Orford by the present writer (Canadian Record of Science, July, 1900). Unfortunately, it is the writers, rather than the subject, that receive the greater share of attention in this article. Yet a few words of explanation may help to remove any misapprehension regarding the latter.

In the annual report of the Geological Survey of Canada Dr. Chalmers advanced the view that Mount Orford and other hills in south-eastern Quebec were not glaciated above an altitude of eighteen hundred feet. In 1898 Professor Hitchcock reported to the American Association for the Advancement of Science that glacial markings and drift were found by him at the summit of Mount Orford in the previous season.

On the appearance of Dr. Chalmers' report, early in 1900, the writer, quite unaware of Professor Hitchcock's investigation, wrote the short paper above referred to, expressing the opinion that the mountain had been glaciated to the top, and that, consequently, the extreme height reached by the ice in south-eastern Quebec is not yet known. When in manuscript, this note was sent to the late Dr. G. M. Dawson, then Director of the Geological Survey, with the request that it should be also submitted to Dr. Chalmers. Dr. Dawson's reply was to the effect that, the writer's view being probably the correct one, there was no objection to its publication. Accordingly, after again visiting the summit of the mountain, the article was published in July, 1900. It is, therefore, only after five years that Dr. Chalmers first expresses his dissent, and that, apparently, without having in the meantime re-visited the field. It is still more inexplicable that his criticism should now be so largely a personal one.

Dr. Chalmers' ground for discrediting the evidences of the

glaciation of Mount Orford seem to be, 1st, that he did not see any himself; 2nd, that Professor Hitchcock—in short, like Cæsar's untrustworthy lieutenant, reported "*pro viso quod non vidisset*"; 3rd, that the writer, not being a glacialist, would not know what he saw, or be able to reason from it correctly if he did.

To the soft impeachment against himself the writer may be excused from reply. But to the suggestion that Professor Hitchcock reported what he did not see, it is only just to say that Dr. Chalmers omits to mention a very important part of that gentleman's observations. In order to remove any doubt as to the source of the boulders which he found on the higher portions of Mount Orford, Professor Hitchcock submitted a specimen for lithologic determination to Dr. F. D. Adams of McGill University, who found it to be a Laurentian erratic which must have come from the north side of the St. Lawrence river. Yet, Dr. Chalmers makes no reference to this in his criticism of Professor Hitchcock's article. Had he, on the other hand, exercised equal care to inform himself of the character of the loose rock material on the summit of the mountain, Dr. Chalmers doubtless would never have reached his present conclusion. Serpentine from the northwestern base of the mountain, slates from the palæozoic rocks beyond, and Laurentian gneiss are so plentiful that any ordinarily careful observer cannot but see them. The soil which supports the scanty timber growth contains a large admixture of drift. A petrographic study of the mountain made by the writer a few years ago did not show a noticeably greater decomposition in surface specimens from the top, than from the base, of the mountain.

Therefore, until Dr. Chalmers has other evidence than he has yet adduced, the writer, while always open to conviction by information, must respectfully decline to accept his present views on the subject.

Yours respectfully,

JOHN A. DRESSER.

St. Henri de Montreal, May 17, 1905.

NATURE STUDY—No. XXIV.

Apparatus Required For Nature Study.

S. B. Sinclair.

It is often urged that "A Nature Study laboratory is necessary for the successful teaching of elementary science and that without expensive apparatus the work done will be of little or no value." If this view be entirely correct it is prohibitive as regards the introduction of Nature Study into the primary grades of elementary schools, for the general public are not likely to sanction any large expenditure for such a purpose. A brief investigation of this argument therefore may not be out of place.

Nature Study versus Laboratory Method.—The method of the laboratory is usually artificial, technical, abstract. In a laboratory experiment the conditions set up are different from the natural conditions and are established with the purpose in view of discovering or proving certain facts or laws by eliminating irrelevant factors and gaining control of others.

Now, a study of genetic psychology reveals the fact that, speaking generally, it is only when the child has reached the period of youth (beginning at the age of from 12 to 14 years) that the mind takes on the more reflective laboratory attitude which is interested in law, abstraction and generalization, seeks truth for its own sake, desires to probe into the hidden meaning of things and to develop technique in a scientific way.

Previous to this age and during the period of childhood (from about 6 to 12 or 13 years) when the child is in the primary classes of the Public School, the attitude is quite different. During this period the unity of interest is found in serial order, a relation of means and ends, a history or scheme. The child likes to observe the process from one stage to another and see how it is going to come out. He also finds his greatest pleasure in the development of skill in the attainment of some life purpose. It is a delight to him to find that he has gained a power to cause the process to come out differently from the way in which it otherwise would. He is not content with mere play as he was in the previous stage of infancy, but begins to look ahead, make plans for the future

and work for the achievement of his purpose, and he is willing to take considerable pains in gaining skill which will enable him to attain his end quickly and effectively.

With such an attitude the child naturally finds the laboratory work of the High School distasteful, but he takes to certain forms of Nature Study as instinctively as the duck to the water. The life-history of birds, trees and insects, the adaptation of each to its environment, the relation of each to his own life, the care of animals and plants—these and similar subjects, if presented in the right way possess an irresistible charm to him.

These characteristics of child-nature furnish a key to the material and the method of study which should be selected during those early years.

It may be noted in this connection that such study may be quite as scientific as laboratory work. If we accept the dynamic definition of Science as that which furnishes insight to interpret a new situation, we must admit that the child who intelligently and perseveringly studies the life history of a bird or plant and acquires skill in the control of the life process, is proceeding scientifically even though he never perform a laboratory experiment. Further, there is reason to believe that if the child omits such study during childhood when the impulse is at its height he will never again be able to atone for his neglect.

As the attitude, during this entire period constantly progresses toward the more thoughtful attitude of youth there should similarly be a constantly increasing emphasis upon the conventional side and particularly upon the development of skill. The need for such experimental investigation will be realized most readily by the child when there is a selection of material which lies very close to his own life interest, for example, the study of the effects of various kinds of food upon pet animals, of heat, light and moisture upon plants, or the humane extinction of injurious insects. These subjects may be treated from the functional standpoint without any tendency to commercialism. Such studies enlist the interest of the parent in the work of the school. They prevent and cure habits of vandalism and cruelty, and develop in the child a spirit of co-operation and helpfulness, which is the highest aim of education.

Character of Presentative Material—As regards the materials of Nature Study, it may be noted in the first place that many of the models offered for sale are very poor substitutes for the original object. The study of the singing bird in its natural habitat is likely to prove a much more attractive and helpful exercise (especially with beginners) than the investigation of the mounted specimen or the inaccurately colored picture "11-17 of the original size." However, in some cases, after he has failed repeatedly to obtain a close and continuous view of the flitting object of his investigation, the learner turns to a study of the school model with a due appreciation of its special advantages. At the beginning, out-door study is most valuable, and with proper preparation and care an occasional field excursion presents the best form of non-conventional Nature Study for the little child, and the most lasting results will be those gained from such outdoor study by the pupil without any immediate assistance from the teacher. Fields and woods are always accessible, the domestic animals, garden plants and flowers, birds and insects, the wonders of water, earth, air, forest and sky, are available in every locality, and all that is required is a sympathetic attitude toward nature, a genuine desire to investigate, and a few simple suggestions regarding the mode of procedure. I know a boy of 12 years of age who, with very slight preliminary instruction, has acquired a good working knowledge of all of our common local birds, their appearance, migration, nesting, song, adaptation etc., and has formed a close acquaintance with several of them. His interest in the subject is normal and wholesome, and his method of study quite ingenious, e. g., he never takes an egg except from a deserted nest and yet he has a fairly good collection. Making out-door investigation the starting point, the teacher soon finds that the children themselves bring specimens to the school for examination. Thus a collection of specimens for a cabinet is begun. As a rule children enjoy making collections, and there is a sense of proprietorship about such a possession which is a desirable factor and cannot be gained from bought specimens. The materials for definite study can very often be brought by the children, e. g., each child may bring a sample of the flower to be studied. There is no difficulty in securing a number of pet animals in a similar way.

For the highest type of work, books and other kinds of materials must be secured, but at the outset the cost will not be great, and these should succeed and not precede the collection of natural specimens. Under such conditions the purchased materials will be wisely selected, carefully studied and properly cared for.

Experimental Apparatus.—As has been pointed out, the experiments at this period are not of a vigorous analytic type, and consequently little apparatus is required, and that of a most elementary character, easily constructed by the teacher or pupil, or procured at trifling expense. A twenty-five cent lens may be of more value in such work than a compound microscope. The life-history of a plant, together with such phenomena as appeal to the child can be studied from a single specimen, the only expense involved being the cost of the seed and the crock. One of the most scientific and fruitful investigations of insects made in recent years is a study of ants, extending over six years, conducted by Miss Fielde of New York City, and reported to the members of the Philadelphia Academy of Natural Sciences. The following is a description of the apparatus used: "An ant nest can be made in an hour or two with two pieces of glass 3 in. by 4 in. and strips of Turkish towelling glued around for walls. A partition with a door is necessary to make a separate room for the food, a wet sponge in the living room, a few dead flies, and the home is quite satisfactory to your little guests. A sheet of orange tinted glass over the nest enables you to study them without any offensive publicity."

In no other subject is it so true as in Nature Study that "half a loaf is better than no bread." The teacher who waits for gilt-edged apparatus, a well-prepared school garden, a sympathetic public and other ideal conditions, will always find good and sufficient reason for postponing the introduction of the subject. On the other hand, the teacher who makes a wise selection of material, is content to begin with the day of small things and to make the best of the present situation, will find that in Nature Study, as in every other activity, "Perfection consists not in a having and a resting but in a growing and a becoming."

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THE OTTAWA NATURALIST.

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A NATURALIST IN THE FROZEN NORTH.

By ANDREW HALKETT.

Beyond the ordinary range of observation are vast ice-bound and snow-clad regions, where nature, although not there at all times profuse in the manifestation of her life forms, unfolds before the eye of the naturalist who may be fortunate enough to visit those far away places, creatures remarkable in their structure, and quite as remarkable in their life-histories and habits. Something is already known concerning certain of the animals which inhabit the frozen North : much, very much indeed, remains to be found out. The fields where those creatures have struggled to exist, and have survived, are vastly extensive, and their habitats very varied, and often singular. They exist in divers environments : they swarm in the open sea, creep about or remain stationary deep down upon its bed ; they swim at its surface, or fly immediately over it, or yet again in the upper air ; they bury themselves in mucky substances along the beach, or in sand in pools of salt water ; they hide themselves and take refuge among algæ and under stones ; they crawl along among the leaves of stunted plants, and hover among arctic flowers ; they move about amid the azoic rocks of the barrens, and even live beneath the ice in fresh-water ponds formed of melted snow.

Furthermore, there are many delicate forms, such as the medusoids, and other hydrozoans, which cannot well be preserved as museum specimens ; therefore, an adequate conception of those could be acquired only through coloured illustrations, so that they await the skill of an artist, with pencil and brush to figure them on the spot.

Ice-bound and snow-covered, then, as those northern regions are during the long winter, they yet offer to the observer a rich field where nature reveals the living objects she has placed there; and the opportunities to observe which the short milder season affords, are many. It is primordially a place for a field-naturalist: a place, moreover, where the mind is aroused to the urgent need on the part of naturalists (and this the more so on account of the present state of zoological knowledge) for closer and deeper observations, whatever the nature of their respective researches may happen to be. In this connection, a few preliminary remarks may be in place, and are offered suggestive of what may be expected in an address which purports to deal with animal forms many of which have had little if any attention, and which are made in order to show that as yet the work of a naturalist in the Hudson Bay region and in the more northern and eastern locations, is that of a pioneer.

The mere closet naturalist lacks the experience of the field naturalist. Were one, it is true, to confine himself to a laboratory or a library, having little desire to go out of doors, were he simply to read popular works on natural history, or to pore over more advanced zoological treatises, he might familiarise his mind with general theories of classification, or with outlines of comparative structure. In other words, a student of this sort might gain a fairly accurate conception of the sub-kingdoms into which the animal creation is divisible. But if he thus limited his studies, having little ambition to walk even a mile from his home in order to stroll through the woods or along the banks of a stream, his knowledge would be curtailed and inaccurate. On the other hand, one who values the recorded researches of others, and who, whilst not dependent upon books, reads or refers to them, knowing that they contain many corroborated facts concerning the forms and habits of animals; but who at the same time is independent enough to follow living beings to their haunts, to learn at first hand from themselves, will find his stock of information accumulating and resting upon a surer basis. Nevertheless, one who carries on original researches will discover how little, relatively, he knows, and the more deeply he pursues knowledge in the realms of natural history, the more he will see,

not only how much remains to be found out, but also how much already alleged and taken for granted, requires corroboration, or even correction. If this be so, one whose opportunities have led him into fields hitherto little frequented, will commensurately feel the gravity of nature's own obstacles which tend to impede the way in seeking to add to the treasury of knowledge, and therefore he ought to be as certain as possible of his data before entering into descriptions. The substance of the following remarks, then, is at best fragmentary and partial, an effort to adhere strictly to what was actually observed, leaving the filling in of details, in such a wide and varied field, to subsequent researches. "It is an old and firm conviction of mine," wrote Darwin, "that the naturalists who accumulate facts and make many partial generalizations are the *real** benefactors of science." And, surely, the true scientific method is to ascertain facts and marshal them, which of course implies incompleteness entailed through the processes of collecting them.

The mammals observed are limited to the four orders of the Carnivora, or the beasts of prey; the Rodentia, or those which gnaw their food with chisel-like incisor teeth; the Ruminantia, or those which chew the cud; and the Cetacea, or those of the whale kind. The tail in all the species observed, excepting those of the family of the Canidæ, or dogs, wolves, and foxes, is short or rudimentary. This is true even of the Ruminants, although those creatures of the North are plagued by dipterous insects—at least the Caribou is. The tail in the Cetaceans is of course broad, so as to act as a propeller. The colour of the iris is generally brown, and this is the case in many of the birds also. I was struck with the similarity of the colour of the iris in the fox and in the hare, and was led to think that some homologous purpose is thereby served to those creatures. Burrowing does not seem to be a common habit, and, when resorted to, has usually to be done in the snow, the rocks affording little facility for that purpose, except in the instance of small rodents.

In appearance the Walrus (*Odobæus rosmarus*) when seen in its habitations, is massive and unwieldy. Great numbers were

* Italics his.

seen at, and in the vicinity of, Charles Island, Ungava, in September, 1903. They were first observed in the sea, either singly, or two or three together. At the island they were numerous, and were moving about among the surf and boulders. Walruses were also encountered off Southampton Island. At this place numbers were resting themselves on the great sheets of floating ice, and when approached would in the easiest manner simply slide over the ice into the sea. In August, 1904, numerous Walruses were seen on floating sheets of ice, as we were sailing up the Greenland coast.

Whilst at Coming Creek, North Devon Island, some of the party, intent on making researches regarding the geology and palæontology of the place, went ashore When in the small launch, a number of Walruses were seen swimming about in the bay. They were chased, and it was great amusement to see them rolling themselves down into the water, in order to hide, and to see them coming up again, as they were compelled to do, in order to breathe.

Knowledge of the Seals is nearly as involved as is that of the Whales. (See p. 86.) Usually only their heads are seen above water, and viewed, as they often are, from a distance, it is sometimes impossible to be sure of the species. The different kinds outwardly resemble one another, and there is considerable individual variation, occasioned by the creature's time of life; and probably for other reasons, such as that of the patterns and markings in the sexes of a particular species. Indeed, one who has never been in the arctic regions cannot properly understand the obstacles to be overcome in studying out those creatures. With us, the best opportunities were in the iglows, or snow-houses, only dimly lighted by the stone lamps when the days were very short, and the sun low down in the heavens.

Seals were observed dotted about here and there in the water at Winchester Inlet, in September, 1903, their heads appearing and disappearing as they sported themselves in this sheltered place. At Fullerton, throughout the winter, seals were frequently seen. One day I observed two frozen-over openings, at places apart, the abandoned holes of seals. In the month of May, seeing a seal resting on the ice far away in the distance, I

walked toward it with one of the firemen in order to get a better view of it, but it disappeared through its hole in the ice. I then walked over to examine the hole but failed to find it. The surroundings disguised its whereabouts, the packed snow of the low rocks being just sufficiently ridged to hide it from view; and this was a clear case of protection to the creature.

Irrespective of difficulties, three species of seals were determined, viz., the Flipper or Ringed Seal (*Pagomys fœtidus*), common at Fullerton, where it was frequently to be seen at the floe or open water during the winter, and it was also seen in Baffin Bay; the Harp Seal (*Pagophilus grœnlandicus*), seen in Baffin Bay, and on the ice near Cumberland sound; and the Hooded Seal (*Cystophora cristata*), seen resting on a sheet of ice in Davis Straits.

The Polar Bear (*Thalarctos maritimus*) can be seen during the short summer, walking about when the ground is carpeted with a low-growing vegetation, and cranberries and blueberries paint the landscape, and when, in certain localities, there is snow only in ravines and deep hollows where the sun cannot penetrate. Sometimes also his bruinship is to be seen on the floating ice in the sea. Bears were encountered as they were walking about on the mountain sides at Eric Cove and at Digges Island, Ungava, and on floating ice off Southampton Island, where walruses were observed. Also among the ice at the head of Hudson Straits, near Cumberland Sound, and in Baffin Bay.

A Barren Ground Wolf (*Canis lupus albus*) was killed with a trap gun in the month of March. If this were the same individual—which is more than probable—it had been seen several times for some days, previously, prowling about near the vessel, and running along over a frozen pond on an island. Its colour was white, the hairs of the back being tinged with black.

The Esquimo Dog (*Canis borealis*) is very wolf-like. This variety of the dog is the domestic animal of the Innuit or Esquimo, and it would fare ill with him were it extinct. It draws his sleigh over the frozen sea, and over the snow inland. Its disposition is that of the dog of a savage, lacking the docility of our civilized varieties; but it has little of the aggressive ferocity which, from descriptions, I anticipated it would have. It remains

quiet as you pass it, but retreats at the slightest sign of molestation. At the same time I am certain that, if kindly treated, it would soon exhibit affection. It is about the size of a collie. In colour it varies: some are black, variegated with white, or *vice versa*, others gray, and others again, but infrequently, cinnamon colour.

The Arctic Fox (*Vulpes lagopus*) is tolerably common in the vicinity of Fullerton, and during the winter months was frequently brought in from the traps. In winter its coat disguises it thoroughly. One day in February I walked to the traps, in one of which was a fox, dead and frozen stiff, which at first I took to be a lump of snow, so much did the creature resemble its surroundings. On another day of the same month the traps were again visited, in one of which was a fox caught by the toes of one foot. It was living, and limped about when approached, but was very easily killed. As soon as it was dead, I examined its iris, and also examined the iris of a living fox which was brought to the vessel in November, and found the colour to be a beautiful brown.

This completes our brief consideration of the carnivorous mammals observed. We have next to consider those belonging to other orders, and will begin with the Polar Hare (*Lepus arcticus*). This rodent, when fully clad in its pure white coat among the frozen ponds and snow-covered rocks of its native haunts, presents a graceful sight. It runs about, sits up, and lies down betimes, and moves rather timidly, somewhat in a semi-circle round about the observer.

Polar Hares were occasionally shot at Fullerton, and any fine day during the winter, when walking over the islands of the channel, their foot tracks might be seen in the snow. Its winter coat is pure white, excepting the ear tips, which are jet black. The Hares have little difficulty in obtaining food, because the stalks of the dried hay-like grass which they feed upon, are often left uncovered by the drifts several inches above the surface of the snow. I frequently came across the places where they had been feeding, and found that besides eating the exposed grass, they also got at the covered-up vegetation by scraping the snow away. Hares were seen in August along the Greenland coast, and at

Cape Sabine, all of them white, there being evidently in those places of the very far north no time for assuming a summer coat.

A few specimens of several kinds of small Rodents, such as lemmings, and marmots or ground squirrels, were found. The males of the Marmots have cheek-pouches for storing food for after use.

The skins, with the heads intact, of six Musk Oxen (*Ovibos moschatus*) were brought to the vessel from the inland. An examination of their skulls is as follows:—Cavity of brain small; very prominent orbital projections, eye sockets full of fat; when thawed out, the iris brown, pupil light blue. The skull of a calf shewed a different contour from those of the mature animals, the occipital opening being larger, and the lower mandibles thicker in proportion towards the middle. Dentition:—Incisors, 6 in each lower jaw; canines, 1 in each side of lower jaw; molars (including pre-molars), 6 in each upper and lower jaw of specimens numbers 1, 2 3, and 6; 5 in each upper jaw of number 4, with a space for a 6th, and 6 in each lower, the back portion of 6th not having the usual flatness of a molar, but conical and canine-like, and received into the vacant cavity of upper jaw; 4 in each upper and lower jaw in number 5 (calf), the last pointed not flat, but low, apparently a tooth in the forming, each 3rd molar in three parts; 6th molar in each lower jaw of the other skulls in three parts. A small branch of crow-berry (*Empetrum nigrum*) was attached to one of the skins.

We were well supplied throughout the winter with the flesh of the Reindeer or Barren Ground Caribou (*Rangifer grœnlandicus*), the carcases being brought to the vessel from the island by the Esquimo. The flesh of those deer is excellent, and one might eat it every day of the year without tiring of it. The Caribou are much infested with the large larvæ of an Œstrian dipteron, which are buried in the flesh.

In many respects, more is known about the infinitesimal protozoans than about the Cetaceans, or mammals of the Whale tribe, many of which are the giants of the animal world. As a rule, only certain parts of their great bodies are to be seen at one time, usually when they rise to respire; and, even then, very often at a considerable distance from the observer. For this reason, I

seek to be cautious in speaking with certitude concerning the identity of species, in particular cases, unless the evidence was unmistakable. The bones of Cetaceans, bleached, mutilated and worn, are often to be seen along the shores.

Two Whales, evidently the Right Whale or Bow-head *(Balæna mysticetus)*, were seen on the Greenland side of Baffin Bay; the Killer *(Orca gladiator)* was reported seen after leaving Port Burwell in August, and the Narwhal *(Monodon monoceros)*, whilst we were sailing along the coast of Greenland. A White Whale or Beluga *(Delphinapterus leucas)* was seen sporting itself leisurely near the shore in a harbour on the Labrador coast, and several White Whales were seen at Fullerton. Certain cetaceans, apparently the Grampus *(Grampus griseus)* and the Common Porpoise *(Phocæna communis)*, were seen whilst we were sailing along the Labrador coast.

Bird life is an attractive feature in the Arctic zone. Some, such as ravens, eiders and sea-pigeons, remain in the far north throughout the winter (that is, some of them do); and when the sun gains in the ascendency, the return from the south, for breeding purposes of insessorials, birds of prey, numerous shore birds, swimmers and divers, is indeed a thing of import. Some unerring instinct leads those immigrants to leave the more genial and wooded temperate parts, to betake themselves to the barrens of the north, where, undisturbed, they may make their nests, and rear their young among the rocks and ponds. Among the earliest arrivals are the insessorials, notably the Snow-birds, and these are soon followed by gulls, terns and shore birds. Whilst removing their skins I found the birds were generally well protected from the cold by fat, and that the swimmers and divers, in addition, were very oily for resistance against water.

Tit-larks *(Anthus pensilvanicus)* were seen at Port Burwell. Lapland Longspurs *(Calcarius lapponicus)* were frequently noticed hopping about among the snow-birds at Fullerton.

Snow-birds *(Plectrophenax nivalis)* were observed among the rocks at Fullerton, when we arrived there towards the end of September, 1903.

(To be continued.)

BIRD NOTES.

NOTES FROM CENTRAL ONTARIO. — The most important ornithological event of the spring of 1905 has been the breeding of the Pine Siskin in Central Ontario. These birds were abundant in the vicinity of Guelph during the past winter, and, at the approach of spring, instead of leaving for the north, they scattered over the country and bred commonly.

Some ten nests were found in the County of Wellington. The first nest to be found in Central Ontario was taken by Mr. F. Norman Beattie at Guelph, on May 7. They appear always to have selected White or Black Spruces as nesting trees.

Our previous Ontario records are from the vicinity of Ottawa, where they have been found breeding by Mr. Garneau.

This spring was marked by the late appearance of the American Crossbill, which was seen on April 13 and again on May 1; on the former occasion a flock of 6, on the latter a single bird.

During the spring migration Blackburnian Warblers, Nashville Warblers, Chestnut-sided Warblers and Magnolia Warblers have been particularly abundant, and the Mourning Warbler has been much commoner than usual and is breeding in far larger numbers.

On May 5 I took a male Cape May Warbler and saw a female and shortly afterwards Mr. L. Beattie took a male and saw others; on May 13 I took a male Tennessee Warbler, and on May 20 a pair of Pine Warblers. This last species is decidedly rare in Central Ontario.

Myrtle Warblers are again breeding at Puslinch Lake near here, as well as at Puke Lake near Mount Forest. The Green Heron is also breeding again at Puslinch Lake, as on June 29 I saw one fly down to, and away from, a particular spot in a bog there several times.

The Red-billed Grebe is breeding at Puslinch Lake this year for the first time, as far as our records go.

A. B. KLUGH.

Guelph, Ont.

RING-BILLED GULLS (*Larus delawarensis*) ON LAKE ONTARIO.—For some years past I have been interested in the gulls of Ontario, and, while I have found the Herring Gull breeding in several of the little lakes north of Kingston, there has always remained unsolved the problem of the gulls to be found on lake Ontario during the breeding season. I always supposed that these were Herring Gulls, probably immature or barren birds, and possibly a few birds which flew here from the inland lakes to feed. This was because in the early morning many gulls could be seen going north, and there was reason to believe that some birds returned in the evening. This year I have been watching the gulls on Snake and Salmon Islands very closely, and have ascertained positively that the flock, numbering between three and four hundred, is made up almost entirely of Ring-billed Gulls, There may be half a dozen Herring Gulls among the number, but certainly not more. Nearly all are in immature plumage and are, in probability, merely here during a developmental period. It will be interesting to note whether the gulls we see on these islands every summer, are of the Ring-billed variety, and more interesting still to learn if any the Ring-billed Gulls, breed in the lakes of Frontenac and Addington. Of course, as is well known, it is many years since gulls bred on any of the islands in Lake Ontario, even the Common Terns are disappearing.

C. K. CLARKE, M.D.

Kingston, Ont.

GENERAL EXCURSION TO CHELSEA.

Following a series of very successful sub-excursions held, as announced in the Spring Circular issued to all the members of the Club, to Blueberry Point, Aylmer; Victoria Park and the Central Experimental Farm ; Leamy Lake, Hull, Que ; Beaver Meadow, Hull, Que ; the first General Excursion of the Club took place on Saturday, the 27th of May, when Chelsea, Que., was visited. There was a very large attendence of members of the Club and their friends. The Provincial Normal and other leading schools of the City were also well represented. From those present at

the Teachers' Convention, which was being held in Ottawa during the same week, and at the Royal Society's meeting, were noticed : Prof. A. H. MacKay, Superintendant of Education for Nova Scotia, Halifax ; Dr. G. U. Hay, Supt. of Education for the province of New Brunswick, St. John, N.B. ; Dr. C. F. Hodge, of Clark University, Worcester, Massachusetts ; Mr. E. R. Howes, of Bowesville ; Mr. J. W. Gibson, etc.

The weather was all that could be desired and the woods were very green and fresh, filled with treasures from which many a lesson might be learned. At this time of the year the world of Nature seems to unfold its wonders to the eye of the observer in a manner which it cannot do in the more advanced season of summer and later when the fruition comes with its varied stores. There is no time when Nature studies ought to be carried on with more interest and profit than when the buds burst forth and the birds arrive, when there is a revival of life and activity in both the vegetable and animal worlds. In a country like ours, where the seasons are so well marked, there is a special attractiveness to all studies of life in the woods, and in the open glade and mead. The pool with its myriads of forms of animal life, each of which would form a life-study of special interest ; the tree with its unfolding leaf and flower buds ; the humbler plants and shrubs, the mosses, and liverworts, the spreading lichens and mystic fungus life, all yield to the student of Nature their own distinct and special secrets that open the heart and lead to paths of pleasantness. Even the rocks, those hard and cruel things which seem so lifeless and "dour", afford a theme which tells the tale of long ago, when molten lavas, boiling magmas were cooled and formed the crust of Earth upon which now we tread and give to plant and animal life the food and the place upon which both subsist.

The excursion train left the Union Station at 1.30 p. m., carrying some 300 students of Nature ; and, on arriving at the grove, Dr. S. B. Sinclair, the President of the Club, gave out the announcements for the day, pointing out to the members and their friends who the Leaders of the Club were in the different branches of work. Rendezvous was given for 4.30 p.m., when brief addresses were given on the principal objects seen during the day and lessons learned.

Professor Macoun was first called upon and gave one of his characteristic speeches, in which he drew wide conclusions as to the best methods of studying Nature and getting acquainted with her ways, in the field. Dr. H. M. Ami followed, giving a brief sketch of the geology of the region visited. The geological party had gone west to a cutting in which sea-shells were collected in abundance. These were exhibited, as were also a number of the principal rocks of the locality traversed. Crystalline limestones, phosphate of lime, gneisses that carried abundance of garnets in their sheared mass, iron ores, were described. Both ends of the geological scale met at this point. The oldest rocks which compose the earth's crust, and the youngest or newest— the Archæan and the Pleistocene—are here in immediate contact.

Dr. James Fletcher spoke on "Seed Babies," Cotyledons. Their functions and uses were carefully delineated and examples shown from specimens obtained during the day. Other forms of plant-life observed during the afternoon were exhibited by him and notes given on insects captured. A fine pair of the Luna moth was shown by Mr. E. R. Howes, which had been collected by one of the party. The eggs of the Cone Bunting were shown and the habits of the bird described.

Dr. A. H. MacKay, of Halifax, followed with pleasant and witty remarks on the Club's work and the good resulting from such outings as the present.

Dr. G. U. Hay spoke of the vast resources of Canada and the need for students all over the Dominion. His recent visit to the West Coast had revealed to him a field of untold magnitude and an inheritance for Canadians of tremendous import.

Dr. Hodge was the last speaker. He received a perfect ovation on rising to respond to the call of the President. He had enjoyed every minute spent with the Ottawa Field-Naturalists' Club. Nature Study was destined to play an important factor in the education of the peoples of the world from now on, and materials for study and research would never be lacking. The manner in which these are approached by us as students, determined the results we would likely obtain. Nature reveals herself to those who put themselves in touch with her and who seek earnestly to feel her pulsations.

The President, Dr. Sinclair, then adjourned the meeting and the excursionists returned home to the city, having thoroughly enjoyed the day's outing, which all agreed had been both most profitable and pleasant.

H. M. A.

GENERAL EXCURSION TO CARP.

The second general excursion of the Club was held on June 10th, to Carp, Ont. Only a dozen members took advantage of the cheap rate secured by the Excursion Committee. Undoubtedly the unsettled state of the weather and the probability of rain discouraged many from attending. This locality is a very interesting one, and those who did take advantage of the outing were all of the same opinion—that the day had been profitable and most enjoyable. Many interesting specimens were collected and notes made as to the distribution of species, etc.

The greater part of the morning was spent in going through a charming grove, permission to enter which had been kindly granted to the Club by the owner, Mr. Johnson, and in walking along a lovely country road to a rocky prominence, from which a fine view of a beautiful stretch of country could be had. Some wild plum trees were examined, the fruit of which had all been destroyed by the well known fungus called Plum Pockets. Near a small pool a fine large, well marked example of the Milk Snake was seen.

With regard to the plants of the district the following note is from Prof. John Macoun: "There was a marked resemblance in the flora of the rocky district at Carp with that of Kingsmere, in the absence of certain species and the presence of others; yet the species in both districts are almost identical. *Phlox divaricata* and *Hydrophyllum Virginicum* were the only species seen that have not been detected at Kingsmere. *Geranium Robertianum*, considered a rare species, was common on rocky ledges. *Archangelica atropurpurea*, new to the Ottawa district, was found by springs above the village and *Heracleum lanatum*, *Anemone riparia*, *Rhamnus cathartica*, *Phegopteris polypodioides* and *Ran-*

unculus septentrionalis, all rare and interesting species, were detected by the botanists."

As to the birds of the district, Mr. A. H. Gallup writes: "Forty species were listed, none rare. The following might be mentioned: Warblers—Yellow, Black and White, and Black-throated Green; Redstart, Oven-bird, Water Thrush, Mourning Warbler, and many Wood Pewees, Red-winged Blackbirds, White-throated Sparrows, Purple Martins, Red-eyed and Warbling Vireos and Wilson's Thrush. The delightful song of the Catbird was noticed."

On the geology of Carp and environs, Dr. H. M. Ami, the leader of the Geological Section, says: "Carp village is situated on the bank of a small stream of the same name, along the edge and top of a series of marine terraces made up of "drift" materials deposited during later Pleistocene times, over the irregular surface of an Archæan mass which crops out in numerous places and exposes gneisses crystalline limestone, holding various kinds of minerals. Immediately opposite the Canada Atlantic Railway station are the remains of a hill of gravel from which were obtained the remains of two species of marine organisms: (1) a barnacle, probably *Balanus Hameri*; (2) a shell, *Saxicava rugosa*, L. This hill, on which a house used to stand, has been cut away for ballasting the railroad track along the line of the Ottawa and Parry Sound Railway. *Saxicava rugosa.*—Large and abundant specimens occur in the westerly portion of what remains of this once prominent feature in the landscape about Carp station, opposite the box factory and sawmill, near the old school house. The gravel is coarse; pebbles varying in size from that of a pea to 7 or 8 inches in diameter occur throughout the mass, and a large proportion of them would average from 2½ to 3 inches. Many of these, about 10%, are of Archæan age.

"Under the guidance of Mr. J. W. Gibson, to whose good management much of the pleasure of the day was due, the party skirted along the edges of the Laurentian ridge and returned over the rocks where iron-bearing gneisses—associated with crystalline limestones—syenites and granitoid or pegmatitic masses traversed by veins of quartz and occasional dykes of diorites or some other augitic materials, were seen to hold interesting minerals. In an

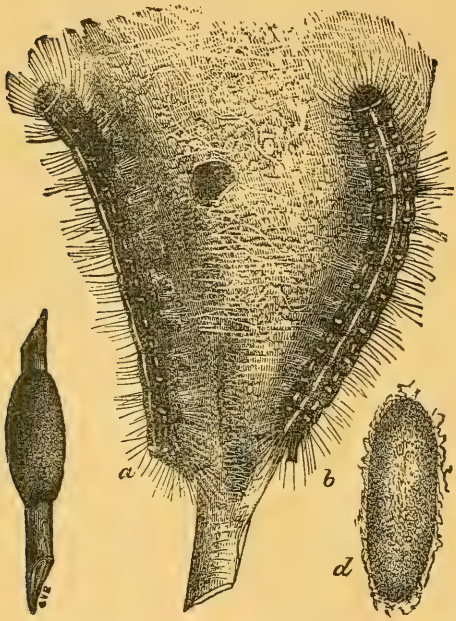
opening for mica were seen colonies of crystals of hornblende, which presented a very curious appearance.

"*Curved Crystals of Hornblende*.—In a single colony of hornblende crystals obtained on the dump of this vein of mica, in which pink calcite magnetite biotite crystals and hornblende crystals were observed, there were no less than fifty crystals presenting the unusual phenomenon of being curved or bent. That some extraneous force or other dynamic agency was at work to deform the crystals, is evident from the face of the crystals themselves. There are two phases of the flexure and curved condition of these crystals which may be readily observed, viz., (*a*) the broken and re-cemented prisms along one side or plane of the crystal; (*b*) the uniformly curved and deflected crystal. That the dynamic forces at work were strong enough to break many of the crystals in the colony is a fact merely to be observed; whilst many of the crystals having such a gentle, even and unbroken curve in their present appearance would lead me to believe that the crystal had once been in a more or less plastic condition. The crystals are worth studying more closely. The presence of a pink calcite in the mass leads me to infer that the pyroxene crystals were probably developed in a vein of this calcium carbonate. In a quartz vein said to be gold-bearing and occurring on the ridge, which was opened and followed a short distance in the hope of finding more material of an auriferous character, fine examples of felspar were obtained, which gave evidence of the presence of microcline or perthite. They are highly crystalline, exhibiting large faces with perfect cleavage everywhere on the dump. Crystalline limestone and wollastonite were also observed—the limestone holding numerous and irregularly shredded masses of rusty gneiss-like structure imbedded throughout their surface outcrop which appeared in relief.

"On the farm of Mr. James Wilson a sandpit occurs, from which the members of the Geological Section obtained a fine series of marine shells, referable to two species only: *Macoma fragilis*, Fab. (= *M. Balthica*, L.) and *Saxicava rugosa*, L."

The entomologists of the party, although few in number, made some acceptable captures, and doubtless would have collected many more interesting insects, had the day been more suit-

able for such work. As is well known, the butterflies delight in the bright sunshine, and, as the day was dull, few species were seen. Altogether eight different kinds were observed, but none of these were plentiful. The first specimens of the season of the Little Wood-satyr, *Neonympha eurytus*, Fab., were seen flitting about in the woods. On account of the weather, therefore, those seeking insects confined most of their attention to the collection of lepidopterous larvæ, and many caterpillars of some of our noctuid moths were found beneath pieces of board, chips, etc., on the ground. Two different species of arctian larvæ, viz., *Apantesis virgo*, L., and *A. parthenice*, Kirby, were collected. On several wild cherry trees, tents containing numerous specimens of the American Tent Caterpillar were observed. This injurious insect of orchard and forest, it is to be regretted, seems to be on the increase again.



American or Apple-tree Tent Caterpillar: *a*, tent; *b*, caterpillar; *c*, egg mass on twig; *d*, cocoon.

Everybody can do something to control it by cutting off the tents whenever seen and trampling on them, thus destroying every time a colony of upwards of two hundred caterpillars. Much of the foliage of some Silver-leaved Maples was conspicuously disfigured by being covered with the galls of the Maple-leaf Gall-mite, *Phyptoptus quadripes*. This is a very small mite which causes the elongated galls which sometimes cover the whole upper surface of the leaves. It has been particularly abundant this year on ornamental maples. Unfortunately, nothing in the way of a remedy can be suggested for this pest other than spraying with the lime and sulphur mixture before the buds burst, as is done against the Pear-leaf Blister-mite ; for it probably hibernates in the same way in the scales of the buds. A. G.

NATURE STUDY—No. XXV.

A SHORT INTRODUCTION TO SOME OF OUR COMMON BIRDS.

C. W. G. EIFRIG.

People desiring to become acquainted with birds, those lovable, pretty and useful friends of man, are sometimes bewildered and discouraged by the mass of material which offers itself in nature itself, or in the books which they consult. To help in overcoming these primary difficulties is the object of this paper. How elevating it is to know the birds one meets with, to recognize them by their form, color, behavior, flight and song, to become acquainted with these companions of one's work or walks! How much more beauty and satisfaction can then be got out of life! No one need be discouraged from forming at least a passing acquaintance with them. A little hard work, patience, close observation and perseverance will do it.

The families and species treated of here are loosely arranged in the relative order of abundance and probability of their being seen. The list is more especially for the Ottawa district, but many of the species are of almost continental distribution.

The Finches.—Everyone is familiar with the appearance of birds of the Finch family from our common and least desired neighbor, the English Sparrow. The chief characteristic is the thick, conical bill. A useful species of this family is the CHIPPING SPARROW, *Spizella socialis*. The English name is from its call and alarm note, chip, chip, etc.; its song is a locust-like trill, *lillillillill*, etc. It is smaller and more slender in shape than the English Sparrow. Its *bright chestnut crown* and grayish white line over the eye serve to identify it. Found in gardens, tree-lined streets and the borders of woods.

As common as the Chipping is the SONG SPARROW, *Melospiza cinerea melodia*. About the size of the English Sparrow, more roundish in build; much streaked with black, brown and gray, below whitish, streaked with black with a larger *blotch in centre of breast*. Its chief mark is its cheerful song beginning with usually three long notes, thus: "Olit, olit, olit, chip, chip, chip, che-char, che wiss, wiss wiss," or "Maids, maids, maids, put on your teakettles, teakettles-ettle-ettle" (Blanchan). It likes places with at

least some water and a few bushes near by, but is also found in city lots and gardens.

When passing through large meadows or pastures, you may often hear a subdued, penetrating high wiry song, something like *ptsip, ptsip, ptsip zee-ee-ee-e-e-e* (Blanchan). The bird uttering it will be seen on a tall grass or weed stem. That is the SAVANNA SPARROW. It is streaked above and below like the Song Sparrow, but *has not the blotch* on the breast; besides, it has yellow above the eye and on the bend of the wing.

Like the Song Sparrow in shape and size is also the SWAMP SPARROW, *Melospiza georgiana.* It frequents marshy places in meadows and woods, and is the darkest of our Sparrows, having darker brown and more black above, no streaks on the gray below. Its song is : *lellellellell*, etc.

When walking through lanes and fields, a sparrow-like bird will be seen to mount the fences or stumps, which, when flying away, exhibits *two outer tail feathers of pure white.* This is the VESPER SPARROW or Bay-winged Bunting, *Poocætes gramineus.* It is probably our least pretty Sparrow, gray all over, streaked with brown and black, wing near the bend rich brown. Its song, breathing the dreamy repose of the summer meadow, is not so jubilant as that of the Song Sparrow, but still pleasing, thus : *Dee dee ree-deree deree dee dee*, etc , or, *chewee, chewee, chewee, teera leera, leera lee*, which, though insignificant in itself, when sung as the bird's vesper song, late in the quiet summer evening, is inspiring.

Another member of the Finch family exhibiting the two outer white tail feathers in flight and having the song of the Swamp Sparrow, is the well known JUNCO or SNOWBIRD, *Junco hiemalis.* It is slaty bluish black, brownish in the females, which together with the whitish bill and white in the tail and the jerky flight near thickets, makes its identification easy.

A very pretty bird is the WHITE-THROATED SPARROW, *Zonotrichia albicollis.* More noticeable by its sweet song than by its bodily appearance, it is rich chestnut, streaked with black above, grayish below, throat white. From the pine and spruce woods and thickets, can be heard its sweet, somewhat plaintive whistle of from one long drawn out note to as many as ten. Some hear

it flute: *Peabody, Peabody, Peabody*; others, *Sow your wheat, Peverly, Peverly;* again others, *Dear Canada, Canada, Canada.*

Closely allied to this, and handsomer still, is the WHITE-CROWNED SPARROW, *Zonotrichia leucophrys.* It stays with us a a week or two during migration, is then sometimes very abundant and can be easily recognized by its white on the crown between black lines, the rich chestnut and bluish gray of the upper and under parts respectively. The song is low and soft, somewhat like that of the Vesper Sparrow.

The little GOLDFINCH or Thistle-bird (also known as the Wild Canary), *Astragalinus tristis*, singing *perchicoree* in its undulating flight, is well known—at least in summer. It is a hardy little bird and sometimes stays all winter in quite northerly latitudes. Then, however, both sexes are of a dull olive brown color.

Similar to this in size, shape, note and behavior is the little REDPOLL, *Acanthis linaria.* It is gray, streaked with brown and blackish all over and can be told best by its *crimson crown.* Old males also have a delicate pink on their breast. This and the next four species are hardy birds, breeding north to the limit of tree-growth and coming south in winter only and then not very far.

Together with the Redpoll, like it in appearance, may then be seen also the PINE SISKIN, *Spinus pinus.* Its field mark is a bright *yellow wing bar.* The large red bird often seen feeding on berries of various trees during late fall and in winter is the PINE GROSBEAK, *Pinicola enucleator leucura.* It has a very thick bill, as its name suggests and is very fearless, allowing of close approach. It is a distinct ornament to city streets in winter.

Then may also be seen the AMERICAN and the WHITE-WINGED CROSSBILLS, *Loxia leucoptera minor* and *leucoptera.* They feed chiefly on the seeds of pines and spruces, which they abstract from the cones by prying the scales apart with their crossed bills. They are red, the former *brick red,* the latter *crimson red,* together with a *white wing bar.* In size they are like the House Sparrow.

Then there is the PURPLE FINCH, *Carpodacus purpureus*, which breeds a little further south than the last. It is about the size of the common sparrow, *crimson* or *purple-red*, the females and young males grayish with black and brownish streaks; plainer looking than the English Sparrow. It breeds commonly at Ottawa.

The FOX SPARROW, *Passerella iliaca*, seen mostly during migration, is a large, stately sparrow, bright reddish-brown, especially the tail and similar spots, and streaks below.

The TREE SPARROW, *Spizella monticola*, is also a northern breeder and is abundant in Ontario and southward in migration and winter only. It has the *bright chestnut crown* of the Chippy, though a larger bird, and the *blackish-brown spot* on the middle of the breast, like the Song Sparrow, but no streaks around it. It is found in woods and thickets.

Another winter visitor from the North is the SNOWFLAKE, *Plectrophenax nivalis*. This can at once be told by the preponderance of *white* in its plumage.

A member of this family which, on account of its beauty would perhaps not be recognized as such, is the ROSE-BREASTED GROSBEAK, *Zamelodia ludoviciana*. When it flies you see a *network of black and white* on wings and tail ; head entirely black ; under the wings and a triangle on the breast a beautiful cherry-red; rest of under parts white. It frequents open woods and deciduous trees, park-like groves, etc. Its song is as fine as its plumage. It is larger than the English Sparrow and has a very thick whitish bill.

A speck of rich tropical coloration, as it were, is the INDIGO BUNTING, *Cyanopiza cyanea*. It is rather scarce in the Ottawa district but commoner as one goes south. It is lustrous blue, *deep indigo* on the head and neck, lighter on the back. The female is brown, with a tinge of blue on wings and tail. It likes to sit on telegraph wires or poles or dry branches, and pours forth a fine sustained medley of song, in quality like the perching song of the Goldfinch. In size it is like the Chippy, much smaller than the Bluebird. These are the common members of the Finch family.

The next family of birds after the Finches is that of the Tanagers, of which we have but one member in Canada, and that one is so brilliant in coloration that it immediately attracts attention. It is another bit of tropical luxuriance and prodigality of color transplanted to our sterner climate. This is the SCARLET TANAGER, *Piranga erythromelas*. The head and body are a brilliant scarlet, the wings and tail black, thus making identification and remembrance of it very easy. This species seems to be increasing its numbers in Canada. This spring it was reported in more places and greater numbers than before.

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THE EGGS OF THE SCARLET WATER-MITE *(Hydrachna sulcata)*.

By Prof. E. E. PRINCE, Dominion Commissioner of Fisheries, Ottawa.

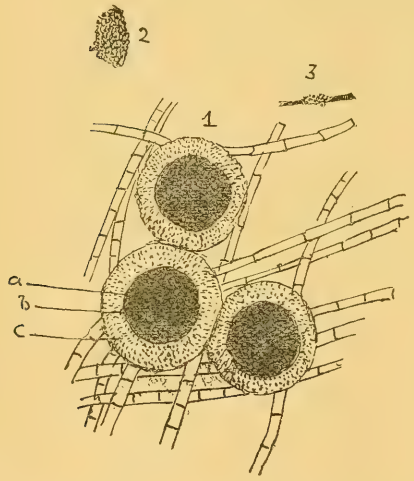
The Scarlet Water-mite *(Hydrachna)* is common in ponds and ditches near Ottawa. On account of its conspicuous coloration it may be readily seen moving actively through the water, or climbing amongst green water-weeds in search of food. Its eggs and spawning habits do not seem to have been described, and in a number of papers on the Acarines or Mites, which I have looked over, I find no reference to its ova. Some of the memoirs which I have consulted (including Edouard Claparède's splendid contribution entitled "Studien an Acariden,"* with ten exquisite coloured plates), describe and figure the ova and early stages of several allied species; but none of them quite agree with the eggs of *Hydrachna sulcata*, which I here describe. I have mounted some of the adults and the ova, in order that I may finally determine them later, as Dr. Wolcott reported to Professor H. B. Ward that in certain Michigan waters no less than 43 species of Hydrachnidæ, belonging to 16 genera, had been obtained in 1893†; and, as our Ottawa region is probably no less prolific, the diagnosis of specimens demands very careful examination. Owing to the limited amount of work done in the study of mites, any observations upon them, however fragmentary, are of interest. As the Rev. O. P. Cambridge has said, the study of the mites, on account of their small size and obscure modes of life, seems to have been neglected; yet, the variety which characterises their

* Zeitschrift für Wiss. Zool. Band 18, 1868.

† Michigan Fish Comm. Report 1896, p. 15.

forms and habits, renders them peculiarly interesting. They belong, it is hardly necessary to point out, to the class Arachnoidea, which embraces the spiders, mites and scorpions, and includes, amongst other orders, the Araneina or true spiders, the Acarina or mites, the Pœcilopoda or King-crabs, in the opinion of some eminent zoologists, and other interesting groups. To the Acarina belong the cheese-mites (*Tyroglyphus*), the parasitic skin-mites (*Desmodex*), and others which are destitute of tracheæ, or special breathing organs, and the harvest-mites (*Trombidium*), the bird- and beetle-mites (*Gamasus*), the dog- and cattle-ticks (*Ixodes*), and the water-mites (*Atax*, *Hydrachna*, &c.). The possession of an unsegmented abdomen united to a cephalothorax is an important feature in the mites.

In a small vessel, containing various aquatic animals, I had two specimens of *Hydrachna sulcata* obtained in McKay's Lake, Rockcliffe, in May. On June 24th, my little daughter, a very assiduous observer, called my attention to a granular mass, amongst some green *Confervæ*, which had the appearance of microscopic pellets of a bright scarlet hue. Some were attached to a small twig (fig. 3), and an adult *Hydrachna* was seated upon them, apparently in the act of depositing these minute ova. Later in the day two other masses were laid, some being attached to the floor of the vessel. In all, I counted nearly three hundred eggs, and their brilliant colour was exactly that of the parent *Hydrachna*. After being laid, they remained slightly adhesive, as is the case with so many aquatic eggs, and became firmly cemented to each other and to adjacent objects, when the adhesive coat hardened under water. Each egg was perfectly spherical; but,



where the eggs pressed against each other, slightly flattened facets were formed (fig. 1), a feature noticeable in many other eggs, especially the eggs of certain fishes. In diameter each egg was about $\frac{1}{120}$ of an inch, or slightly larger than the mites' eggs described by Claparède, which were about $\frac{1}{140}$ of an inch in long diameter, the form being ellipsoidal in that case. Claparède states that the eggs may be deposited at all times of the year*, but in the case of this Canadian *Hydrachna* the chief spawning period may be in the warmer summer months.

When examined with a pocket lens, the bright red ball of yolk is seen to be surrounded by a dull whitish envelope, the external shell. Under a higher power, say 200 diameters, the red mass or vitelline globe, which is very opaque and dense, is enclosed by a thin skin or layer (fig. 1, *b*) outside of which is the extremely thick external capsule or shell (fig. 1, *c*). This external shell, which I distinguish as the chorion, is either of great thickness or a wide space separates it from the vitelline globe inside. In the hen's egg the yellow vitelline ball is separated by a wide albumen-filled space from the outer white shell; but the shell itself is thin. Claparède, in the mites' eggs which he describes, speaks of a space between the outer shell (his "Schale" or "Dotterhaut") and the contents inside; but, while he describes a thin layer around the dense yolk-ball, the "Keim-haut," which is not really an egg-membrane at all, but a thin layer of germinal protoplasm, he mentions a third layer or skin, which he distinguishes as the "Zwischenhaut"; and the vitelline ball is thus surrounded by three membranes. The outermost is a true chorion produced not by the yolk but by the epithelial cells of the oviduct, whereas a vitelline membrane or zona radiata is always a product of the vitellus or egg itself. The chorion in the egg of *Hydrachna* is hard like horn and extremely granular in appearance, as though studded all over with grains or minute papillæ, each papilla, under a high power, apparently exhibiting a puncture (fig. 2). I tried various experiments in order to prove the existence of pores or canals in the shell, and of a wide space separating the shell from the yolk-ball inside. I subjected some eggs to great pressure under a cover

* Op. cit., p. 451.

glass in order to force fluid through the pores, or to squeeze the yolk-ball out of its central position ; but neither experiment succeeded, and the capsule repeatedly burst. The yolk poured out as a granular fluid, orange or ochre in tint by transmitted light, and destitute of the large spherules, which Claparède described in his mites' ova. Thus the capsule does not appear to be minutely perforated and no space seems to exist inside the shell, or, if it exist, it must be filled by some dense clear substance of which I saw no indication in ruptured eggs. I think that no space exists, and that the apparent space, around the central yolk-ball, is due to the great thickness of the external capsule. Claparède, I may add, specially refers to a space filled with clear fluid, which he considered had entered through the shell from the surrounding water.

To summarise these points, it may be said that the ovum of *Hydrachna* consists of an opaque globular vitellus, bright red in colour, consisting of minute yolk granules and germinal protoplasm; surrounding this ball is a thin skin or pellicle, and enclosing the whole is a thick horny chorion or shell, dotted all over with external granular projections, but whether or not pierced by radial canals, or pores, is uncertain. Embryonic development appears to be slow, and I cannot in this note give any details, but, like all the spider and mite class, there is no true larval metamorphosis, the newly hatched young resembling, in all essential features, the adult, save for the possession of six instead of eight legs. I have constantly found one of the specimens of *Hydrachna* ensconced near the masses of eggs, as though keeping watch over them. Many spiders show parental care, but I could not decide whether *Hydrachna* exhibited such guardianship or whether the scarlet eggs proved attractive merely on account of their bright colour. The body of *Hydrachna*, about the size of a large pellet, is of a rude oval form, the integument is smooth, soft, and deeply creased with irregular folds. Owing to its ceaselessly active movements, the animal is difficult to study in life, the long attenuated snout being protruded and withdrawn, and the whole body changing shape as though it were a bag of soft jelly. The eight legs (not six as in insects) have a thick fringe of hairs on the

inner side, converting them into effective paddles. At the base of the mouth, projecting like a rostrum, are the two simple ocelli, black eye-spots, one on each side, provided with a thick translucent cornea, a thickening of the integument.

Authorities state that *Hydrachna* has no heart, but that the blood is forced from one part of the body to another by the irregular motions of the alimentary canal and the muscles of the limbs, as the animal is most restless and in constant movement. Breathing is effected by small rudimentary tracheæ, though certain mites breathe by means of the skin. Some of the species allied to *Hydrachna* are parasitic in water-beetles and aquatic Hemiptera, others spend all their lives (young and adult) in fresh-water mussels (*Unio*, &c.). Most of them live in ponds and streams, but others, like *Pontarachna*, are marine. The relationship of these interesting creatures to the true spiders, the scorpions, the false-spiders or "harvest-men," the whale-lice or *Pycnogonidæ*, the Chelifers and the Tardigrades or water-bears, gives importance to any feature in their structure or life history. If, as some authorities hold, *Limulus*, the King-crab, be really an Arachnid, the Hydrachnidæ or water-mites, have very ancient phylogenetic connections.

EXPLANATION OF FIGURE ON PAGE 100.

SCARLET OVA OF THE RED WATER-MITE, *Hydrachna*.

1. Three eggs attached by facets to each other amidst Confervæ × 90.
   a. Scarlet vitellus or yolk-ball.
   b. Thin membrane around the vitellus.
   c. Pitted chorion or egg capsule.
2. Portion of external capsule more highly magnified.
3. Group of eggs attached to twig. Natural size.

A NATURALIST IN THE FROZEN NORTH.

By ANDREW HALKETT.

(Continued from page 86.)

Their return from the south to that vicinity was observed early in April, and one or more were seen at intervals between then and the 20th of that month, by which date they had fairly established themselves, and were afterwards to be seen daily, at any hour, flying about, or alighting on the tops of the iglows. During the long sunlit days those little birds, together with the dogs, longspurs, and horned larks, lent a picturesqueness to the group of iglows, and were thoroughly at home, among the snow and ice, even when the wind was blowing strongly.

The nest of the snow-bird is a substantial structure, composed chiefly of grasses lined with white feathers; those found by me were placed under large stones.

A Red-poll *(Acanthus linaria)* was caught on the deck of the vessel when we were sailing along the Labrador coast, and a specimen shot whilst it was flying about among the snow-buntings near the vessel and iglows at Fullerton.

"When you see one raven you need only look round to discover a second." So said Father Brehm, and maybe his statement is based upon fact. One or two Ravens *(Corvus corax principalis)* had made their abode at Fullerton, and were often to be seen singly or together throughout the winter. Not requiring to be disguised from enemies, nor in order to obtain its food, this bird is a conspicuous object, and its jet black colour amid its white surroundings, is no doubt an advantage to it in finding its mate.

The Horned or Shore Lark *(Otocoris alpestris)* was occasionally seen among the snow-birds at Fullerton, and the Snowy Owl *(Nyctea nyctea)* was occasionally reported to have been seen in that vicinity. This owl is diurnal as well as nocturnal.

Two eggs, from the same nest, of a Falcon *(Falco)* were found at Fullerton on the 5th of July. In one incubation was advanced, the other was rotten.

The Rock Ptarmigan *(Lagopus rupestris)* was repeatedly seen in various stages of plumage. In the white plumage in the months

of December and May, in variegated plumage in September, and in white or variegated in June. It is not easy to understand this, but I speak of what I saw. Ptarmigan were also seen out at sea—off Labrador—early in October, their tails spread out fan-shape in flight, and their plumage was then white.

We must hurry through the birds. That line of the arctic fauna is too great to do anything like justice to in a single lecture.

Shore-birds are numerous. One day a little Sandpiper tried to decoy me away from its nest by feigning to have its wings broken. It would allow me almost to touch it, and then skip away; after which it repeated its tactics. I sat on a rock and patiently watched it until it returned to its nest, which contained four beautiful eggs.

The Red Phalarope (*Crymophilus fulicarius*)—a bird of wide distribution—is well represented and thoroughly at home in our northern waters. With its coot-like feet it swims gracefully about in the ponds, and equals any duck in its ease of movement, a thing shared with other Phalaropes, but otherwise unique among the shore birds. During the summer it was common at Fullerton, but its nest was hard to find.

The Whistling Swan (*Olor columbianus*) was found at Southampton and Hutchen's Goose (*Branta hutchinsii*), and the Lesser Snow Goose or Wavy (*Chen hyperborea*) at Fullerton.

Eiders (*Somateria mollissima*) was very plentiful, and some remained at the floe or open water throughout the winter, and were frequently shot.

The following analysis of the contents of the gizzards of some 20 Eiders may be of interest:—Numerous shells of *Acmæa testudinalis*, numerous fragments of valves of *Tonicella marmorata*, a few shells of *Margarita cinerea*, a number of shells of other small gastropods, a few opercula of a gastropod, egg-capsules of a gastropod, numerous valves of *Crenella*, fragments of valves of various small and medium-sized lamellibranchs, various parts of the shells of *Hyas* and other crustaceans, a few pieces of the arms of an ophiurian, a few bones of a very small teleost, fragments of alga, numerous small stones.

The King Eider (*Somateria spectabilis*) was of rarer occurrence than the common Eider, but was occasionally seen. A male bird

I came across suddenly during one of my walks, resting on the water, and, as it shewed no inclination to get out of the way, I had for a few minutes a splendid view of it.

The Long-tailed Duck, Old Squaw, or Sou-wester (*Clangula hyemalis*) was common at Fullerton, where during the long days it was to be seen at any hour among the fresh water ponds, and to be heard uttering its distinctive cry : *ha-how-wa.*

The nest of this bird is a beautiful object—composed of grass, thickly lined around the sides with down and sunken in the turf. The eggs, which are of a pleasing buff colour when seen in the nest, add to the appearance of the object.

Terns' eggs were brought to the vessel by the natives promiscuously. There is a considerable variation in the markings of the eggs, and they may not all be of the same species, although mostly to be referred to the Arctic Tern (*Sterna paradisæa*), which was the species of tern most commonly seen.

The American Herring Gull (*Larus argentatus smithsonianus*) was to be seen anywhere in the northern part of Hudson Bay, in the Straits, and along the coast of Labrador.

Besides the Herring Gull, several other kinds, notably Jaegers, which may be considered the birds of prey of the Laridæ, or Gulls, were found.

The little Dovekie (*Alle alle*) is one of the most boreal of birds. It was plentiful in Davies Straits, and in the far north, to be seen gregariously in isolated flocks, or singly, flying, diving, or swimming. At Eath, Greenland, it was also seen, flying in flocks high up in the air.

Murres (*Uria lomvia*) were numerous at Coates Island, and all through Hudson Straits. They were doubtless hatching their eggs in the near vicinity to the vessel at Wolstenholme ; but, owing to the ice jam, there was no way of getting near them.

Sea Pigeons (*Cepphus mandtii*) were seen off the coast of Labrador ; in proximity to the low and rugged islands situated at the entrance to French Head Bay ; and at Winchester Inlet. They were quite common at Fullerton, and were occasionally shot at the open water. They were also seen at Beechy Island.

Red-throated Divers (*Urinator lumme*) and Black-throated Divers (*U. arcticus*) were found at Fullerton.

Of Fishes, small Salmonoids were seen jumping at the mouth of the river at Nachvak. The Salmonoids are numerous, at least in individuals of particular species, in the far north, and were frequently caught through openings in the ice at Fullerton. Hundreds of Salmonoids were netted at Pond's Inlet. The stomachs of those were crammed full of amphipods. A small trout was caught with the hand in a stream at Port Burwell. Cod-fish (*Gadus callarias*) were caught with the gigger at Port Burwell, and a number of small Gadoids was found at Fullerton. A specimen of *Lycodes*, and one of *Gymnelis*, were dredged at Port Burwell, and a few specimens of two species of Blennioids at Fullerton. A Sand-launce (*Ammodytes*) was found at Eric Cove, lying on the beach at low tide, out of the water, and was alive, and no doubt was awaiting the return of the tide. Cottoids or Skulpins were numerous, and were the most common of the marine fishes observed. Great numbers of a species of fresh-water Stickleback were found in the ponds at Fullerton. A Basking Shark (*Somniosus microcephalus*) was seen in the hands of the Esquimo at Port Burwell.

Several specimens of Ascidians or Tunicates were dredged. Among them two of *Boltenia*, one at Port Burwell (small), the other at Fullerton (large). The latter is of a red colour, and the stalk is covered with *Spirorbis*, Polyzoans, and a bright pink alga.

The crustacean fauna is very rich ; the sea abounding with cirripedes, amphipods, decapods, and isopods : the fresh waters with copepods and phyllopods.

Swarms of a bright red-coloured copepod of the family Diaptomida exist in fresh water ponds, formed of melted snow, in the barrens at Fullerton ; associated with which are numbers of so called water-fleas and also a species of phyllopod.

These fresh-water crustaceans are probably the modified descendants of primitive kinds which throve in the glacial period; for as G. O. Sars points out, "all the Copepoda pass through some free-living stages, the earliest of which is the well known so called *Nauplian* stage," and, as he clearly demonstrates, "it is easy to believe that the parasitic forms have originally descended from free-living forms," so that "the most primitive characters must be sought for, not among the parasites, but among the free-

living forms." Now these crustaceans, found during the Expedition, are free-living and comparatively highly organized kinds. Furthermore, their occurrence together in the same pond so corresponds with a somewhat similar condition of things which Sars observed in Norway, that I quote what he says: "The only place where I have met with this form [*Diaptomus bacillifer*] is in the farthest north of Norway, at Vardö, Finmark. It occurred here rather abundantly in a shallow tarn situated close to the town. In the same tarn the arctic Phyllopod *Branchinecta paludosa*, was very common, and the water was moreover peopled with large shoals of *Daphnia magna*."

Some conception of the conditions in which those remarkable copepods and phyllopods live and move, may be gathered from the following quotations from my manuscript notes.

"Walked over beyond the first pond, intending to find the opening in the second, but, owing to a blizzard, could not find even the pond. Had on returning to guide myself by the sun which dimly shone through the clouds and snow-drift, and at length saw the house which had been built for the Mounted Police, and so was enabled to make my way back to the vessel. My ears and nose were frozen. These facts are merely introduced because such being the circumstances under which copepods were looked for that day, some of the conditions under which they were to be sought are thus shewn. Of course they were not to be found, but I knew that under the ice they were swimming about as usual." This was on the 11th November.

Of isopods collected were specimens of the Salve Bug (*Æga psora*) found on cod-fish, and specimens belonging to the families Idotheidæ and Arcturidæ. Amphipods were exceedingly numerous at least in individuals, and were found in the sea or along the beach almost anywhere, some of the species being very closely allied. Specimens of Cirripedes or Barnacles, of the genus *Balanus* were found; but the Crustaceans are two numerous and require working out, to say more about them just now.

Of Arachnids, spiders of different kinds and sizes were found, under stones or moving over the ground at Nachvak, Eric Cove, Fullerton, and at North Devon Island. Very tiny arachnids (just perceptible) were found at Beechy Island, where Franklin's monu-

ment is. Small arachnids were found under a stone at Wakeham Bay.

Humble or Bumble Bees (*Bombus*) of two species were seen at Fullerton at the end of June and in July, flying over the rocks or hovering among the flowers of the pinkish red moss-campion (*Silene acaulis*), and specimens obtained.

Diptera, chiefly of the families Culicidæ, Œstridæ and Muscidæ, are numerous and common in the arctics during the short summer. Mosquitoes were very thick and troublesome at Port Burwell, and some were caught with the hand on the deck of the vessel. Specimens of mosquitoes in the larval, pupal, and imago stages were also collected at Fullerton. The large larvæ of a fly which I have named the Tooktoo-fly, infest the flesh of the Caribou. Tooktoo is the natives' name for the Caribou. Small dipterous larvæ were found in a small dead bird at Cape Isabella, Ellesmere Land, and dipterous pupæ in the skull of a cetacean at Port Burwell.

The larvæ of Caddis Flies were found common at the bottom of the fresh-water ponds, where they were readily to be seen, crawling along slowly. They were voracious, and those collected kept eating the phyllopods which I had in the same vessel. Their cases were composed of bits of leaves. A specimen of Caddis Fly (imago) was also found.

Further reference to insects collected may be made to a few diurnal moths and caterpillars, to several species of beetles (including aquatic kinds), and to a curiously modified louse, specimens of which were found on a walrus and on a seal.

The time would fail in any effort to describe the various mollusks, polyzoans, annelids and echinoderms, observed or collected during the expedition. The barest allusion can be made to them.

Pteropods were found, mingled sparingly with medusoids and ctenaphores, moving about near the surface of the sea in harbours; and specimens representative of the two sub-classes, viz : Gymnosomata and Thecosomata, into which those mollusks are divisible, obtained. The species found belonging to the latter named division are popularly known as "black-berries."

(To be continued.)

BOTANICAL NOTES.

THE FRUIT OF EPIGÆA REPENS.—Where it grows, there are few flowers so well known as the deliciously fragrant Mayflower or Trailing Arbutus ; but in collections there are few specimens which are so uncommon as the fruit of this charming plant. During a recent visit to Youghall, New Brunswick, I had leisure to examine some patches of *Epigæa* which were growing in an open wood of Red and White Spruces. That this plant, which is so enormously abundant over tracts of many miles in extent, must mature vast quantities of seed is shown by its very abundance ; for there is perhaps no plant which is so difficult to transplant. Notwithstanding this, I could find only one patch upon which the interesting seed capsules occurred at Youghall. These were in clusters of three to six, in shape turbinate or depressed-globose, roundly five-lobed, glandular bristly, with the pistil in most cases attached and each one surrounded by the pale persistent membranaceous sepals. When ripe, the leathery valves separate at their tips in the centre of the capsule, and gradually curl backwards between the sepals, leaving exposed a central fleshy disk consisting of the five placentæ on the surface of which are the small dark brown, oval, tuberculate seeds so close together as almost to hide the disk.

RARE OTTAWA PLANTS.—On the 1st of July I visited the sand hill on the Rideau River above Hog's Back. In driving along the road after the sand was reached, several plants of *Scrophularia nodosa*, L., var. *Marilandica*, Gr., were found. Close by was a large bed of the beautiful white Convolvulus (*C. spithamæus*, L.) and, farther on, a large patch of *Physalis viscosa*, L. At the top of the sand hill above the river were several large patches of *Monarda fistulosa*, L. This sand deposit itself is of great interest. It is a steep bank running down 100 or more feet to the river and consisting of clean white sand. Dr. Whiteaves tells me that it is the "Saxicava sand," a shallow water marine deposit which immediately overlies the "Leda clay," which is a deep water marine sediment. Perfect specimens of *Saxicava rugosa*, *Macoma Balthica* (formerly called *Tellina grœnlandica*), *Mytilus edulis* and valves of a barnacle, probably *Balanus crenatus* were found.

J. FLETCHER.

NATURE STUDY—No. XXVI.

Field Work at the Ottawa Normal School Summer Course for Teachers.

A. E. Attwood, M.A.

Nature Study was the feature most emphasized at the recent session of the Summer School at Ottawa. During the forenoons two lectures were delivered daily by Dr. J. F. White, Mr. J. H. Putman, Dr. James Fletcher and other members of the Field-Naturalists' Club. The afternoons were devoted to practical field work, the leaders being Dr. J. F. White, Mr. J. H. Putman, Mr. J. F. Sullivan and Mr. A. E. Attwood. The object of this sketch is to record the methods of work and other suggestive features of the daily excursions.

July 4. In spite of the excessively hot weather, over one hundred teachers visited the Arboretum of the Experimental Farm, where they were met by the Director, Dr. Saunders, and the Entomologist and Botanist, Dr. J. Fletcher. After a half-hour's ramble among the trees and shrubs, a halt was made at the coniferous group, where Dr. Saunders gave an interesting address on the evergreens, illustrating his remarks by the specimens at hand. For ornamental purposes he recommended the Colorado Blue Spruce *(Picea pungens glauca)*. He showed how the Norway Spruce *(P. excelsa)* may be identified by its leaves and handsome cones over four inches long. When the teachers had reached the maple group, they were addressed by Dr. Fletcher. He referred to the lack of unanimity among the authorities as to the exact species whose leaf is the emblem of Canada. By breaking twigs of a Norway maple *(Acer platanoides)* he demonstrated the one serious fault of this species for cultivation—its brittleness.

July 5. Serious work was begun at the Britannia outing. The students were divided into four groups, the investigations of each group here and in subsequent excursions being directed by a leader. After a ramble of an hour and a half, all the groups assembled at a place previously selected, where discussions took place and short addresses were given. The subject of trees was considered and the students contributed the following characteristics of an ideal ornamental tree: hardiness and ease of culture; freedom from insect pests; beauty of foliage and symmetry of contour; beauty and abundance of bloom; and usefulness of fruit.

July 6. A profitable afternoon was spent at Rockcliffe. The leaders discussed trees, and the following species were recommended for ornamental purposes in school gardens: Wier's Cut-leaved Maple, Schwedler's Norway Maple, Sugar Maple, Ameri-

can Elm, Cut-leaved Birch, the Rowan trees, White Pine, Norway Spruce, and several varieties of the American Arbor-vitæ or White Cedar. Ten minutes was spent in guessing the plants and animals described in a number of poetical selections read by one of the leaders, the object being to endeavour to appreciate the spirit of the poets in their interpretation of nature

July 7. For illustrations in physical geography, no better region can be found than the vicinity of McKay's lake. On one side is a bank of marl which time and great pressure would convert into limestone. An inquisitive student plunged his magnet into the sand and was surprised to see minute particles of magnetite adhering to it. Some apparently clear water was collected in a bottle from one of the inflowing streams. After allowing it to stand, a distinct sediment was observable : thus was demonstrated one of the agencies tending to the obliteration of lakes. Evidence of the other agency was seen in the gorge cut by the outflowing water through the barrier which separates the lake from the Ottawa river. The exploration of this outlet is full of interest; at and near its mouth are to be seen examples of a canyon, a bay, a delta, a cape, a river, a mountain.

July 10. The teachers took advantage of the invitation of Mr. J. B. Lewis to see his magnificent collection of shrubs and flowering perennials, which have been brought from all parts of the world regardless of expense. The collections of Rhododendrons and Delphiniums were particularly admired.

July 11. The peninsula north of the Little Chaudière rapids was the field investigated. The Red Cedar *(Juniperus Virginiana)* was the most interesting tree observed, and it was gratifying to have evidence of the development of observing powers in the assertions of several of the students that the red cedar resembles a juniper rather than the so-called White Cedar *(Thuya occidentalis)*. Dr. H. M. Ami was present and gave an address pointing out to the teachers illustrations of tilting, outcrop, stratification, syncline, anticline, etc., in the Trenton limestone.

July 12. The Seed Division of the Department of Agriculture was visited, where there was an opportunity of seeing a systematic application of Nature Study. The objects and methods of this Division were explained in a lucid manner by Mr. G. H. Clarke and Mr. L. H. Newman. The teachers were much impressed with the value of careful seed breeding when they were informed that recently a single ear of Indian corn, the product of 56 years of intelligent selection, was sold for $11.

July 13. Two hours were spent in company with the aristocracy of plants in the garden of Mr. R. B. Whyte. The stately beauty of *Lilium candidum* was especially attractive to the ladies. Mr. Whyte's magnificent collection of Poppies was much admired.

Speaking in favour of having a garden, Mr. Whyte said that it gives occasion for the most healthful exercise ; that it provides a constant source of pleasure in experimenting with new varieties, and that the exhilaration experienced in originating a valuable new variety was in itself an adequate reward for many years of labour. In this connection Mr. Whyte's two greatest triumphs are the Bresaya gladiolus and the Herbert raspberry.

July 14. The swamp and spring in Beechwood were the chief centres of interest. Specimens of Sphagnum or peat moss were examined. It was characterized as the vegetable equivalent of the coral animal, both forming enormous deposits by living and growing at the top, while dying and consolidating below, rising "on stepping-stones of their dead selves to higher things." A frog was made the subject of examination. In contrast with the the human being, several interesting points were observed ; the absence of an external ear, the tympanic membrane being continuous with the skin ; the manner of breathing by working the throat muscles, which function as a diaphragm ; and the winking of the eye by movement of the lower lid. The death of the frog due to the drying of its skin by being held in the hand, showed that the skin acts as a subsidiary organ of respiration only when it is kept moist.

July 17. The forest belts of the Experimental Farm were visited. Dr. Saunders explained that in one part the different species of trees are mixed, while at another part there are groups of trees of the same species. Insects and fungus attacks are naturally more severe in the latter arrangement. He characterized the white pine as a tree which bears the same relation to the lumberman as the apple-tree does to the horticulturist

July 18. At Blueberry Point the Jack Pine *(Pinus Banksiana)* was undoubtedly the tree that attracted most attention. It was remarked that the teachers were more interested in becoming acquainted with a native tree than with the foreigners represented at the Experimental Farm. At the daily conference at the close of the ramble, as a sequel to the lecture of the morning on "A Flower Garden," a discussion was held as to the characteristics of an ideal flowering plant. The following were contributed : abundance of bloom, suitability for cutting, length of blooming season, beauty and variety of bloom, intensity and purity of colour, delicacy of perfume, beauty of foliage, symmetry of contour, and ease of cultivation.

July 19. As a logical sequence to the talk on Minerals in the forenoon, it was decided to visit the Geological Survey Museum, where an opportunity was given to become better acquainted with the twenty minerals introduced in the morning. The cabinet of precious stones was a great attraction, and the specimens were

examined with an intelligent appreciation which would have been impossible without the previous hour's class discussion. Many questions were asked regarding the fine specimen of meteoric iron. After having seen a real meteorite, the teachers will doubtless satisfy their curiosity by reading up the subject of meteors at their earliest opportunity. Dr. Ami gave a short informal talk to the teachers in which he showed the value of a study of fossils in their assisting to determine whether or not valuable minerals might be found in a given rock formation.

July 20. The little creek east of Britannia was explored for about one mile of its course. Near the mouth was seen the swampy immature flood-plain, while further up-stream an excellent crop was growing on a developed flood-plain. On the outer part of a curve in the stream the bank was much eroded while nearly opposite was observed the usually accompanying sand-bar. It was suggested that the students should teach their pupils to test the fall of a stream by using crossed stakes and a spirit level. A series of miniature rapids was obliterated by moving the stones, and the effect in lowering the surface of the water was readily noticed. The opposite phenomenon was illustrated by referring to Patterson's Creek, part of whose basin is drowned land, due to the backing up of the water by the filling of Rideau Canal.

July 21. Delightful weather, surroundings and addresses characterized the final outing of the Summer School. The rendezvous was near the residence of the Director of the Experimental Farm. Dr. Charles Saunders showed the method of artificial cross-fertilization by using flowers of two different varieties of lily. From this he passed to the cross-fertilization of two varieties of wheat. In breeding wheat three objects are kept in view; earliness in maturing, abundance of yield and quality of flour.

Prof. Saunders showed specimens of a great many different species of oaks. As in the pines, the time required to mature the seed varies from one to two years. The *black* oaks in this particular are *biennial* and are characterized by having *bristles* on the of the leaves, easily remembered by the three initial *b*s.

Mr. Alex. McNeill, Chief of the Fruit Division of the Department of Agriculture, gave a demonstration of two methods of grafting. He recommended for Nature Study work the use of a jeweller's magnifying glass, which permits both hands to be free for purposes of manipulation and one eye for gross observation.

Dr. J. C. Glashan quoted the nursery rhyme, "Pussy-cat, pussy-cat, where have you been," etc., to illustrate that the nature of the objects seen depends upon the nature of the observer. He emphasized the importance to the teacher of the highest of nature studies—the study of the child.

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A NATURALIST IN THE FROZEN NORTH.

By ANDREW HALKETT.

(Continued from page 109.)

Of Gastropods may be mentioned Periwinkles *(Littorina palliata)*, Whelks *(Buccinum)*, and the egg-capsules of Whelks, Limpets *(Acmæa testudinalis)* found in the gizzards of Eiders and, at the shore at low-tide, valves of Chitons *(Tonicella marmorea)*, also found in the gizzards of Eiders, and certain Nudibranchs.

Of bivalve mollusks, Cockles *(Cardium islandicum)*, and specimens of various species which bear no English names, were dredged, and dried valves of Mussels *(Mytilus edulis)* were found lying on the ground at Wakeham Bay.

Fragments of a few species of Polyzoans were dredged.

Of Annelids, certain specimens were collected in muck at Fullerton. The tubes of those worms and the worms themselves are beautiful objects of exquisite pattern. The tubes are shaped like the shell of *Dentalium*, and are composed of very fine grains of quartz or other substances of an archaic nature, which the annelids skilfully cement together. Specimens of *Spirorbis* were found on sea-weed, shells, etc., and numerous annelids were dredged. Mention may also be made of fresh-water annelids, including a very small kind of leech, collected at Fullerton.

Of Echinoderms, Sea Urchins *(Strongylocentrotus drobachiensis)*, a few Star-fishes of the genera *Solaster* and *Crossaster*, and Sea Cucumbers *(Pentacta)* were found among sea-weed at the beach at Port Leopold, North Summerset. A few tiny specimens of typical Star-fishes *(Asterias)*, specimens of Brittle- or Serpent-

stars (*Ophioglypa*), and numerous specimens of Sea Cucumbers (*Psolus phantopus*) were dredged at Port Burwell.

The Cœlenterates seen and examined embraced Hydrozoans, Anemones and Ctenophores. The Hydrozoans and Ctenophores (which on this occasion may be considered together) of the northern seas are of exquisite shape and colouring. They are extremely delicate organisms, yet so constructed as to live and thrive in the sea. Once removed from that element, however, their fragility defies any way of well preserving them as specimens. Some were of mushroom or umbrella shape; others like bells, and were of the most beautiful blues and pinks, or of opaline or soft yellowish colour. Others again were transparent and colourless, and appeared like water bubbles.

In size the Medusoid kinds range from over a foot across the disc to that of less than a small thimble, and I had frequent occasion to examine the smaller ones close at hand, by scooping them up with a small net and placing them alive in a glass vessel containing sea-water.

Medusoids were observed at Black Tickle, Labrador; at Port Burwell, Ungava ; at Cumberland Sound, Baffin Land ; at Fullerton, Keewatin; and at Chesterfield Inlet. I saw some large ones at Port Burwell, one of which was more than a foot across the disc. In colour those were magenta with transparent borders.

The phosphorescence of the sea in the Hudson Bay is not such an imposing spectacle as I have seen that phenomenon in the Behring Sea ; nevertheless, where the Cœlenterates were numerous, on dark nights, the sea appeared at places near by as if beset with twinkling stars. Doubtless, small crustaceans, notably amphipods, also contributed to this phenomenon. I experimented with some of the ctenophore cœlenterates, by placing them in glass vessels containing salt water, in the dark in my cabin, and discovered the luminosity to proceed from the vibratile cilia which are located, in eight rows, at regular intervals adown the sides.

The Ctenophores were particularly fragile, so that it was impossible indefinitely to preserve any specimens. This very fragility, however, led to observations which may prove to be of some consequence. On removing them from the scoop-net and

placing them in a vessel containing sea-water they would usually break up into fragments, some of which would afterwards form themselves into revolving little wheels with cilia, which gave me the impression that the particles were starting on a new round of existence as separate individual organisms; and were there facilities at some subsequent time for observing their strange evolutions, I am of the opinion that light might be thrown on modes of reproduction concerning this and perhaps of other allied groups of the Cœlenterates. But this fact itself, so far as observed, requires to be mentioned with caution, unless it be a matter which has already, unknown to me, engaged the attention of biologists.

Ornithologists who would like to know more about birds of the Frozen North region visited by Mr. Halkett, are referred to a special article on the subject by the Rev. C. W. G. Eifrig, in *The Auk*, for July last, pp. 233-241, entitled: "Ornithological Results of the Canadian 'Neptune' Expedition to Hudson Bay and Northward, 1903-1904."

STHENOPIS (HEPIALUS) THULE, STRECKER, AT OTTAWA.

By ARTHUR GIBSON, Central Experimental Farm, Ottawa.

The discovery of this rare and extremely local moth at Ottawa during the past season is very remarkable. The only known definite locality of this insect, as far as we know, is Montreal, Canada, where the moths in some years are taken not uncommonly. The presence, therefore, of the species at Ottawa is most interesting and worthy of special notice.

On the 6th July, 1905, Dr. Fletcher, Mr. J. W. Baldwin and the writer spent the evening collecting moths around the electric lights close to the entrance to the Experimental Farm. The night was a rather good one for the purpose, and it was a little late when Mr. Baldwin and I started in to the city, for our respective homes. At the southern end of LeBreton Street, where there is an electric light, we stopped for a moment, and, just as we did so, I noticed a large moth fly quickly past and settle on the road a short distance away. A few seconds later it was safe

within my cyanide bottle, and naturally I was rather excited when I saw that it was *Sthenopis thule*, the first specimen which had ever been taken in the Ottawa district.

The specimen, a female, was in perfect condition, and had evidently only emerged from the pupa a short time previously. In colour it was a beautiful primrose yellow, the reddish brown along the costa and the spots of the same colour on the primaries, being well defined. With the wings expanded it measures 3⅛ inches. The time of capture, viz., 11.35 p.m., seems rather unusual. In an article on the occurrence of the species at Montreal,* Mr. H. H. Lyman says :

"The species seems to fly only for about fifteen to twenty minutes in the twilight, as I have never taken it before ten minutes past eight, nor ever after half past eight."

Since capture, the wings of the above mentioned specimen have lost some of the bright yellow colour ; but this, Mr. Lyman tells us, is peculiar to the species, as, in the cabinet, specimens soon fade and lose their original yellow colour.

The following evening, the 7th July, I again had the good fortune to observe the species. At this time it was along the road at the northern end of Dow's Lake, but a short distance from where the first specimen was seen. About 8.30 p.m. I was walking along this road to the Farm to meet Dr. Fletcher, when I saw a male specimen of *thule* flying rapidly up and down, near a tall cedar tree, in the peculiar oscillating manner of the species. I watched it flying thus for several minutes, when suddenly a female flew along and settled near the end of a twig of the same tree. The male immediately flew around her, and in a very short time copulation took place. I observed them further for some little time, and thought by giving the tree a sudden jar that they would fall and I could capture them. The jarring, of course, disturbed them; but, as it was getting dark, I failed to see whether they fell to the ground or flew away.

Search was made for further specimens on following evenings, by both Dr. Fletcher and the writer, but without results.

*Canadian Entomologist, vol. xxv, Dec. 1893.

BIRD MIGRATION, 1904.

OBSERVATIONS MADE AT SABLE ISLAND, NOVA SCOTIA.

By JAMES BOUTEILLER, Sable Island.

Name of Species.	When First Seen.	Number Seen.
Shore Lark	January 21	In numbers.
Redpoll	February 7	In a flock.
Sanderling	March 4	A flock.
American Robin	,, 20	Two.
Slate-coloured Junco	,, 20	One.
Fox Sparrow	,, 20	Two.
Song Sparrow	,, 20	In numbers.
American Crow	,, 20	Several.
Blackbird	,, 25	One.
Gannet*	April 5	In numbers.
American Robin	,, 12	In numbers.
Yellow-crowned N. Heron	,, 13	One.
Slate-coloured Junco	,, 17	In numbers.
Fox Sparrow	,, 17	In numbers.
Red-winged Blackbird	,, 20	One.
House Sparrow	,, 22	One.
Terns, Common and Arctic	,, 26	A few.
Semi-palmated R. Plover	,, 26	Several.
Yellow-legs	May 5	One.
Crow	,, 7	One.
Least Sandpiper	,, 8	In numbers.
White-throated Sparrow	,, 13	Several.
Black-bellied Plover	,, 13	One.
Roseate Tern	,, 15	In numbers.
Nuthatch	,, 16	One.
Spotted Sandpiper	,, 21	One.
Black-bellied Plover	,, 22	Three.
Yellow-legs	,, 22	Four or five.
Swallows	,, 22	Four.
Semi-palmated Sandpiper	,, 23	One.

* On north side ot the island.

Two House Sparrows, here since autumn, left about April 1st.

Name of Species.	When First Seen.	Number Seen.
Ovenbird	May 25	One.
American Crow	,, 25	Two.
Red Phalarope	,, 25	In a flock.
Black-bellied Plover	,, 25	Six.
Spotted Sandpiper	,, 25	In numbers.
Magnolia Warbler	,, 25	One.
Belted Kingfisher	,, 25	One.
Hermit Thrush	,, 25	In numbers.
Turnstone Plover	,, 25	One.
Black-bellied Warbler	,, 26	One.
Piping Plover	,, 29	In numbers.
Yellow Warbler	June 4	One.
Pine Siskin	,, 7	One.
Pine Warbler	,, 8	One.
Yellow-legs	,, 8	Two.
Yellow-bellied Flycatcher	,, 8	Several.
Barn Swallow	,, 8	Several.
American Crossbill	,, 20	One.
Wilson's Snipe	July 10	Nine.
Yellow-legs	,, 10	One.
Turnstone Plover	August 3	In numbers.
Greater Yellow-legs	,, 3	In numbers.
Semi-palmated Sandpiper	,, 3	In numbers.
White-rumped Sandpiper	,, 3	In numbers.
Black-bellied Plover	,, 3	In numbers.
Yellow Warbler	,, 3	One.
Kittiwake	,, 3	One.
Black-bellied Cuckoo	,, 5	One.
Lesser Yellow-legs	,, 5	In numbers.
Solitary Sandpiper	,, 5	In numbers.
Great Blue Heron	,, 5	One.
Black and White Warbler	,, 20	One.
Purple Martin	,, 20	In numbers.
Various kinds of Swallows	,, 20	In numbers.

ONTARIO ORNITHOLOGICAL NOTES : WINTER 1904-05.

By A. B. KLUGH, Sec'y. Wellington F.-Nat. Club, Guelph, Ont.

Ornithologically considered, the past winter has not been without its interesting episodes.

On December 30, during a snowstorm, a Horned Grebe lit in a snowdrift in Guelph. One foot appeared to have been frozen, but the bird seemed otherwise all right. It was placed in a large case with a pan of water and fed on fish, which it consumed readily; but it died the next day.

Great Black-backed Gulls have been seen throughout the winter at Toronto by Mr. S. Hunter.

Herring Gulls, though seen on the Great Lakes, have not wandered inland as much as usual.

American Mergansers wintered in some numbers on the Thames at London and a few on the Speed at Guelph.

A Mallard was taken at Wingham on February 12, and two Black Ducks were seen at the mouth of a small creek near Penetanguishene by Mr. A. F. Young on February 8.

A Scaup Duck was taken at Penetanguishene on December 5.

Old-squaw Ducks wintered at Toronto, and American Golden-eyes at Toronto and London.

An adult female Black-crowned Night Heron was shot in an orchard near Woodstock on December 24, and was given to Mr. W. D. Hobson of that city.

A Cooper's Hawk was seen by Mr. S. Beattie at Guelph on January 20, and by others on January 28 and February 7.

A Bald Eagle was seen by Mr. W. E. Saunders at London on February 4, and one was shot near Woodstock on March 11 and examined by Mr. W. D. Hobson.

An American Sparrow Hawk was seen at Guelph in February by Mr. A. A. Davidson.

Three Snowy Owls were shot in Frontenac and Leeds counties and sent to the taxidermist in Kingston, one was taken at Brampton in December, and one at Guelph on February 26.

An Arctic Three-toed Woodpeckper was seen at Penetan-

guishene on December 3, and another on February 17 by Mr. A. F. Young; two were seen at Millbrook on December 31 by Mr. S. Hunter, and one taken on February 21 at Alma by Mr. E. Gale.

A Red-headed Woodpecker was seen at Toronto on February 23 by Mr. S. Hunter.

Canada Jays were seen between October 7 and December 31 at the following places: Madoc, Penetanguishene, Napanee, Acton, Toronto, Hillsburg, Rockwood, Guelph, Killean, Galt, Kingston and Millbrook.

A Bronze Grackle was noted as wintering at Kingston by Dr. C. K. Clarke, and a Meadowlark at Guelph by Mr. E. J. Colgate.

Purple Finches wintered in large numbers at Guelph, and were also seen throughout the winter at Alma by Mr. J. Allan, Jr., at Toronto on February 13, 16, 20 and 28 by Mr. S. Hunter, at Penetanguishene on February 17 by Mr. A. F. Young, and at London on February 27 by the writer.

A flock of White-winged Crossbills was seen at Guelph on January 2 by Mr. L. Beattie.

American Crossbills were seen at Woodstock, by Mr. W. D. Hobson, and at Guelph by Mr. F. N. Beattie.

Redpolls appear to have been common only at Penetanguishene; they have been seen also at Madoc by Mr. C. J. Young, and at Guelph, but at the latter place not since October.

The American Goldfinch has wintered in rather larger numbers than usual at Guelph, and has also wintered at Alma, where specimens were noted by Mr. J. Allan, Jr., and at Madoc, where others were seen by Mr. C. J. Young.

Pine Siskins have been noted at Penetanguishene, Alma and Woodstock, and have been very abundant at Guelph.

Snowflakes arrived early and have been seen throughout the winter at various points.

Tree Sparrows have been scarce; they have been noted at London, Alma and Guelph, but only in small numbers.

Cedar Wax-wings were noted by Mr. S. Hunter at Toronto on January 5, 6 and 24; two were seen at Guelph on February 1 by Mr. W. Holliday; 36 at London on February 26 by Mr. W. E Saunders, and 16 at Galt by Mr. W. Herriot on February 5.

A Northern Shrike was seen at Guelph on November 3, and several were seen throughout the winter at Woodstock by Mr. W. D. Hobson and at Alma by Mr. J. Allan, Jr.

Brown Creepers were very common at Guelph during the early part of the winter, and Golden-crowned Kinglets have been fairly common throughout the winter.

An American Robin wintered at Mount Forest, where it was seen by Mr. Howard Skales, one at Port Albert, one at Kingston, where it was noted by Dr. C. K Clarke, and three at Guelph, where they were seen by Mr. E. J. Colgate.

A FEW NOTES ON THE FAUNA AND CLIMATE OF THE LIÈVRE RIVER.

By E. E. LEMIEUX.

The following notes are an extract from my report for 1904 as secretary-treasurer to the Matabi Fish & Game Club, respecting a few observations made on the preserves of that Club during the last two weeks of November, 1904. These preserves are situated some 90 miles up the Lièvre River (P. Q.), or 10 miles farther north than Notre Dame du Laus, and 7 miles on the east of the river.

BIRD LIFE.—The birds noticed around the club house during the last two weeks of November were: Chickadees, ravens, owls, blue jays, magpies, sparrows (near the last farmer's house), cherry-birds, and for the first time at such a late season quite a number of wild canaries near the club house.

BEASTS OF PREY.—Wolves are reported quite plentiful around Whitefish Lake, but not on the club's preserves. I have seen no indications of them during 1903 and 1904, although I travelled the bush to a great extent during the last two weeks of November, when snow was on the ground. Bear tracks, however, were quite plentiful. Two were killed in October, 1904.

METEOROLOGY.—Temperature: maximum, 41° for two days; lowest, 6° above zero; mean temperature, 27° to 28°. At same period, in 1903, the mean temperature was 5° to 6° degrees lower; the lowest point reached was 3° below zero.

ICE ON THE LAKES.—These lakes (which contain speckled trout

only) are to a great extent fed by natural springs from the mountains around and from the bottom of the lakes themselves; consequently, when the ice forms, it is of very uneven thickness, and is therefore dangerous to travel on. I have noticed that the ice formed at certain parts of the Pembina Lake would all melt away within 48 hours, although the weather kept much below freezing point.

The ice forms on Pembina Lake, usually, between the 15th and 20th November. It is a very few days earlier in small surrounding lakes. I have no personal accurate data as to when the ice breaks up in the spring. These lakes being land-locked and surrounded by high mountains, the ice becomes gradually honeycombed by the sun, and I have been told that even in the first days of May the waters are not entirely clear of ice.

April, 1905.

WHY OUR FIELD AND ROADSIDE WEEDS ARE INTRODUCED SPECIES.

W. T. MACOUN.

A few years ago an Englishman was visiting Canada and, being observant, though not a botanist, was struck, when going about the cities and towns and along the country roads, by the similarity between the wild flowers he saw in Canada and those in the Old Country.* "How is it," he said to a well known Canadian botanist, "that, separated as we are by nearly 3,000 miles of water, Canadian flowers are just the same as those at home?" "You do not see Canadian flowers," said the botanist; "you see your own species which have been introduced into this country and become weeds, as many of them are with you.

* For instance, the following twenty-four well known common weeds are all introduced species:—Buttercup, Charlock, Shepherd's-purse, Penny-cress, St. John's-wort, Cockle, Chickweed, Purslane, Mallow, Purple-tufted Vetch, Mayweed, Yarrow, Ox-eye Daisy, Groundsel, Canada Thistle (which in spite of its name is a European plant), Chicory, Dandelion, Sow-thistle, Viper's-bugloss, Bindweed, Mullein, Toad-flax, Heal-all and Plantain.

If you wish to see Canadian wild flowers, you must go to our woods or along our streams, where you will find many beautiful species quite unknown to you."

The fact that practically all the weeds seen growing in vacant lots, along roadsides, in cultivated and uncultivated fields in Ontario and some of the other provinces, are introduced species, is known to botanists ; but the reason why these introduced plants should become weeds and our own should not, is not, we think, so generally known or thought of.

At a meeting of the Botanical Branch of the Ottawa Field-Naturalists' Club held last winter, Prof. John Macoun explained the matter to everyone's satisfaction. Ontario and other parts of Canada were heavily wooded before the settler came and the native plants grew in the woods, along the rivers' banks or in the marshes. When the woods were cleared away, the conditions were not favorable to the woodland species and they disappeared; but in their stead are found the weeds introduced from Great Britain and Europe, where for centuries they have been growing in field, in hedgerow, and along the roadside. These, finding suitable conditions, have multiplied with great rapidity in Canada.

It would be an interesting study for the botanists of the Ottawa Field-Naturalists' Club to determine how many, and which, of the bad weeds of Canada are native. The list would, we know, be found very small.

BOTANICAL BRANCH.

A regular meeting of the Botanical Club was held at Mr. R. B. Whyte's, on March 10th. Mr. Whyte gave a brief account of a recent visit to the New York Botanical Garden at Bronx Park, New York. He was much impressed by the extent of the collection of plants, and the great size and luxuriant growth of the palms, most of which were grown in large boxes, about five feet square. As an instance, he mentioned a Banana in fruit twenty-two months old, that was twenty-two feet high, with leaves fourteen feet long. A very large collection of Cacti was also referred to, and the information obtained from the horticulturist, that

most growers erred in keeping their Cacti too dry. While these plants require but little moisture in the dormant season, it is still quite possible to keep them too dry.

The Bronx Park Orchid house was also referred to, and the names given of a few kinds that were easily grown in any amateur greenhouse, such as *Cœlogyne cristata*, *Cypripedium insigne*, *Bletia hyacinthina*, *Phaius grandiflorus*, etc. In the forcing house was a large collection of seedlings in pots of *Œnothera biennis* grown to illustrate Dr. Hugo de Vries's theory of mutations, which had been discussed by the Club at the previous meeting. Nothing was observed or learnt by Mr. Whyte about them to change the opinion he had held, in the first place, that there was nothing in these mutations to justify the prominence that had been given to them, and, secondly, that the variations were varietal and not specific.

As a subject for discussion, Mr. Whyte introduced the question of the relative value of artificial cross-fertilization versus natural cross-fertilization. He maintained that, while there was a great future for artificial fertilization and much had already been attained by it, still we should not lose sight of the fact that more than nine-tenths of our apples, peaches, pears, plums, grapes, currants and gooseberries were the product of natural crossing. Though accidental seedlings, when valuable, had been selected and propagated by the skill of the horticulturist, he held that natural crosses would continue to be the principal source of improvement, on account of the great number of these crosses compared with the very small number of successful artificial crosses ; also that it was only by slow advances that permanent improvement could be expected when the cross is violent, as from different species, as in Roger's grapes the progeny are apt to be deficient in vigor. Mr. Whyte illustrated his remarks with his own experiences in raising new varieties of raspberries, gladiolus and poppies. R. B. W.

ANNOUNCEMENT.—Mrs. Agnes Chamberlin, Lakefield, Ont., is now receiving subscriptions ($1.50) for copies of the new valuable book by the well known author of several delighfful volumes on nature, Mrs. C. P. Traill : "Studies of Plant Lile in Canada" —like the former works beautifully illustrated by Mrs. Chamberlin. To be out this autumn.

NATURE STUDY—No. XXVII.

OTTAWA SUMMER SCHOOL FOR TEACHERS.

J. H. PUTMAN.

The first Summer School held in Ottawa closed on July 31st after a most successful three weeks' course. The work of organization was entrusted by the Department of Education to Dr. J. F. White, Principal of the Normal School. Early in May Dr. White sent circulars to the teachers and inspectors of Eastern Ontario, giving an outline of the work and specifying four courses, viz :— Nature Study, Art, Manual Training and Domestic Science.

About 160 students were enrolled; and, while the larger number came from Eastern Ontario, other parts were represented, several coming from Peterboro', London, Stratford, Brantford, and other western points.

A most interesting feature of the attendance was that some ninety of the students were teaching sisters from the various convents of Eastern Ontario. If the enthusiasm shown by these ladies at the Summer School is a fair criterion by which to judge their work, then it may safely be said that the Separate Schools of Ontario have many earnest and capable teachers. Their attendance also showed that they are only too ready to make sacrifices in order to keep fully abreast with the requirements of the most advanced curriculum.

Inspector Cowley was present at the opening and gave many valuable suggestions on the aims of Nature Study. Mr. Cowley's well-known interest in Nature Study and his success in introducing such work into the schools under his charge, made his hearers feel that he spoke as one sure of the facts.

As the OTTAWA NATURALIST is most closely in touch with the Nature Study work, this article will deal especially with that phase of the Summer School.

Principal White gave six lectures on Physical Geography. The aim of these was to present in a simple manner how the Earth has been changed from pre-historic times down to the present, to call attention to changes that are now going on, and by induction to infer the changes that will come in the future. Special emphasis was laid upon the agency of rivers and streams in depositing soil

and giving the Earth its present diversified form of rounded hills, precipitous gorges, low lying valleys and rich alluvial flood plains. The evolution of lakes, springs, deltas, coal-beds, oil-fields and gas reservoirs was treated in simple, yet comprehensive, manner. Soils, their formation, composition and possibilities was another special feature. These lectures, coupled with the practical field work given the class by Dr. White, cannot fail to make Physical Geography a more interesting department of Nature Study to those students who followed the course.

Dr. James Fletcher, of Ottawa, gave two lectures on Canadian birds, and two on insects. Not always is a great naturalist a good teacher, but it was the unanimous voice of the Summer School that Dr. Fletcher is both. His unbounded enthusiasm carried him over every difficulty. His homely apt illustrations made scientific facts as simple as the multiplication table. His natural methods of classification and his skill in using common terms instead of technical ones, show him to have the essentials of the "Kindergarten" method. Dr. Fletcher laid especial emphasis upon the economic side of bird and insect study. A loving sympathy with nature is the key-note of Dr. Fletcher's philosophy.

Principal Attwood, of the Waller Street School, gave two interesting and practical lectures on minerals. He led his class to form for themselves a very concise working definition of what is meant by a mineral. He suggested several natural methods of classifying minerals and added very much to the clearness of his explanations by concrete illustrations. Perhaps one of the most striking features of his lectures was his practical illustration of how each mineral may be identified by its stain, when powdered and smeared over paper. The two lectures on minerals convinced the students that mineralogy offers an inviting field for Nature Study, which may be used with advantage to broaden the minds of pupils in our elementary schools.

To the writer was assigned the work in Botany and Nature Study Aims and Methods with children. Whether rightly or wrongly, the Botany purposely got the lion's share of attention. A method is a part of each individual teacher: it is his ideal way of doing a thing; it is part and parcel of himself. Let him know a thing thoroughly, let him have a reverent love for its spiritual significance, let him know something of the child to whom the truth is to be imparted, and the method will take care of itself. With this as a pedagogical creed, it was felt that the most important work was to foster a love for plant life by giving the maximum of instruction about plants.

All educators recognize that, in order to do any work well, the teacher must be inspired; but so often we forget that true and

permanent inspiration can come only through knowledge. It would be pessimistic and uncharitable to hold that no good work in Nature Study can be done by teachers who are not scientists ; it would be insanely optimistic to hold that we can ever do the best work in Nature Study until we have a corps of teachers who have done enough work in science to catch the scientific spirit. Nature Study for elementary schools and natural science may be very different things--indeed they are different--but their difference is a difference in method, in spirit, in point of approach, in quantum, in continuity, in intensity, in purpose, rather than a difference in knowledge demanded of the teacher.

Only those who have tried to map out a course in Botany that will have some organic significance and yet be comprised in a dozen lessons, know the difficulties that meet a teacher in planning a course for a Summer School. The course followed at the Ottawa school comprised Germination, Roots, Stems and Buds, Leaves the Plants' Stomach, Plants and Insects, Plant Societies, Plants and their Environment, Monocotyledons and Dicotyledons, Plant Structure, Seed Dispersal and A Flower Garden. These subjects served as centres round which it was possible to group the most elementary and essential facts about the way plants live and the work they do.

It had constantly to be kept in mind that a summer class is made up of students having widely varying information of plant life. Some have a fair knowledge of elementary botany, others know almost nothing of the subject. Under such circumstances only one line of action was possible—to begin at the bottom. The growth of a plant, like the life of a human being, is in its way an epic. This epic may, like the story of the Prodigal Son, be told in a hundred ways, and yet every one of the hundred may embody all that is essential.

Germination was illustrated by a series of experiments. Three weeks previous to the lesson, germinating cases were prepared. Each of these consisted of two pieces of glass 16 in. x 5 in. with a layer of moistened cotton wool between. Just under the upper glass a layer of black cloth was stretched over the cotton. Then each day a single seed was inserted between the glass and the dark cloth. The moistened cotton behind the seed supplied the water. As the germinating seed was between the glass and the black cloth, the whole process was plainly visible. At the end of fifteen days the story of the germination of every seed under observation was told in fifteen chapters of twenty-four hours each. Experiments of this kind were made with peas, beans, scarlet runners, barley, Indian corn, flax, vetch, white lupin, radish and Boston Ivy. This selection gave an opportunity to observe seeds of slow germination and seeds of rapid germination, seeds with one

cotyledon and seeds with two, seeds whose cotyledons were raised above the soil and seeds whose cotyledons remained below the soil, seeds sending out tap roots and seeds with fibrous rootlets.

Small sheets of glass and seeds were supplied the students in order that each might make some experiments at home. One result of these home experiments was reported, that has a peculiar interest and that illustrates the inherent possibilities of Nature Study. A middle-aged business man who saw a student's experiments, became so fascinated that he began work for himself and was still carrying on his studies with seeds when the Summer School closed.

Every lesson in Botany was illustrated as far as possible with lantern slides. The students were unanimous in their opinion that these were of great service in making clear the lectures. Sometimes not more than three or four slides were used during a lesson. The educational value of lantern slides with either children or adults is often inversely proportional to the number used.

An interesting lecture was given by Dr. H. M. Ami on ferns. The lesson was introduced by a reference to the classification of ferns illustrated by beautiful specimens. Dr. Ami then gave the students an opportunity to examine the reproductive organs of ferns under a high-power microscope.

An inspiring address was given by Prof. Robertson on the Manual Training and Nature Study Schools organized under the Macdonald Fund. Several students determined to take a thorough course in Nature Study when the College at Ste. Anne de Bellevue shall be ready to give them a welcome.

A very profitable lecture was given by Prof. Prince, of the Fisheries Department, on Fish Life. It was superbly illustrated and delivered in a most pleasing manner by a man who has given the greater part of his life to this one subject, and whose opportunities for studying fish habits have been unrivalled.

On the whole, although a course of three weeks has many limitations, it has some possibilities. The chief of these is the giving of an intelligent and rational inspiration.

The great success of the Ottawa Summer School this year was undoubtedly due to the great care with which all arrangements were made by Dr. White and Mr. Putman, not only for the instruction of the visitors but for their comfort in every way. All in attendance felt that. The constant patience and courtesy of these gentlemen and of Mr. Attwood, as well as the vast amount of useful and helpful knowledge imparted, made what was undoubtedly a period of hard work also a pleasant holiday.—NATURE STUDY EDITOR.

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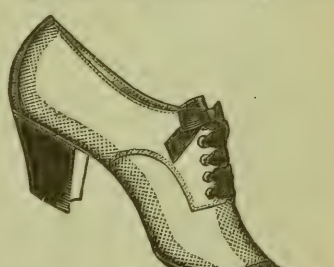

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THE OTTAWA NATURALIST.

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THE HAIR-EEL *(GORDIUS AQUATICUS*, L.*)*.

By Prof. Edward E. Prince, Dominion Commissioner of Fisheries, Ottawa.

Most people are familiar with the story according to which horse-hairs soaked sufficiently long in a pond or stream will be transformed into eels. I have seen a small book, published in Scotland 50 or 60 years ago, by an intelligent Forfarshire gardener, which, to the apparent satisfaction of its author, proved the vulgar belief to be true. Like most vulgar fallacies, this belief has some apparent foundation to rest upon. The elastic, hard, thread-like body of the Hair-eel *(Gordius aquaticus)* so resembles a brown or black hair from the tail of a horse that the origin of the popular error is easily explained. The further circumstance that ponds and other waters, in which hair-eels were never seen before, suddenly become peopled with these creatures, and that eels also appear unexpectedly in the most out-of-the-way localities, added strength to the theory, especially as the origin of the fish was a matter of dispute amongst naturalists. The sudden appearance of hair-eels was readily explained by the alleged transformation of horse-hairs; and the presence of eels was no mystery if they were simply developed from horse-hairs.

When a boy, I remember well discovering, to my surprise, specimens of *Gordius aquaticus* in the basin of a moss-grown spring by a Yorkshire (England) roadside. This clear, sparkling spring, as a rule, contained no visible signs of aquatic animals, and the appearance of the writhing, active hair-eel seemed difficult to understand.

A few weeks ago, during a short holiday at Fort William, P. Q., on the Ottawa River, about 120 miles above the Capital, I noticed examples in a pond about a mile from the Fort. A week later in a sand-pool, 6 or 8 inches across, which had been dug by some children the evening before, I obtained a specimen. In this newly excavated pool, only an inch or two deep, and thirty or forty yards from the Hotel Pontiac, the hair-eel appeared actively undulating and twisting about in characteristic fashion. Grenacher's paper "Zur Anatomie der Gattung Gordius" happened to be in my hands at the time, and I resumed the study of this curious creature after the lapse of many years.

Villot's monograph ("Monographie des Dragonneaux"), in which a detailed account of *Gordius* is given, had also been recently consulted by me.

My specimen was almost exactly 12 inches in length and a little over $\frac{1}{25}$ of an inch in thickness. Its smooth hard hair-like body, without distinctive head, and its uncanny contortions, suggested, at once, an animated horse-hair. It was engaged unceasingly in winding itself into endless gracefully curved knots, and as constantly unwinding itself. The Gordian knot of classical tradition was not more tortuously twisted, and the generic name *Gordius* seems very appropriate.

Observations have shown that these creatures will survive if removed from water and dried. Doubt has been cast on the somewhat venerable story that the Abbé Fontana kept a hair-eel in a drawer for three years, and that at the end of that time it was dry and hard, and exhibited no sign of life; but, on putting it into water, it very soon recovered its former vigorous activity. On the authority of the distinguished Professor Alexander Macalister, this traditional story is confirmed. "They are remarkable," he says, "for their tenacity of life, as they can be dried into hard, brittle threads, and yet appear lively and active on being moistened." Some author, whose name I cannot just now recall, tells of a museum curator who observed a hair-eel emerge from the body of a beetle which had long been killed, dried, and put away in a cabinet.

The usual colour of *Gordius* is black or dark brown, some are of a pale shade; but my specimen is of a very deep brownish black colour for the posterior 4½ inches of its length, while for about ⅞ths of its length, from the head, it is yellowish or olivaceous-brown. The attenuated head end is very pale in colour. The hind portion of the body is thicker than the anterior part. I notice that Grenacher describes a reverse coloration in specimens from the Philippine Islands, the head end being dark, while the hind portion of the body is a lighter shade of blackish-brown. *Mermis acuminata*, Leidy, a species of the genus Mermidæ, allied to the Gordiidæ, is of a pale brown colour.

From what has been said, it is clear that the Hair-eels are widely distributed on this continent and in Europe, while Grenacher's studies were largely based on specimens brought by Carl Semper from the Philippines.

The zoological position and the details of their anatomy and structure have been matters about which high authorities have seriously disagreed. Grenacher refers at some length to the contradictory views held. As he states, one author describes a mouth-opening, others deny its existence; one states that the digestive canal is obsolete in the adult, another gives a detailed account of its various parts; one found a pair of secreting organs, others regard them as alimentary pores. The great Carl Gegenbaur speaks of an enteron or alimentary tube in the entoparasitic larva of *Gordius*, but declares that it so degenerates that the mouth disappears, the ingestion of food ceases, and the adult relies upon the store of food taken in during its earlier life as a parasite. In my specimen a mouth is certainly present, though there can be no ground for the statement of Captain Thomas Brown that "its bite, sometimes, inflicted on being taken out of the water, has been known to produce the complaint called whitlow." The further statement that Linnæus recorded it as a popular opinion in Sweden, and that the fact has since been confirmed by various other persons, may be passed over. The mouth of *Gordius* is too small and feeble to inflict a bite: it is a simple minute pore.

Though *Gordius* has no jaws and not the slightest traces of biting or masticating organs, the round mouth-opening can be very distinctly seen in my specimen, when viewed in full face,—a small circular pore, like a black spot in the centre of the finger-like anterior tip. It is not situated towards the ventral side as in Grenacher's Philippine specimens, in which the head-end is very obtuse and bluntly flattened terminally. The lumen or chamber of the gullet, viewed from the dorsum, appears as a hair-like tube in optical section and is surrounded by a pale fibrous matrix, with striations passing forwards, the tissue becoming denser immediately posterior to this lighter anterior area. Microscopic sections show the gullet to be a minute tube with a simple epithelial wall. The body becomes gradually thicker posteriorly, and the tail end in the male *Gordius aquaticus* is split, the two halves separating like two cotyledons with an internal rounded projection between them. In *Gordius varius*, according to Kingsley's drawing, given by Packard, the terminal cleft is trifid and much more marked than in other species. *Gordius ornatus*, according to Grenacher (and shewn in his fig. 1, Taf. xxiii), exhibits a simple blunt termination with a centrally situated cloacal aperture. My specimen is apparently a female ; yet the posterior end shows a slight indication of bifidity, a central depression being discernible : but no terminal aperture can be made out.

There are no traces of eyes or other sense organs ; nor have glands, a water-vascular system, or definite nerve structures been determined beyond question in our common species. The various species differ greatly in the details of their anatomical features. Thus, in *Gordius aquaticus* the external cuticle, save for a few corrugations near the head end, is smooth. As the creature curls about, irregular creases, usually transverse, appear : but in *Gordius ornatus* remarkable protruding sense-organs are described by Grenacher. These structures have the character of cuticular mounds, and when highly magnified, are seen to consist of a bundle of stout threads, projecting like tendrils with a circle of papillæ around them. The tail region in *Gordius aquaticus* is

studded with small rounded papillæ. Beneath the outer cuticle is an inner cuticular layer, underneath which is a thinner stratum composed of a granular matrix containing a few nuclei. This stratum sends up through the next layer, to be described later, a thin perpendicular lamella, which expands into a thickened rod or cylinder lying longitudinally upon the muscle layer. It may be likened to the hypoderm ridges projecting inwards from the subcutaneous layer in the Nematode *Ascaris*. *Ascaris* possesses four such internal ridges, dorsal, ventral and two lateral, these last being pierced by a minute canal, probably excretory in nature. If this comparison be justified, the ventral ridge (Grenacher's "Bauchstrang") is the sole representative of the hypoderm ridges in *Ascaris*. A thick muscular layer lies internal to the cuticular and granular layers mentioned. Its greatest thickness is midway along the body, and it is of a most interesting character. The fibres are flattened and longitudinal: but in transverse vertical section the cut ends look like radial fibres converging upon the internal organs. They are really large muscle cells, naked and pressed against each other, and are the simplest form of muscular tissue known, if we except the neuro-muscle cells in the Cœlenterates, or the pecular transition cells in *Ascaris*. Each fibre exhibits a slight cavity which is much reduced, owing to their mutual pressure and flattened form. To this thick layer of muscle cells *Gordius* owes its marvellous power of contortion, of tying itself up in complex knots, and ceaselessly untying them.

Inside the muscle layer is the perienteric tissue, composed of irregular nucleated cells and fibrous intercellular tissue. In the midst of this tissue the central digestive tube passes, and on each side of the tube the genital glands lie. The latter, as long ovaries and cylindrical testes, pass backward and finally unite with a large terminal chamber, above which lies, in the female *Gordius*, the *receptaculum seminis*. When the ova are nearly mature, the ovaries become greatly expanded, and along the inner margin of each of these organs, passes an efferent canal, called the egg sac in the female, which further back becomes a slightly convoluted oviduct, or *vas deferens*, according to

the sex. Both these tubes end in a spacious atrium in the centre of the body. The digestive canal posteriorly is so pressed upon by these large viscera that it becomes reduced to a mere slit in the walls of the atrium. Villot states that the atrium or cloaca is capable of protrusion externally, and Grenacher found also, in *Gordius ornatus* a well-defined cloacal aperture, but Vejdovsky failed to discover it, or to make out the testes and *vasa deferentia*.

No doubt the main function of the adult *Gordius* is the production of eggs, and the perpetuation of the species, as the digestive organs are of limited capacity and appear to end blindly in the wall of the atrium. The modes adopted for dispersal are most remarkable. Adult Hair-eels have been taken from the bodies of water-beetles when flying from one pond to another by night, the serpentine creature being, it is stated, coiled around the abdomen under the wings and elytra, though Packard states that it actually penetrates into the body of beetles and locusts, twining round the intestines of its host, and finally emerging into free life, when the water is at last gained. It is difficult to understand how the adult *Gordius* can do this, and become for the time an entoparasite. The female, on reaching the water, deposits minute whitish pear-shaped eggs, attached in strings by a cement secreted in the atrium. A thick capsule and two or three thin internal layers protect the egg, which soon divides up into a group of rounded cells, like a thimble-berry; for one end becomes pushed in, converting the germ into a cup-shaped gastrula. Later the embryo elongates, becoming pyriform, and developing three rows of hooks in the gullet, and three sharp stylets at the apex of the body. With the last-named instruments it pierces the shell, and escapes into the water. The head is everted or can be drawn in like the finger of a glove. Villot describes a strong muscular band around the anterior half of the embryo, a protrusible proboscis, a gullet or throat-tube and a capacious intestine with a ventral pore a short distance in front of the acuminate posterior end of the body. As Packard points out, the larva is wholly unlike the adult, having "some resemblance to *Acanthocephalus* by its cephalic armature,

to the Nematoidea or thread worms by its alimentary canal, and in the nature of its secreting glands to the larva (Cercaria) of Trematodes." It enters the body of a water-snail, such as *Lymnæa* or *Planorbis*, but has also been found in the frog, fishes, aquatic insect larvæ, and in these it becomes encysted, or encased in a hard capsule. A second form of *Gordius* larva, more elongated and without head-armature, has been described in the body cavity, outside the intestine, of *Dytiscus*, the large water-beetle, *Carabus*, spiders, certain fishes and amphibians ; and it was observed to move freely amongst the internal organs of its host. Later it loses its larval features and distinctively ento-parasitic habits, and takes on the form and free life of the adult. The larval life has been stated to last five or six months, at the end of which time it doubles its length, loses its spines, becomes swollen and soft : but on attaining a length of two inches the skin hardens, and the dark brown or black color is assumed.

If naturalists still disagreee in their descriptions of the minute structure and anatomy of *Gordius*, and if there is some inconsistency in the existing accounts of its larval development and adult habits, it might be anticipated that its zoological position had been decided beyond dispute. But this is not so. It has been usual to group the Gordiidæ, Mermidæ, and Spherularidæ, in the order Gordiacea, alongside the order Nematoda, in the class Nematelmia ; others place them amongst the thread-worms or Nematodes with which they agree in many important particulars ; but other authorities remove them altogether, and regard them as aberrant, and not closely allied to the parasitic worms mentioned. The Nematode worms, it is true, are cylindrical animals, tapering towards each end, and never divided, like so many groups in the sub-kingdom Vermes, into segments or successive joints ; and the Gordiidæ agree in this total absence of metamerism or segmentation : but in their minute structure they exhibit as many diverse features, as features of resemblance, and further study is necessary to establish the position and real character of the Hair-eels. Even their alleged survival after long periods of dessication needs

accurate corroboration, and this and other problems in the life of the Hair-eels offer subjects worthy of the attention of naturalists.

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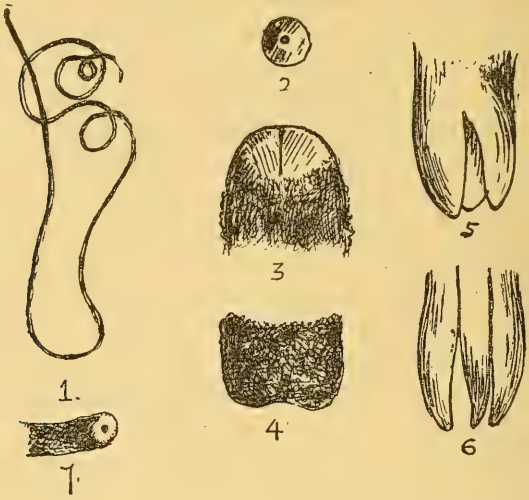

EXPLANATION OF FIGURES.

1. *Gordius aquaticus*, natural size.
2. Head end of same, shewing centrally situated mouth. x 36.
3. Do. do. somewhat compressed under cover-glass, viewed from the dorsum. x 150.
4. Tail end of *Gordius aquaticus*, probably a female specimen, showing slight bifurcation. x 120.
5. Tail end of male *Gordius aquaticus* (from Packard).
6. Tail end of male *Gordius varius*, showing trifid termination (after Kingsley).
7. Tail end of *Gordius ornatus*, showing cloacal pore, enlarged from Grenacher's figure.

THE RED-BREASTED NUTHATCH

(Sitta canadensis).

By WM. H. MOORE, Scotch Lake, N. B.

Were our birds classified as are plants, according to their abilities to withstand the inclemency of our northern climate, the subject of the following sketch would rank as a hardy perennial among the avi-fauna of eastern Canada.

Although not a bird having a well-developed song as do some of our other winter birds, its voice is nevertheless well cultivated along certain lines. The ordinary notes sound like *yank* or *kngak*, and, when heard at some distance, are suggestive of loneliness. Then there are sweet twitterings uttered incessantly when the individuals of a family are foraging among tree tops. A noticeable flow of talk is poured forth as the mated birds are investigating and deciding upon a nesting site.

The search for the location of the nest apparently begins in the month of March. The yanking abilities are then taxed to a great extent, the birds being known to utter that call unintermittently for over a half minute. After the site is exactly decided upon, and work begun, the calling of the birds ceases to a great extent.

The nesting site is chosen in some decayed tree trunk, preferably that of a conifer, the second choice being the white or soft maple. The birds undoubtedly understand the method of decay in trees, as the above species of trees seem to decay most near the heart, and are more easily chipped out than trunks that are decayed upon the outside and sounder toward the centre. Thus, when the bark is pierced, the hardest of the mining is accomplished. Yet their work is often in vain, as they sometimes come upon knots in the wood ; these they are unable to chip out, and they are obliged to choose a new site. In such instances, they evidently occupy a nest of a previous year, either one of their own species or that of a small woodpecker, as the female would be ready to lay the eggs before a new nest could be excavated. The length of time occupied in nest making is from two weeks to two months.

In one instance, when the birds located in a dead maple trunk set up for them within a few feet of our own house, the birds worked alternately at mining or excavating the hole in which the nest proper was placed. The length of time one would work varied from a few minutes to thirty. Then it would call a few times, and the mate would appear upon the scene and take a shift at the work. Toward the last of the mining operations the male performed that work and the female was busily engaged in collecting material for the nest. This consisted of fine shreds of cedar bark, other fibrous material, hair and a few small feathers, and the whole was well fitted together.

The excavation had been enlarged to satisfactory dimensions, which were as follows : entrance oval, one inch by one and one-eighth in diameter, leading inward an inch and one quarter on lower side, then downward six inches and enlarged to nearly four inches across for half the lower tunnel.

The next cavity measured about one and one-half inch in diameter and depth. All chinks and cracks within the excavation, if they lead to the outside, are tightly caulked with fibrous material of the same composition as the nest.

Before the female had completed the nest, the male began carrying fir balsam, from the trees surrounding their home, and besmeared an area about the entrance to the nest, fully four inches in diameter.

The Nuthatches we may consider our only birds which use artificial weapons for their protection. The entrance to the nests being always fortified by means of balsam, which seems to be applied for the purpose of keeping out the white-footed mouse, an omnivorous little rodent that would gladly avail himself of the opportunity of making a meal of the eggs or young birds, or drive away the old birds and use the nest for its own tenement.

The eggs of this species of Nuthatch are usually six in number, white, with brownish spots, chiefly near the large end. Some sets contain eggs nearly spherical in form.

The duty of incubation is performed by the female and covers a period of twelve days. The male occasionally feeds his mate during this period, adds more balsam about the entrance to the nest, and does general picket duty about home. When hatched, the

young are nude little creatures, having a very faint trace of down upon the feather tracts. At the end of a week the feathers are quite well grown, and the superciliary stripe begins to show. After the tenth day one of the young may often be seen looking out of the nest, but at the least disturbance retreats to lower quarters. At the age of two weeks the young leave the nest, and are led to pastures new ; for suitable insects for their diet have been well garnered near home, and they must move to where their food is more plentiful.

Some months are devoted to the education of the young birds, who are shown where to look for food. It is interesting indeed to follow a family of these feathered mites, observe their movements and listen to their talk when they all alight in the top of some spruce or fir tree, and with much twittering search among the cones and twigs. Soon all are off to another tree, and the searching and jeering go on ; many insects, caterpillars and eggs of various insects are taken. No doubt, many small seeds are also eaten. Toward autumn and throughout the winter the birds are often observed upon highways, searching among the excrements dropped by horses. One specimen in the writer's collection was struck by the foot of a passing horse and killed. When night comes on, a roosting place is chosen among thick grown conifers.

Thus the Red-breasted Nuthatches pass the time, and among their feathered companions are others of our hardy annual aves, such as the Black-capped and Hudsonian Chickadees, Golden-crowned Kinglet and Downy Woodpecker, the half-hardy Brown Creeper and semi-annual Ruby-crowned Kinglet.

The adults of the Red-breasted Nuthatch measure from four and one-half to four and three quarters inches in length. Of this the tail takes one and one-half inches and the bill one-half inch. The upper parts are leaden blue, brightest in the adult male, who has a black crown, with a white stripe over the eye, and a black stripe through the eye. The under parts are of various shades of brownish, being lightest in young birds and richest in adult males. The wings are fuscous with pale ashy edgings ; the tail-feathers, except the middle pair, black, the lateral, marked with white.

GENERAL EXCURSION TO CHELSEA.

On Saturday afternoon, September 23rd, the third General Excursion of the season was held at Chelsea. The outing was fairly well attended, many of the Normal School students being present. The President, Dr. Sinclair, was in charge.

On arriving at Chelsea, most of the party went into the grove, and then down to the rapids. Here the water was very low. Large boulders and rocks usually covered, but now bare, formed an interesting study. The other division of the party, under the guidance of Dr. Ami, went up the railroad track, to examine geological conditions, and to see a cutting in which sea-shells were in great abundance. At 4.30 p.m. the party assembled in the beautiful grove contiguous to the railway station. Here short addresses were given by some of the leaders of the Club.

Mr. W. T. Macoun gave a practical talk on the identification of forest trees, showing specimens of the foliage of many kinds, which he had collected during the afternoon. Mr. Shutt drew attention to the fact that the unwise denudation of our forests, if continued, must eventually deprive Canada of one of her most valuable assets, viz. her magnificent water falls. The present reduced condition of the Chelsea rapids was pointed out as an object lesson illustrating this fact.

Dr. Ami gave a brief sketch of the geology of the district and showed some interesting specimens which he had collected. He mentioned that the oldest and the youngest, or newest, rocks which composed the earth's crust, were to be found at Chelsea in immediate contact.

Rev. Mr. Eifrig gave an interesting talk on the migration of birds, instancing in special the migrating habit of our beautiful robin. Mention was also made of many of the common birds of the district, and songs of some of the species were mimicked.

Mr. Halkett showed specimens of spiders, insects, etc. which he had captured during the afternoon, and gave interesting descriptions of some of these. A fine specimen of the large millipede, *Julus canadensis*, was exhibited.

Mr. Clark, the Secretary of the Club, spoke on some of the plants which he had seen during the afternoon, mentioning particularly some of the ferns to be found about Chelsea.

Mr. Cameron, of London, Ont., formerly of the Toronto Globe, in a few well chosen words congratulated the Club on the value and efficiency of its work. A. G.

NATURE STUDY.—No. XXVIII.

A SHORT INTRODUCTION TO SOME OF OUR COMMON BIRDS.

SWALLOWS AND SWIFTS.

Rev. C. W. G. EIFRIG.

When a bird lover has solved the riddles that the identification of the members of the Finch, or Sparrow, family presents to him, of which Nature Study No. 25 treated, other birds also clamor for recognition at his hands. The Finches present themselves first and insistently for his consideration, on account of their greater abundance, variety, difficulty of separation and nearness to one's home. However, in small cities, along the outskirts of larger ones, and especially around country homes, there are certain birds just as plentiful at places, and then even more apparent than the sparrows. These are the Swallows, those welcome harbingers of spring.

Although they are swift of flight and do not settle very often, thus making it somewhat difficult to get a good view of them, yet their identification should not present any insuperable difficulties, even to the novice, on account of the small number of species belonging to this family. There are only five kinds of Swallows to be found in most parts of Eastern Canada, or at most six.

The first Swallow to arrive in spring, in fact one of the first of birds, is the lively and pretty Tree or White-bellied Swallow. The latter name, though not the most euphonious, is the better, because it gives at once the distinguishing mark, i.e., the *pure white under parts*. It arrives at Ottawa the first or second week in March, and for a month it is the only Swallow ; and, as all Swallows make themselves very noticeable by their swift graceful flight, made possible by their comparatively long, sickle-shaped wings, the Tree Swallow can not long remain unnoticed. So, when you see a swallow darting around over rivers and ponds, white only below and steel-blue or green above, that is the Tree Swallow, *Tachycineta bicolor*. It is called *Tree* Swallow because it makes its nest in cavities, knot-holes or old woodpecker holes in trees and fences.

The second swallow to arrive from the south—the first or second week in April at Ottawa—is at the same time the largest

of the family, namely, the Purple Martin, *Progne subis*. It is also the darkest of them all, looking black from a distance ; but in reality it is of a glossy steel blue all over, except wings and tail, which are duller. This is the one also showing least fear of man, inasmuch as it takes up its abode right in the heart of even large cities, and is not frightened by the noise produced by trains, street cars and wagons in our busiest thoroughfares. At Ottawa I have noticed colonies—for they always nest in colonies—at the Canada Atlantic Railway freight sheds, on Rideau street and in other places. Its song is a melodious chuckling, twittering. It can be easily distinguished from Blackbirds by its more graceful *gliding* flight, its shorter, little-forked tail and its notes. It takes kindly to bird houses provided by man ; but they must be made large enough to afford room for several pairs. Their nesting near one's home should be encouraged by all means, since they do away with an immense number of flies and other pests.

The beginning of May brings two more Swallows, the Barn and Cliff Swallows, and these two need closer inspection than the first to separate them. The lovable Barn Swallow, *Chelidon erythrogaster*, can best be told by the *deeply forked tail*, the only Swallow having this ; in flight, however, it keeps the tail closed ; then the next best characteristic is that the under parts are *entirely brown*, the whole upper surface steel blue. The song is a merry twittering. The nest is built of mud under the eaves of barns, etc., sometimes in them. It also should be protected by all means, because it is a friend to the farmer on account of its great insect-destroying propensities.

The Cliff or Eave Swallow, *Petrochelidon lunifrons*, may at first sight be confounded with the preceding species on account of the general likeness in size and colour. But it has not that deeply forked tail. Furthermore, its *forehead* is *whitish*, and the upper tail coverts are light brown or yellowish. Otherwise, it is also steel blue above and brown on throat and breast ; but the belly is white, not brown like in the Barn Swallow. So, when you see a Swallow flying away from you, that has a *light spot or area between the back and tail*, put it down as a Cliff Swallow. This name really holds good no longer ; for it has in most places adapted itself to civilization, building its mud nest no more against the sides of cliffs, but,

like the Barn Swallow, under the eaves of barns and other buildings. The gourd-shaped nests of both species may occasionally be seen in peaceful commingling on the same barn.

The last member of the Swallow family to arrive from the south is the Bank Swallow, *Riparia riparia.* This is the least pretty of our swallows, also the smallest. It is brownish-gray above, and white below, with the exception of a *dusky band across the breast.* It can be recognized at once by its nesting habits. What it loses by its lateness in coming, it makes up doubly by its energy in nesting No sooner has it come than it digs into the nearest sand bank, without any delay after its long journey from the south, and this, without taking into consideration the nearness of boys or other evil agencies, that will at once render unvailing its best efforts. In a sand pit at Ottawa, when its nests were destroyed by the breaking down of the sand walls by the men hauling the sand away, they would nevertheless set to work digging new tunnels in the same banks. When ground was broken for the foundations of the new Victoria Museum at Ottawa, these Bank Swallows came in numbers, bored into the sides of the excavations and did not in the least mind the men working a few feet away from their nests. By the dusky band across their breast they can be told from the Tree Swallow; their twittering is also more rasping than that of the other swallows.

The sixth and last swallow, the Rough-winged, *Stelgidopteryx serripennis,* is found in some places in south-western Ontario only. It is much like the Bank Swallow, but may easily be distinguished from it by the dusky gray of throat and breast, being the darkest of the smaller swallows.

Now a reader may ask, What about the Chimney Swallow? Where does that come in? Answer: The Chimney Swallow is no swallow at all but a *Swift,* belongs to an entirely different order, far removed from the swallows in classification and by structure. But, since it is associated with the Swallows in the popular mind, we will here introduce it.

The Chimney Swift, *Chætura pelagica,* is an inhabitant of our cities like the Purple Martin, and, like the Cliff Swallow, has adapted itself to and made use of the changed conditions wrought

in its natural habitat by the advent of man. Instead of pasting its nest in the inside of large hollow trees it now pastes them on the inside of our chimneys. They are tireless fliers and practically never settle, unless their clinging against the rough surface of the inside chimney walls for the night, can be called settling. They can be told from swallows by their narrower, more sickle-shaped wings, their less gliding flight, and their flying in and out of chimneys. The color is brownish-black all over.

A bird closely related to the Swift, and like it, the only member of its family occurring in Eastern Canada, is the tiny Hummingbird, *Trochilus colubris*. It is so well known that no description is necessary. It is the smallest bird we have; its very smallness precludes confusion with other birds. But, though small, it is none the less hardy and active; it goes up to the Arctic circle and beyond, and breeds even in cold Labrador. The one found with us is the *Ruby-throated* Hummingbird, so named from the ruby throat of the male, the female being whitish below and the back of both sexes irridescent green. They are, like their small downy, lichen-covered nest, perfect gems. To invite them to your home, all that is necessary is to plant bright flowers in your garden, and the invitation will surely be accepted.

A NEW NATURE STUDY BOOK.

The NATURE STUDY COURSE, with suggestions for teaching it. By John Dearness, M.A.—Many Nature Study books have appeared recently. The latest addition to these is by John Dearness, Vice-President of the London (Ont.) Normal School. It is a small, convenient-sized octavo of 206 pages, well illustrated but not overloaded with pictures. The author treats his subjects in a succinct and definite manner. The introductory part is particularly well stated, and it is probable that most readers will agree with Mr. Dearness's views as there expressed. The ideas of the advocates of Nature Study are still somewhat diverse, both as to the choice of material and the way to use it, and, even with regard to the limits of this important branch of education. Mr. Dearness's idea seems to be the right one, that the choice of subjects will depend chiefly on the interest the pupils have or can be led to have in any common natural object. The method of treatment, including the suiting of it to existing conditions, will show the teacher's power of leading and training. This small work, which is issued at the moderate price of 60c., is worthy of perusal by everyone interested in training boys and girls to become useful citizens.

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ON THE FORMATION OF LOCAL COLLECTIONS.*

In reference to local collections and the study of local natural history, one of our older Essex County botanists said, at a field meeting of the Essex Institute many years ago, that "the careful study of the flora of a very limited area may well occupy a lifetime while the results would probably be of more value to science than any general work undertaken by the same student."

There is no better presentation of the need of local collections accessible to the public than the article by Prof. Edward S. Morse † entitled "If Public Libraries, why not Public Museums?" In this paper the author points out how many more public libraries there are in this country than museums and how much more difficult it is to install and maintain a library. And yet there is no doubt whatever regarding the great and in some cases even the greater educational value of the museum. Referring to museums open to the public he says:—"For New England, the fingers of one hand could almost count them, and for the rest of this great republic, the fingers of the other hand would be sufficient to keep tally." And this in contrast to European countries where nearly every large town has its public museum.

Nor have these conditions materially changed since the paper was written in 1893, although new museums have been

* A paper read at the Field Meeting of the Andover Natural History Society at "Alderbrook Farm," in Andover, Massachusetts, July the twentieth, nineteen hundred and four, by John Robinson, of the Peabody Museum in Salem.

† Atlantic Monthly, July, 1893, pp. 112-119.

founded in several of the larger American cities and in some of the smaller ones and in many towns local historical societies have begun museums. Libraries, however, have increased more rapidly than ever before, until it is our boast, here in Massachusetts, that there is not a single inhabitant who has not free access to a public library. It is very desirable, therefore, that attention should be called to the formation of museums.

As art museums and certain specialized museums are usually established by endowment and are placed in the hands of boards of trustees, the museums most likely to be formed or which require consideration at this time are the educational museum of natural history (taken in its widest sense to include mineralogy, geology, archæology and ethnology, as well as the usual branches of zoology and botany), which is generally connected with some school or college, and the local museum illustrating the fauna, flora, etc., of some definite area, usually with political rather than natural boundaries, and nearly always the offspring of a local society or club.

It is hardly necessary here to suggest that the educational museum should contain well balanced collections, covering all of the departments of science within its scope in due proportions, that it should practically be a condensed encyclopædia illustrated by type specimens. Such a collection should be attractively arranged and well labelled, with copious references to books and papers treating of the specimens it contains on the groups to which they belong. Large special collections should not be merged in a museum of this sort, they should be kept in separate rooms or, better still, in separate buildings. The educational museum may be made equally perfect in its way whether it fills a single small room or occupies a series of large halls, so long as the relative proportions of its departments are rigidly adhered to.

But the museum most likely to be established at the present time is the local museum. The formation of the many local historical societies, taken in connection with the increasing interest in the study of plants and birds, and the great demand and consequently the great supply of the so called "nature books," in-

dicates an interest in these subjects which it is hoped will be permanent and lead to the establishment of local museums in every centre of population in the country, the smaller as well as the greater. In many cases the local museum must cover both natural and civil history,—minerals, plants, animals, pre-historic remains and historical relics. The grouping in one museum of these widely different objects seems at first to be inappropriate, but it is perfectly proper and quite possible to carry out.

In forming a local museum, it should be decided at the outset exactly what is to be done,—what ground is to be covered,—and when decided, every temptation to go beyond these limits should be firmly resisted. Local and general collections should never be mixed and the objects in each department should be arranged in different cases or otherwise distinctly separated.

But specimens are nearly always given before the cases to hold them are obtained, in fact, it is usually the gift of a collection, or the offer of one, which suggests the museum and even the formation of the society itself. The president of a well known county society was in the habit of saying that every person who gives a book to a library ought to give a dollar with it to shelve it and keep it in order, a rule which may be applied with equal propriety to the museum specimen as to the book, but a rule impossible to carry out in either case, for the donor usually thinks that he has done enough in giving the object and would feel insulted at at the suggestion of a contribution of money to provide for its keeping.

Museum cases are much more expensive than is generally supposed and temporary ones may be hired or borrowed which will answer the purpose until funds can be raised to obtain permanent cases. Rather than expose delicate objects to dust and injury upon open shelves it is far better to pack them away in drawers and boxes until suitable glass cases can be provided. It is imperative that the cases should have more glass than wood in their construction. A collection comes to mind, housed in heavy, over ornamented, black walnut cases, which were given to an institution by a generous friend,—his own selection. They were so dark and exposed so little surface of glass that the specimens

inside could hardly be seen, and yet for the same cost cases might have been built with five times the glass exposure had they been made of painted pine and placed against the wall as fronts simply, the shelves being attached independently to the wall itself. Such cases may be constructed quite economically and are perfectly satisfactory. It is well to have the cases nearly white in color and the room itself as light as possible so long as the blazing sun light is avoided.

The labelling of the specimens is a most important matter, for a collection without labels is of no use whatever. The labels should be amply descriptive, concisely expressed and distinctly written on one sort of paper or card, except for class or general labels, and, if possible, in one sort of hand writing or one style of printing.

With the exception of such bulky specimens as wood, cones and other fruits, the botanical collection is best kept on shelves in tightly closed cupboards. All the dried plants should, of course, be poisoned and mounted on paper of the standard size, in order that one collection may be united with another if required in the future. The birds, to save expense, may, if numerous, be kept as skins in shallow drawers, only one set being stuffed and mounted for public exhibition. Eggs and nests should be placed with the species of birds to which they belong. The mammals must be stuffed and the fishes and reptiles likewise, if possible, for specimens preserved in alcohol and other liquid preparations are troublesome and quite expensive to maintain and only of service to students. They are almost useless for public exhibition because, aside from the distorting effect of the liquid, nearly all lose their original color and change to a dirty white in a few years. The minerals and rocks on exhibition should be reasonably large, characteristic specimens and there should not be so many of one sort as to be confusing.

One of the most difficult collections to care for is the insect collection. Insects are the most numerous of all animals. The best results for the local museum are gained by collecting only the larger and more interesting insects, enlarging the scope of the collection from time to time. In this way the butterflies and

the larger moths, the dragon flies, conspicuous beetles and some other groups may be collected and arranged in tight glass-topped boxes of the same size. The various stages in the developement of the insect should always be shown if possible by carefully prepared specimens. A very attractive way of exhibiting the butterflies and larger moths has recently been adopted in some museums and in many private collections where each specimen is mounted separately on a white tablet covered with glass, but this is a very expensive method when applied to large collections. The insect collection may easily occupy the entire time and attention of one person and the local society is fortunate if it counts an amateur entomologist among its members.

The museum should always be opened at regular hours on designated days. Nothing is more exasperating to the visitor than to find the doors closed against him after taking much trouble to go, perhaps a long distance, to see the collections, or to be told by a sign, or some person near by, to call at Mr. Soandso's, half a mile off, to get the key.

It is hardly necessary here to go farther into details of the arrangement of the museum, except to say that the local collection should contain, so far as possible, a specimen of every native species of rock, plant, animal, etc., together with a typical collection illustrating the pre-historic remains of the aboriginal race of the region. Photographic and other illustrations interspersed among the specimens add greatly to the interest and educational value of the collection.

From the minerals and rocks, which may be considered the foundation of the collection, it is an easy advance through the plants, and animals, to the handi-work of aboriginal man and thence to our own early historic period and the present time; so that, one finds a perfectly natural sequence of objects from the native rock to the musket our great grandfather carried at the battle of Bunker Hill, and the difficulty of combining natural history collections with those of the local historical society vanishes. With care this combination may be made in an absolutely scientific manner.

One of the greatest difficulties in conducting a museum is

in dealing with unsuitable gifts offered by well meaning friends. The lack of appreciation of the fitness of things sometimes displayed by well educated persons is most surprising. Such a person examines the collection, speaks well of what has been done and then announces his intention of adding to the museum a most valuable contribution, an object which until then the donor would never think of parting with, and of much greater interest than anything in the collection. The donor may be a person of influence in the community and one who has given money generously to furnish the rooms. The gift arrives; it may a fragment of rock from the hill where the witchcraft victims were hanged; a bottle of water from the river Jordan; a bit of polished agate from Arizona with something like the outline of an Indian face in its concentric folds, which you are assured was caught there by the sun's rays as an Indian chief passed by. Although it may be an interesting souvenir of travel to the collector himself, such an object is of no value in a museum, nor can it be classified as scientific or historical and the custodian is at a loss to know what to do with it. He can not afford and does not wish to offend the kindly intentioned donor. What can be done? There is one museum in which a special case is provided for "Recent Accessions" and in this case are placed all gifts as they are received. There all undesirable objects remain until they are forgotten or can be disposed of, while, from time to time, as it may be convenient to rearrange the collections, the desirable ones find their appropriate places in the museum among the groups to which they belong. The establishment of a case for "Recent Accessions" should be among the first things done. There is another advantage in having such a case. A donor is quite sure to visit the museum within a week or two after sending a gift to see if it has been placed on exhibition, and while it may not have been possible to arrange the collection to give it a suitable place, the "Recent Accession" case can take it in immediately.

There is one class of donors who should receive the greatest consideration,—the children. They come with butterflies, beetles, sea-urchins, shells and flowers and want to know what they are and something about them. About the best work which can be

done at the local museum is to encourage children to intelligently observe natural objects. A few reference books may be kept at hand or the children may be taken to the public library and shown a good picture or analytical drawing of the animal or plant and given a short account of it to read, or they may be taken to the shore or fields and assisted to learn the habits of the animal or something about the growth and nature of the plant. All specimens brought to the museum by them should be marked with the donor's name on the card and immediately given a place in the "Recent Accession" case.

Gifts to the collection should always be promptly acknowledged by letters or by filled out blanks which are more convenient. It is surprising what pleasure these acknowledgments give even to older persons, while children show them to their friends with evident pride. In fact everyone appreciates a prompt response and even the most trivial gift should not be overlooked for it frequently happens, after a few worthless objects have been dutifully acknowledged, that a really valuable addition comes from a person thus encouraged.

An important duty of the local society, through its museum, is to aid in the effort now being made to protect our native birds and preserve our rarer wild flowers. Much may be accomplished in this direction, not only by personal appeal to thoughtless and selfish collectors and by the combined influence of the membership of the society upon them, but the museum collections, if reasonably complete and freely accessible to the public, will in a great measure obviate the necessity and curb the desire for making trivial private collections. Collectors should be encouraged to add new specimens to the museum and the duplication of those already there should be discouraged. Efforts should be made to interest the community in the museum and make everyone feel a personal pride and proprietorship in it. The children, having been interested in the life histories of plants and animals, may be taught to be of great assistance in obtaining desirable objects for the museum and at the same time discouraged from collecting indiscriminately and merely for the purpose of accumulating specimens. The thorough knowledge of a few ani-

mals and plants is of far greater benefit to them than the collecting of masses of specimens of which they know but little.

It may be treading upon dangerous ground and, perhaps, outside the limits of this paper, but in a great majority of instances it seems evident that the inclusion of the making of herbaria in the regular work of our schools, where prizes are frequently given for the largest and best arranged collections of dried plants, is of very questionable desirability.

As a matter of convenience, the botanical instruction is too often assigned to teachers, perhaps excellent in other branches, who have no knowledge of botany and who can not interest the scholars in the subject or aid them in their work. Valuable study hours are wasted, usually just at the close of the school year, and other work neglected. It may be that one hundred small collections of dried plants are made. Individually they are valueless but collectively they represent the up rooting of a great number of native plants, often rare ones, without any gain to the scholar or the school. This work as conducted in most of our schools can not be defended as a necessary part of any educational system, nor does it in any way bring the students into touch with nature or lead to a knowledge of her ways.

A single new species of plant added to the local museum collection would be of more value than the entire mass of school herbaria and a greater honor than to win a prize for the best school collection.

The school garden is a far better way of interesting children in botany. The children may be taught to raise their own specimens and, meanwhile, study the germination, leaf and flower morphology, the methods of fertilization and the insect aids, and the development of the fruit.

The work should, of course, be done under the guidance of a competent instructor who could outline the course for the regular teachers and supervise the instruction in all of the schools of a city or in two or more contiguous towns, as is often done now by special teachers of music and drawing, a method already shown to be successful and economical when applied to the care of the roads in adjoining communities. If a near approach to

systematic instruction is impossible, it would be far better to omit botany altogether from the school courses. In some cases botanical and horticultural societies are doing excellent work in this direction and the local natural history society, if it is not possible or desirable to directly conduct classes, may, by its influence, lead the city or town school board into the paths which should be followed. What one horticultural society has done may be learned by reading the reports of the successful work of the children's garden committee of the Massachusetts Horticultural Society in Boston.

Merely pressing and naming plants is not of itself studying botany, it is, literally, the driest part of plant study and, often, if forced to do this work, the boy or girl becomes disgusted with the whole subject.

A very good way of interesting children in botany, available to city children as well as to those living in the country, is to encourage them to become familiar with the trees growing in the streets, to know their names, their nature, to observe them and to write accounts of them and their varied conditions throughout the year, in winter as well as summer. The herbarium, if one is to be made, might take the form of the life history of a single species. Assign to each boy and girl a different tree, or let groups of children study one together. At the end of the season each little collection should contain the seedling plant with the roots, a branch of leaves, a sheet or more of different forms of leaves, the flower,—of both sorts if there are more than one,—the fruit in its different stages. A specimen of the wood of each tree should accompany the sheets of pressed leaves and flowers showing the grain in section, lengthways and across, together with the bark. Such a collection, if carefully prepared and neatly mounted, would be a valuable accession to any local museum, while the written reports would serve admirably as exercises in English composition. Other groups of children could collect the insects found upon the trees, those which come to fertilize the flowers and those which are the enemies of the trees.

A grave mistake is often made in neglecting to interest young persons in local societies and museums by giving them places of

responsibility. As we grow older we are too apt to feel that we alone know best how to conduct the affairs of the society or institution and are loth to give up our hold to others. But even if occasional mistakes are made it is better to let new hands and fresh minds come to the front and before it is too late to engraft the spirit of the founders on the rising generation of workers.—Through the neglect of this important duty many excellent beginnings have later languished and promising local collections have gone to decay or been dispersed.

A NEW ANTENNARIA FROM EASTERN QUEBEC.

M. L. FERNALD.

The common Antennaria of open calcareous soils in the counties of Bonaventure and Gaspé in eastern Quebec is a plant with the silvery-white foliage forming close mats which are extremely dense—much denser than in any of the described species of eastern Canada and New England. The spatulate leaves are very tiny for an Antennaria, when fully developed ranging in length from 8 to 18 mm. and in breadth from 2.5 to 4.5 mm.

In size, outline and color as well as in the dense matting of the foliage, and in the very short stolons, the plant immediately suggests *Antennaria microphylla* Rydberg, and its allies of the Rocky Mountains. Its involucre and pappus, however, are like those of *A. neodioica* Greene. In fact, although the plant as it occurs on the red calcareous-conglomerate rocks about Percé wou'd not suggest to the botanist from farther west the common *A. neodioica* with leaves ranging from 1 to 4.5 cm. in length and from 5 to 18 mm. in breadth, material from the head of the Baie des Chaleurs and from Bic on the St. Lawrence shows it to pass gradually to the ordinary *A. neodioica* with larger more broadly spatulate-obovate less whitened leaves. On this account the Gaspé plant seems best treated as a variety, and it is here proposed as

ANTENNARIA NEODIOICA Greene, var. GASPENSIS. var. nov. Sarmentis dense cæspitosis brevibus valde foliosis; foliis inferioribus supra albicantibus vel argenteis spatulatis 8-18 mm. longis 2.5-4.5 mm. latis apice rotundatis vel subacutis apiculatis, foliis cau-

linis lineari-lanceolatis remotis arachnoideis ; caulibus floriferis tenuibus 1-2.5 dm. altis ; corymbis densis, capitulis fœmineis 2-6.

Densely cæspitose, the stolons very short and leafy : basal leaves whitish or silvery, spatulate, 8-18 mm. long, 2.5-4.5 mm. broad, rounded or subacute at tip, apiculate ; cauline linear-lanceolate, scattered, arachnoid : flowering stems slender, 1-2.5 dm. high : corymb rather dense, of 2 to 6 short-pedicelled heads : involucre and pappus of the pistillate heads as in the species : staminate plant unknown.—QUEBEC, shingle and dry gravel of calcareous-conglomerate, open slopes and summit of Mt. Ste. Anne, Percé, TYPE coll. July 24, 1905 *(Collins and Fernald,* no 142, *E. F. Williams)* also August 18, 1904 *(Collins, Fernald and Pease)* ; dry gravelly woods, banks of Grand River, June 30-July 3, 1904 *(Fernald)* ; dry gravelly beach, Tracadigash Point, Carleton, July 20, 1905 (*E. F. Williams*). Various specimens from Carleton, Nouvelle, River Ste. Anne des Monts, Bic, etc. show transitions in the foliage to typical *A. neodioica*.

Gray Herbarium, Harvard University.

SUB-EXCURSION TO ROCKCLIFFE.

The exquisite weather on October 7th, induced nearly 100 lovers of out-of-doors to participate in the Club's sub-excursion to Rockcliffe. The President and several of the leaders were on hand and punctually at the time appointed the party started off, keenly alert to make the most of this favorable opportunity. A welcome guest at this excursion was Mr. T. D. Jarvis, of the Wellington Field Naturalists' Club, an active Society founded on the same lines as our own Club, and one which is doing good work. The botanists, as usual, were largely in the majority, but Mr. Gibson and Mr. Halkett had several interesting followers, who found many insects to study. After a most enjoyable tramp through the woods the party re-assembled at the north end of Mackay's Lake, and several very interesting addresses were delivered by the Leaders. The President first called on Mr. Halkett, who from his different pockets brought forth a motley collection of insects, snails, frogs and snakes, all of which he handled lovingly while he pointed out their beauties. Mr. Halkett's enthusiaam makes him always a favourite among those who attend the excursions.

Mr. W. T. Macoun said that the study of trees was one of the most important lines of work that the students, especially, could be engaged in. The value of Canadian forests was being more and more recognized every year and, as Forestry was bound to interest an increasing number of persons every year, it was important that the students who would some day be teachers should

know as much about the native trees as possible. Specimens were named by Mr. Macoun and the difference between the various species pointed out. Mr. Jarvis, of Guelph, followed and compared the trees of the Ottawa district with those of Western Ontario, he also conducted an impromptu class for a few minutes and by questions and answers brought out much useful information about the trees observed during the afternoon. Rev. G. Eifrig said that few birds had been observed. He described the habits and notes of the Chickadee, Nuthatches and Creepers, and told the excursionists some interesting things about the migration of birds. Miss McKay Scott spoke appreciatively of the delights to be found in the woods at this time of the year.

Dr. J. F. Whiteaves was present and gave much information to those wishing to learn about the rocks and the fossils contained in them. The President, Dr. Sinclair, in closing the meeting congratulated all present on the enjoyable outing and hoped that they all might have many more together. W. T. M.

SUB-EXCURSION TO BEAVER MEADOW.

Saturday afternoon, 14th October, proved a most delightful day for a jaunt in the autumn woods, and about 60 members of the Club took advantage of the favourable opportunity for examining the rocky ledges along the Beaver Meadow at Hull. President Sinclair drew attention to some of the more interesting localities, and the party then broke up into bands and sallied out under the various leaders. Mr. W. T. Macoun and Dr Fletcher had a numerous following of those interested in plants, and several enthusiasts led by Dr. Ami pushed forward up the valley to Fairy Lake, where they had a pleasant afternoon, examining the fossils in the Coral Reef. Mr. Halkett delighted his party by drawing forth many objects of interest—snakes, frogs, spiders and insects —from beneath stones and logs. When the party re-assembled before leaving for home, Mr. Halkett also gave much valuable and entertaining information concerning the habits of the different specimens secured. Dr. Fletcher spoke briefly of some of the more striking plants, showing what a surprisng number of objects worth studying could be found even at this late date in the season. The trend of his remarks was that all things in a state of nature were beautiful and exceedingly instructive. If at first we could not see the beauty, we must look further for it, feeling confident that it was there, and we should surely find it and get much health-giving pleasure in the quest. He spoke of some of the trees growing around the meeting place and pointed out their characteristics. President Sinclair was congratulated on his thoughtful management, by which this and all other excursions of the year had been made so successful. J. F.

NATURE STUDY No. XXIX.

WOOLLY-BEAR CATERPILLARS.

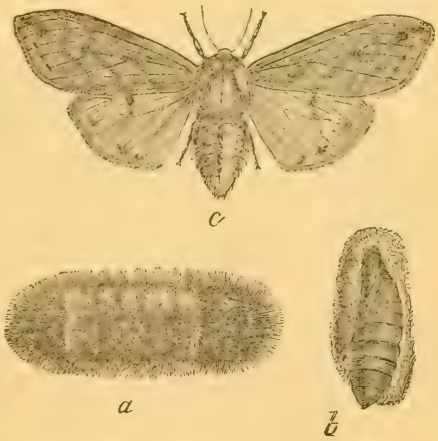
By ARTHUR GIBSON, Central Experimental Farm, Ottawa.

Teachers engaged in Nature Study are often at a loss to decide what forms of life around them will serve best to attract and hold the attention of their pupils.

On account of their abundance, and the ease with which they can be collected, insects are every day being more and more used as Nature Study object lessons. This article is presented simply to draw the attention of teachers engaged in Nature Study work to a certain group of insects, the Woolly-bears, three kinds of which are to be found commonly almost everywhere in Canada. When specimens have been collected, the teacher should present them to the class in such a way as to arouse the interest of the pupils, and thus develop independent thought and investigation. The little that the child sees and thinks out for itself, is of far more educative value than the great deal that the teacher gives out in the course of one or even many lessons.

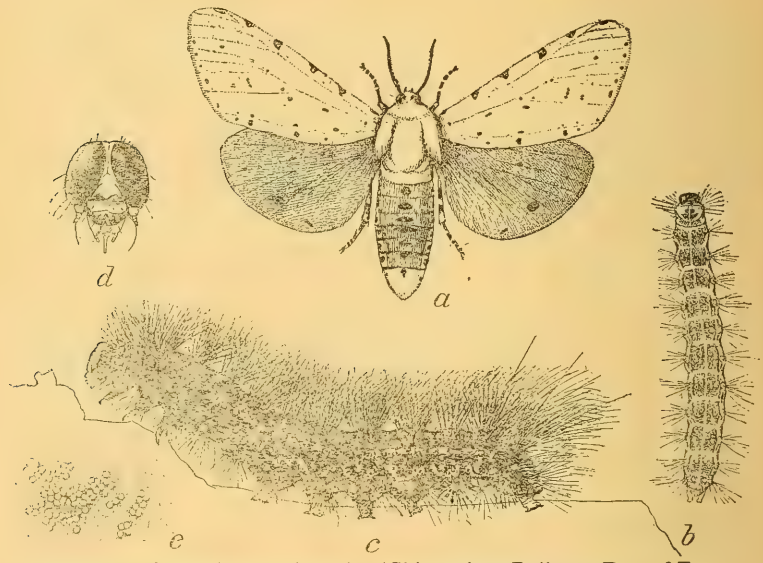
"Woolly-bears" is the popular name given to the hairy caterpillars of the moths known as Arctians. All of these caterpillars are clothed with dense clusters of hairs, which as a rule are conspicuously coloured. In some kinds these hairs are stiff and even, while in others they are slender and of varying lengths. Most arctian caterpillars are general feeders, living upon the foliage of almost any herbaceous plant; but a few kinds occasionally feed on the leaves of shrubs and trees. The moths are fairly large and, on account of their beauty, are favourites with collectors.

THE HEDGEHOG CATERPILLAR.—In the fall of the year, or in early spring, everyone must have seen the caterpillars of the Isabella Tiger moth, *Isia isabella*, S. & A. This Woolly-bear which is called the Hedgehog Caterpillar is particularly noticeable in autumn, hurrying along road-side paths, sidewalks, railroad tracks, etc., as if on a most pressing errand. If we watch them for a little while, we shall soon see that there is a set purpose in their actions. Evidently they are not simply wandering around in search of food, because we see them pass by



Hedgehog caterpillar, pupa in cocoon, and moth.

tempting food plants, time after time. They have something more important to do now, viz : to find a suitable place where they can lay up for the winter. At this time the Hedgehog Caterpillar is full grown, and the winter is spent snugly rolled up under a piece of plank, a flat stone, or an old log. The caterpillar, or larva, is shown in the accompanying figure. The tufts of hair at either end are jet black, those in the middle of the body bright rust red. On the arrival of spring the caterpillar comes out of hibernation and after again wandering around, it finally selects a somewhat similar place to that where it passed the winter, and spins an oblong-oval cocoon composed of coarse silk and the hairs of its own body interwoven. The moth which comes from this cocoon, is a rather sober coloured and heavy-bodied insect of a dull grayish tawny-yellow (Isabella yellow)*, the fore wings being marked with dusky stripes and spotted with black, the hind wings spotted with black, and sometimes flushed with salmon red. There are three rows of black spots on the body, one down the centre, and one on either side.



Salt-marsh Caterpillar and moth. (Chittenden, Bull.. 43 D v. of Ent., U.S. Dept. Agr.)

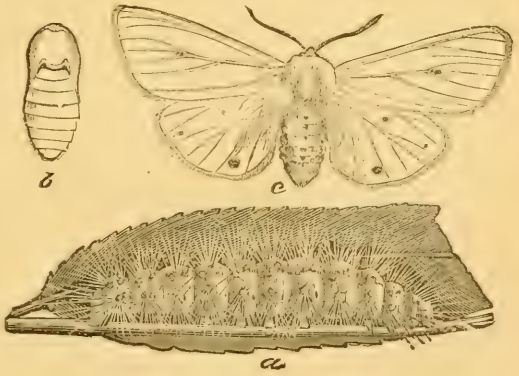
THE SALT-MARSH CATERPILLAR, *Estigmene acræa*, Dru.—Early in the past century a large hairy caterpillar appeared in destructive

*The origin of the term "Isabella yellow" will I think interest any one who looks it up.

numbers in the salt-marshes about Boston, and was then given the above popular name. It is not, however, we now know, restricted to salt marshes, and the name is therefore misleading. This Woolly-bear, which is widely distributed throughout the United States and Canada, is noticed particularly in flower and vegetable gardens. It is a general feeder and seems to be satisfied with almost any low growing plant. When mature it measures about 2¼ inches in length, and has a dark body with yellow markings along the sides. The hairs on the body are slender and mostly reddish or reddish-brown.

This caterpillar becomes full grown in autumn, and the winter is passed in a different state from the preceding species, viz., as a pupa, inside a cocoon. This cocoon is much the same as that of the Hedgehog Caterpillar, only a little larger; it is formed in any convenient place where shelter can be obtained. Towards the end of May, and during June, the perfect moths appear and often come to lights at night. The female moth is a beautiful insect. The wings are pure white, spotted with black, as is also the body, excepting the central abdominal segments above, which are orange. The male differs from the female in being slightly smaller and in having the two hind wings bright buff yellow. The under-side of the wings are also buff yellow. The male moth is shown in the figure.

THE YELLOW WOOLLY-BEAR, *Diacrisia virginica*, Fab.—Occurring also in gardens, feeding on many low plants, and even sometimes eating the foliage of trees, is another hairy caterpillar, called the Yellow Woolly-bear. This kind resembles very much immature specimens of the Salt-marsh Caterpillar, but differs in not being so large when full grown, the hairs being shorer, and the body not so dark. It also lacks the distinct yellow markings on the sides. Although called the Yellow Woolly-bear from the colour of the hairs of the majority of the caterpillars which were first studied,



Yellow Woolly-bear, pupa and moth.

these hairs are not always of a yellowish tinge, as in many specimens they are of a dark rusty or reddish-brown colour, or even nearly white. The body colour also varies, and in the paler specimens a more or less broken lateral blackish stripe, as well as bands of the same colour across the back between each of the segments, may be seen. When full grown, in autumn, this Woolly-bear spins a cocoon similar to that of the Salt-marsh Caterpillar, and passes the winter as a chrysalis inside this coarse silken cover. In May and June, of the following year, the moths appear. These do not differ very much, the wings of both sexes being snowy white, marked with a few black dots. There is a row of black spots down the centre of the abdomen, and another on either side; between these there is a longitudinal orange stripe.

To rear these insects in confinement, an old tin box, if this is clean, will answer as a breeding cage; and it is no trouble at all to get food plants, as dandelion, plantain, and other weeds are common everywhere. If specimens of the Salt-marsh Caterpillar or of the Yellow Woolly-bear are collected in autumn, they should be given fresh food every day or two, and, when this is done, all the old food and any dirt which may be present, should be removed from the cage. As both of these Woolly-bears make their cocoons in the fall, some dry leaves should also be put in the cage, among which they will spin up. Two or three specimens only should be placed in each cage. In early spring the Hedghog Caterpillar may be found commonly under boards, etc., in fields or along roadsides. These do not require much attention, and soon after collection they will make their cocoons.

The three kinds of Woolly-bears, as stated above, are all exceedingly common; but, yet, how few of us know much about them? It is very often the commonest objects about which least is known.

In Nature Study work, it is well known that the presentation of some object in which life is noticeably apparent is bound to induce thoughtful consideration; therefore, some living animal, no matter how small, will prove of special value in the development of an active mind in those pupils before whom such objects are placed.

During all such observations as are above suggested the alert teacher will find many points of value in connection with the work of teaching Nature Study.

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ON SO-CALLED SILENE MENZIESII.

BY EDWARD L. GREENE.

The original specimens of what Sir William Hooker in his Flora Boreali-Americana, published as a rather dubious member of the genus *Silene*, under the name *S. Menziesii*, were from the shores of Puget Sound. Within the hundred years and more that have passed since Menzies gathered this, plants of just this type have been collected from almost every part of the western half of North America, and all the way from the humid seaboard woods and hills to the banks of little streams coursing down the slopes of desert mountains in the remote and arid interior of the continent; from the level of the sea to near the alpine summits of the Rocky Mountains and a thousand miles inland. No type of higher plant life remains specifically one and the same throughout so vast a range, and so great a diversity of geological and climatic conditions; and, quite as we should expect, these inland plants from one region and another, differ both from the original type, and from one another so widely and variedly that no unbiased mind would ever regard them as being all one *Silene Menziesii*. A low almost matted one from Idaho, at a point 8,000 feet above the sea, looks like Chickweed; another from 11,000 feet in Colorado, looks more like *Arenaria lateriflora*, while a third away up in Assiniboia resembles one of the most upright and delicate of Stellarias. A prolonged and careful study of the material of this kind now extant in the larger herbaria has made the distinguishing of eighteen species of this aggregate a necessity; and the characters of them have lately been given in Volume One of my *Leaflets*. The group is out of all harmony with *Silene*, as even Hooker felt, when he had but the one species in hand. It is every way more like either

Arenaria or *Stellaria*, except that the capsule alone is that of *Silene* rather; and I have named the genus *Anotites* in allusion to the absence of those ear-like appendages of the petals seen in *Silene* and in many another allied genus.

The herbarium specimens of the Canadian Geological Survey have been of great service in this study, and about four of the species already described are known to me only as in that collection, and as belonging to the Canadian side only of the International Boundary. That list is now raised to five by virtue of a new one more recently collected by Mr. Macoun, *A. picta*, the first account of which is herein published. With the description of this, I have thought it well to give the essential characters of all the Canadian species as I at present understand them: appending to such a key to the species, the notes of habitat furnished by the labels in the herbarium.

*Stems nearly upright, not slender.

Internodes 1 1-2 to 2 inches long, the lower retrorse-villous, the upper with spreading gland-tipped hairs; leaves as long as the internodes, elliptic lanceolate, acuminate ..... *A. Menziesii.*

Internodes hardly an inch long, all devoid of gland-tipped hairs and retrosely pubescent: leaves short and broad, not acuminate but cuspidately acute..... .... *A. latifolia.*

* * Stems upright, slender.

Stems terete, almost glabrous below, above glandular-hairy: leaves narrowly elliptical; cyme open, leafy: calyx-teeth detoid-ovate, abruptly acutish. *A. tereticaulis.*

Stems 4-angled, below retrosely villous, above with gland-tipped hairs. leaves oblanceolate to elliptic, very acute: calyx-teeth triangular-lanceolate, acute .... *A. tenerrima.*

* * * Stems lower, decumbent or even diffusely branched.

Stems terete, sparsely leafy, below scantily retrorse-pubescent, above glandular-hairy only: leaves elliptic-lanceolate, acute; flowers in an open leafy-bracted cyme: calyx-teeth triangular-subulate ..... *A. picta.*

Stems 4-angled, very leafy, all the pubescence glandless and retrorse: leaves lanceolate or lance-linear, very acute.... ..... *A. debilis.*

A. MENZIESII (Hook.) Greene, Leafl. i. 98. Along the seaboard and western slope of mountains generally in British Columbia, Oregon and Washington; also apparently in Northern Idaho. Almost the longest species, and with long pointed foliage commonly spreading, when well mature, having flowers and capsules in an ample cyme.

A. LATIFOLIA, Greene, l. c., known only from woods about

Yale, B. C., as collected by Mr. Macoun, Geol. Sur. N. 61,314, Under ground growth apparently different from that of *A. Mensiesii*, and the leaves short, broad, not long-pointed; flowers few, not cymose but scattered in the axils of leaves.

A. TERETICAULIS, Greene, l. c. 105. Of this I know but a single specimen, Herb. Geol. Surv. n. 10,123, from Waterton Lake, Alberta, 1895, by Mr. John Macoun, but the characters of the species are excellent, the stems with no trace of angularity, and openly dichotomous from the middle, the inflorescence therefore ample, but leafy.

A. TENERRIMA, Greene, l. c. 104. This is remarkable for extremely thin vivid green foliage, and the whole plant, even to the 4-angled stems is very slender and delicate, the scattered flowers on the most slender of pedicels in the axils of the leaves. Notwithstanding its slenderness and delicacy the plant appears to be upright. The specimens are from Medicine Hat, Assiniboia, by Mr. Macoun, June, 1904, the fine herbarium sheet being numbered 3,090.

A. DEBILIS, Greene, l. c. 104. A low small depressed and much branched herb., nearly as delicate as the last, as different as possible as to mode of growth, the angles of the stem almost uncinate-prickly in a very delicate fashion, the very lowest internodes somewhat villous downwards. The species is another of Mr. John Macoun's gathering in Assiniboia, June, 1895, from Farewell Creek in the Cypress Hills, the number, 10124.

A. PICTA, sp. nov. Loosely tufted, ascending 8 to 10 inches high, the stems terete, dichotomous, leafy and floriferous from below the middle but loosely so, the internodes often of more than twice the length of the leaves, the lower with a minute and scanty retrorse pubescence, the upper and the pedicels with as minute but more copious and spreading gland-tipped hairiness: larger leaves little exceeding an inch in length, spreading, elliptic-lanceolate, very acute, sparingly and retrorsely scabro-pubescent on both faces: reduced leaves of the cyme ovate-elliptic, the pedicels short, the lower not exceeding the leaves; calyx small, oval, the triangular-subulate teeth erect or connivent and wholly red-purple: petals small.

Hector, B.C., 4th Aug., 1904, J. Macoun, Geol. Surv., n.

64,707, the type. This species bears a remarkable likeness to the common chickweed as that appears in its later and fructiferous development. It is akin to *A. alsinoides* of Idaho, yet very distinct.

AN ALPINE VARIETY OF CNICUS MUTICUS.

By M. L. FERNALD.

Cnicus muticus of our eastern swamps and low woods is a tall loosely branched plant with numerous scattered heads, the involucres of which are whitened with dense cobwebby hairs. This plant is frequent in southern New England, and in the more northern States and adjacent Canada it becomes one of the conspicuous elements of lowland vegetation.

On the alpine tableland of Mt. Albert in the Shickshock Mountains, a low simple-stemmed Cnicus abounds in boggy spots. Ordinarily only 3-6 dm. tall and very strict, with the 3 to 5 showy heads sessile in a terminal glomerule, the plant suggests at first sight some species very remote from the tall loosely branched *C. muticus* of low altitudes. In its dark purplish-green nearly glabrous involucre the plant is likewise quite different from typical *C. muticus* with its strongly white-arachnoid bracts.

On Mt. Albert the plant, as stated, is strict and low, but when it occasionally descends from the alpine tablelands and follows the rivers which have their sources in the Shickshock Mountains it becomes very tall. Thus, in alluvial thickets of the Little Casapedia River the plant, retaining its simple habit and glomerulate heads, becomes 1.6 m. high. As far as known to the writer this characteristic plant is confined to a limited area in eastern Quebec, where it is usually constant to the peculiar characters described. Occasional plants from adjacent territory are similar in habit but with the involucre quite as arachnoid as in typical *Cnicus muticus*. On this account and in the absence of any constant character in the foliage or in the form and texture of the bracts the plant should be considered an extreme variation of the widely distributed *C. muticus*, and on account of its great development in the alpine regions of Mt. Albert it may be called

CNICUS MUTICUS (Michx.) Pursh, var. monticola var. nov. Caule

simplice stricto fere 3-6 dm. alto; capitulis 3-5, glomerulatis; involucris companulatis, squamis glabris vel glabrescentibus. QUEBEC, boggy tablelands, altitude 900—1,000 m., Mt. Albert, Gaspé Co., August 12th, 1905 (*Collins & Fernald*). Tall plants, becoming 1.6 m. tall, from alluvium of the Little Cascapedia River, July 29th and 30th, 1904 (*Collins, Fernald & Pease*) probably represent var. *monticola* washed down to richer soil and more favorable surroundings.

Gray Herbarium, Harvard University.

A NEW GOLDENROD FROM THE GASPÉ PENINSULA.

By M. L. FERNALD.

While ascending the River Ste. Anne des Monts in Gaspé County, Quebec, Prof. J. F. Collins and I found in the gravelly alluvium of the river, about midway between the sea and the Forks, scattered plants of a handsome and to us quite unfamiliar Solidago. The occurrence of the plant only as isolated specimens, amongst the everywhere abundant *Solidago elongata*, on the flood-plain of the river, suggested very strongly that it had washed down from one of the alpine tablelands or ravines of the Shick-shock Mountains, and we naturally hoped soon to find the real home of the goldenrod. This hope was encouraged by our finding near by and under similar conditions isolated plants of *Arabis alpina*, *Lychnis alpina*, *Vaccinium ovalifolium*, and various other species which we knew to abound in certain regions of the Shick-shocks.

Such exploration as we were able to carry out in the mountains, however,—the study of a limited portion of Mt. Albert—showed us only two alpine goldenrods, *Solidago multiradiata* Ait. and *S. decumbens*, Greene, both abundant in their respective areas, but clearly distinct from the plant seen in the valley below. This plant, known as yet only from the valley of the River Ste. Anne des Monts, is apparently a unique species of the *Thyrsiflorae* nearest allied to *S. multiradiata* and the anomalous plant described by Dr. Gray from the Mogollan Mts, in New Mexico, as *S. multiradiata*, var. *neo-mexicana*. From the former polar species which abounds

on Mt. Albert the plant is quickly distinguished by its narrow elongate thyrsus and bright yellow involucral bracts as well as by numerous other characters. In habit it is a close match for *S. multiradiata*, var. *Neo-Mexicana*. That plant, however, has the cauline leaves more promiently toothed and the firmer greener bracts of the involucre distinctly pubescent along the back, while the bright yellow bracts of the Gaspé plant are thin and glabrous.

I have been unable to find any mention of a plant which seems specifically identical with the yellow-bracted plant of the River Ste. Anne des Monts, which in recognition of its unusual involucral character I propose to call

SOLIDAGO chrysolepis sp. n. Caule erecto simplice glabro apice setuloso-piloso ; foliis coriaceis, inferioribus spatulatis apice rotundatis petiolatis crenato-serratis, caulinis remotis elongato-oblanceolatis acutis subintegris vel rare serratis, superioribus lineari-lanceolatis ; capitulis in thyrsum spiciformem confertis ; involucris campanulatis, squamis flavis glabris acutis margine ciliolatis medio glutinosis ; floribus 12-16, ligulis 6-8 ; achaeniis setulosis.

Plant 5-6.5 dm. high, the erect simple reddish stem glabrous below, sparingly setulose-pilose above, especially in the inflorescence : leaves leathery ; the basal and lower cauline spatulate, with rounded tips, petioled, crenate-serrate, 12-18 cm. long, 2-3.5 cm. broad ; the few (3 to 5) remote cauline ones elongate-oblanceolate, acute, subentire or slightly serrate, 7-17 cm. long, 1-2 cm. broad ; the floral linear-lanceolate, only the lowermost conspicuous : inflorescence a virgate or spiciform compound thyrsus, 2-4.5 dm. long, 4-6 cm. thick, the branchlets setulose-pilose : heads mostly slender-pedicelled, in anthesis spreading or nodding, later becoming suberect : involucre campanulate, 5-6 mm. long : bracts 12 to 15, in 3 ranks ; the outer bluntly acute ; the inner attenuate, acute ; all bright yellow, with a narrow glutinous darker middle, glabous except the obscurely ciliolate margin : ray-and disk-flowers each 6 to 8, orange-yellow : achenes slightly broadened above, setulose.—QUEBEC, gravel-beach of River Ste. Anne des Monts, August 5th, 1905 (*J. F. Collins & M. L. Fernald*).

Gray Herbarium, Harvard University.

SOME NEW LOCALITIES FOR CANADIAN LAND AND FRESH-WATER SHELLS.

By J. F. Whiteaves.

These localities are new only in the sense of not having been previously recorded, as the specimens from some of them were were collected many years ago. All the shells referred to in this paper are in the Museum of the Geological Survey of Canada, and the species with an asterisk prefixed to their names were kindly determined by Dr. V. Sterki.

Pelecypoda.

Sphærium simile (Say.)

Knee Lake, Keewatin, O. O'Sullivan, 1905 ; one adult specimen. Lievre River, Que., at High Rock, Rev. C. W. G. Eifrig, 1905 ; several specimens. Vermilion River, northern Alberta, J. B. Tyrrell, 1886 ; one perfect and full grown specimen.

**Sphærium crassum*? Sterki.

McLeod Lake, head waters of the Peace River, west of Pine River Pass, B.C., G. M. Dawson, 1879 ; three good specimens. "These resemble most *S. crassum*, but are slightly different from the typical form and larger. I know of no other published species to which they could be referred, though I have a *Sphærium*, which is probably undescribed and under which they may range, from a number of States." Sterki.

**Sphærium stamineum*, Conrad.

Lake Erie, at Port Colborne, Professor John Macoun, 1885 ; thirteen specimens. Abitibi Lake, W. J. Wilson, 1901 ; seven specimens.

Sphærium occidentale, Prime.

Thames River at Woodstock, Ont. ; and marsh near Lake Ontario at Leamington ; John Macoun, 1892. Hector, B.C., at an altitude of 5,300 feet ; and crossing of the Columbia River at Revelstoke, B.C., John Macoun, 1890. A few good specimens from each of these localities.

**Sphærium Walkeri*, Sterki.

Head waters of the Chibougaman branch of the Nottaway River, Northern Quebec, A. P. Low, 1905; four "living" and perfect specimens.

**Sphærium (Musculium) Raymondi?* J. G. Cooper.

Head waters of the Columbia River at Upper Columbia Lake, B.C., J. B. Tyrrell, 1883; two specimens.

Pisidium Idahoense, Roper.

McLeod Lake, Peace River drainage system, B.C., G. M Dawson, 1879; one specimen.

**Pisidium Roperi*, Sterki.

Peat bog near middle branch of Old Man River, Alberta, J B. Tyrrell, 1883; eighteen specimens.

**Pisidium Mainense*, Sterki.

Jupiter River, Anticosti, John Macoun, 1884; twenty-six specimens. "Generally somewhat less characteristic in shape than specimens from Maine and Michigan." Sterki.

GASTEROPODA.

Amnicola emarginata, Kuster.

Mouth of Red River, Manitoba, J. H. Panton, 1884; several specimens. Shell River, Manitoba, J. B. Tyrrell, 1887; two specimens.

Ancylus parallelus, Haldeman.

Chartron's Island, Aylmer, Que., L. M. Lambe, 1889. eight specimens; and Root River, Keewatin, W. McInnes, 1905, one specimen. Lost Lake, Comox, V.I., John Macoun, 1887, two specimens; and Burrard Inlet, B.C., John Macoun, 1889, seven specimens.

As *A. rivularis*, Gould, is "considered by Haldeman to be this species and not Say's *A. rivularis*," it may be that the Montreal specimens that Dr. B. Bell identified with *A. rivularis* in 1859, are *parallelus*.

Ancylus tardus, Say.

Crane Lake, Assiniboia, John Macoun, 1894; eighteen speci-

mens of a shell which Mr. Bryant Walker regards as a "large western variety" of this species.

Pupilla muscorum (L.)

Mouth of Jupiter River, Anticosti, John Macoun, 1884; abundant on logs. East side of the Cypress Hills, Assiniboia, John Macoun, 1894; several specimens.

* *Vertigo modesta*, Say.

Kananaskis, Alberta, John Macoun, 1885; several specimens.

* *Vertigo ventricosa*, Morse.

Riviere du Loup (en bas), Quebec; two specimens.

Sphyradium edentulum (Draparnaud).

Swamps near Tobacco Plains, Kootenay River, B.C., J. B. Tyrell, 1883; four specimens. Kananaskis, Alberta, John Macoun, 1885; several specimens.

THE GEOLOGICAL SOCIETY OF AMERICA.

The Eighteenth Annual Meeting of the Geological Society of America, made up of Fellows from various countries of this Western Hemisphere, but chiefly from the United States, Canada and Mexico, is called for Wednesday morning, December 27th, 1905 and will last three days. The officers of the Society for 1905 are as follows:

President: Raphael Pumpelly, Newport, Rhode Island; Vice Presidents: Samuel Calvin, State Geologist, University of Iowa; and Prof. W. M. Davis of Harvard University, Cambridge; Secretary: Prof. H. L. Fairchild, University of Rochester, N Y.; Treasurer: Dr. I. C. White, Morgantown, West Virginia; Editor: J. Stanley-Brown, New York City; Librarian: Prof. H. P. Cushing, Western Reserve University, Cleveland, Ohio; Councillors: H. M. Ami, Geological Survey, Ottawa; John M. Clarke, State Geologist, Albany, N.Y.; Prof. J. F. Kemp, Columbia University, New York City; Prof. G. P. Merrill, U. S. National Museum. Washington, D. C.; Prof. R. D. Salisbury, University of Chicago.

The circular of information, issued by Secretary Fairchild to all the Fellows. refers to the details of arrangements for the meeting here, including facilities regarding customs as well as railway and hotel accommodation, usually given to the Fellows of the Soclety, announces a Council meeting for Tuesday evening, Dèc. 26th at the Russell House, selected as Headquarters during the meeting. Through the courtesy of Dr. White, Principal of the Provincial Normal School, the Assembly Hall and adjoining rooms of this institution, five minutes' walk from Headquarters, have been placed at the disposal of the Local Committee on behalf of the Society, for the forthcoming meetings, and these are in every way suited for the purpose.

Lantern and other facilities for illustrating papers to be read before the Society have been provided.

Through the kindness of the Commissioner of Customs of Canada all packages, specimens, charts or documents intended, or serving, to illustrate papers read and presented at the Geological Society's meeting will be admitted *free* of duty.

A large attendance is expected at this meeting as many have already signified their intention of being present. A local Committee has charge of details for the Meeting. The evening sessions, when the work of the day is over, promise to be of an interesting nature. To relieve the burden of the day-work a couple of functions have been arranged for already and the Annual Dinner of the Society will be followed by a Reception at which His Excellency the Governor General will be present The Premier, Sir Wilfrid Laurier, the Hon. Mr. Oliver, Minister of the Interior, and head of the Geological Survey Department, as well as other Cabinet ministers in the Capital are also expected to be guests at the dinner.

The meetings partake of an international character and the Public Lecture to be given on Thursday, Dec. 28th, will be on 'The preservation of Niagara Falls"—a subject of deep interest to all North American citizens.

The following order of events has been practically decided for the evening entertainments :

(1) Presidential address ; Prof. Raphael Pumpelly. To be given in the Russell House parlour. Followed by a smoker.

(2) Public Lecture: Dr. J. M. Clarke, State Geologist, of Albany, N.Y. Subject: "The Conservation of Niagara Falls." In the Assembly Hall of the Normal School, Lisgar street.

(3) Annual Dinner of the Society, Russell House, followed by a Reception, when Their Excellencies the Earl and Countess Grey and other citizens will be present.

EXTRACTS FROM THE DIARY OF THE LATE ROBT ELLIOTT.

The whole of the life of this lovable naturalist was lived three miles east of Bryanston, near the banks of the Thames River. For him every occurrence in nature had its interest, and his acquaintance with the different branches of Natural History was that of the thorough student, no person in his district being so well acquainted with so many branches of Natural History as he. His death at the early age of 44 was a great loss to his friends rather than to the public, as he could seldom be induced to write anything upon Natural History for publication, always demurring on the ground that his knowledge of the subject proposed was too limited.

Some of his many poems have been published in local papers, such as the Farmers' Advocate and the London Free Press, and after his death a small volume of selected verses was printed in London. His health was never robust and the pressure of other duties often prevented him from keeping up his Natural History studies and notes as thoroughly as he might otherwise have done, but there is much of great interest in his diaries, relating mostly to Botany and Ornithology, though also touching on almost all the other branches of Natural Science. These notes are now in the hands of Mr. W. E. Saunders of London under whose selection portions of them are to be published in the columns of the OTTAWA NATURALIST.

April 3, 1887. Heard the first Hyla. Saw Towhee (for the first) two males. Yesterday (Sunday) was a typical spring day, the sun shining—the snow rapidly melting—a soft south wind

blowing—birds singing—frogs croaking, etc. Today is somewhat different. In the forenoon cloudy with a strong west to northwest wind blowing. Tonight, 9 P.M. we are having a veritable blizzard, colder, with snow. What of the birds? The Phœbe that chirped this morniug on the barn, or the Robin that sang on the Lombardy poplar at the gate?

April 8. Saw large numbers of *Branchippus stagnalis*, in pools, also caddis-fly larvæ in their curious cases in the same location. Some, perhaps seventy-five per cent, of the cases were made of fine twigs and pieces of grass crossed, the balance was formed of the bark of dead twigs with the wood removed—the larvæ occupying the interior. All appeared alike, head with strong jaws and three pair of legs.

April 14. Saw a Great Horned Owl with three Red-tailed hawks assaulting it; when a dozen or so of crows came to help along the fight the hawks retired. The owl kept low, not more than twenty feet from the ground each time it alighted; twice I saw it in the crotch of a small tree crouching beside a limb, and with tail and wing slightly separated it looked so exactly like a dead branch of a tree hanging there that without knowing for a certainty that it had settled there I would not have suspected its identity. I approached twice within fifteen feet and had an excellent view.

Last Sunday (10th) J. E. saw a racoon that the dog caught as it was attempting to climb a tree. The animal was so poor after its winter fast that it could scarcely stand and was quite unable to climb. The dog did not hurt it and J. E. caught a frog which it ate in presence of the dog.

May 19. Saw Wodchuck in a bare field. When hard pressed he lay flat on the soil and remained motionless; when disturbed his teeth were ground in a very threatening manner. We let him go and he left for the nearest fence working his teeth all the time and displaying to their fullest the hairs on his tail.

June 2. Found nest of Junco in grassy place at edge of woods; placed beneath the half of a hollow log completely covered, with entrance a foot from nest at end of log, contents four young Juncos and one Cowbird. Nest composed of weeds bark strips lined entirely with dry grass leaves.

June 5. Found nest of Redstart among young maples at Model Farm, placed in fork of sapling seven feet from the ground; composed outside of weathered vegetable fibre, inside fine grass stalks, rootlets and a few hairs, contents three Redstart eggs and one Cowbird's, incubated about two days. The latter egg was sunk more than half way down the bottom of the nest and would not likely have been successfully hatched.

March 4, 1888. Dark, cold and dreary. Wind north or northwest, snowing a little A.M., darker P.M. Winter Wrens singing. Brown Creepers and Golden Crested Kinglets very common. From appearances, today may be taken for mid-November. A close glance, however, reveals many reassuring signs of the revival of nature. In the woods innumerable mottled leaves of Erythronium are boldly pushing through the withered relics of last year's vegetation; Jeffersonia is daringly lifting her delicate looking flower buds beside the pond; and in sheltered nooks, reptiles, etc. are freeing themselves from winter's iron grasp.

March 24. Cold and clear. Saw two Pileated at edge of woods not far from house. One would cackle and the other would start the echoes with a ringing caw. They looked very fine, the setting sun striking their brilliant scarlet crests.

April 27. Young Shore Larks on the wing. Saw Water Thrush feeding in shallow water in willows. How quickly nature responds to the warm invitation of the sun. Today plants are springing up in every nook and cranny. Podophyllum is lifting its umbrella to shelter its wax-like blossoms from the glare; Dicentra will soon hang her ear drops in the fresh air; Claytonias are out in all their modesty and sweetness; Hepaticas are very common and already *Erigenia bulbosa* is setting her tiny seeds. Good bye, dear little harbinger of Spring, well have you fulfilled your mission.

April 27. The summer Warbler is singing cheerily from the willows and cherry trees today for first. Young Shore Larks on the wing. Saw Water Thrush feeding in shallow water among willows. How quickly Nature responds to the warmth.

May 2. Hoar frost last night. Morning clearing and

warmer. Pileated at nest, doing what, I can hardly say. Nest is apparently finished, if not, work is going on in a desultory fashion.

May 3. Saw Pileated at nest 5 P.M. Half an hour later saw a Redhead chasing Pileated round and round. Saw six species of Woodpeckers today including Red-bellied.

May 4. W. R. Shrike's nest in Crataegus at Hardy's. Nest 9 ft. from ground, 3 ft. from trunk, on horizontal limb with numerous upright twigs, composed outwardly of twigs, strips of bark, wool, strings, and thistle down, lined inside with wool, feathers and a few horse hairs. Contents, six fresh eggs. Male was feeding female on nest when I approached.

May 9. Pileated is seen more frequently around nest. Dug up two specimens of *Cambarus diogenes* from bottom of ditch, placed in a sort of pocket or cell at water line. Found Blue Jay's nest in *Tsuga Canadensis* fifteen feet from ground and ten feet from trunk, on bank of river. First specimens seen today of Black-throated Blue and Black-throated Green warblers, Redstart and King-bird. Saw Cricket for first.

May 18. Cold and wet. Found beneath rotten log in swampy woods a Salamander, length 6 inches. Color dark brown or smoky black, body, back, sides and tail blotched with blue spots. Tail sticky. When placed in spirits it exuded a considerable quantity of milky fluid, mostly from tail. (A Jeffersonianum.)

May 21. Beneath a rotten log in bush found a Salamander 5¾ inches long, same situation of one of 18th. Color greyish brown, with rather large quite distinct yellow spots. Near the same place found a smaller Salamander 4½ inches long. Similar in markings to the one of the 18th. On irritating it with a twig it exuded a considerable quantity of a milky fluid from the blotches on the tail. This fluid was extremely sticky.

Found beneath a rotten log in dry beech woods a small Shrew, No 20, length 3 inches, tail 1½, color greyish brown, ears large and open. Long hairs on nose, eyes small. A small tuft of bristles on end of tail. Ate two angle worms and one May bug, then died in bottle.

May 23. Saw Blue Jay's nest in grape vine, underneath veranda at H. H's, four feet from door and exactly opposite to it.

People going in and out every day. Contents, two very young birds and one egg.

May 26. Visited Pileated's nest by means of ladder. About 32 feet from ground. Found young birds in nest. Believe it was occupied last year and intend watching next year in same place.

May 27. About 7 P.M. saw two very large flocks of birds flying north and making a sound like young dogs ; probably a species of gull.

May 29. Very warm. At Calamus Point saw two water snakes slip into the water. Captured one and placed it beneath stone on the flats.

May 30. Went for water snake and found it collapsed. It was about 25 inches long. Captured a small one near the same place, alive, and brought it home. It proved to be *Tropidonotus leberis*, Leather snake.

May 31. Found water snake of same size as the first one. The five individuals of this species that I have seen during the last three days were all in moderately deep water—18 inches, among large stones, and in a steady current. One of them settled in the bottom among some decayed plants and seemed inclined to stay there ; the others all appeared unwilling to remain underneath the surface for any length of time ; all coming to the surface quite close to me at intervals of about three minutes.

They are easily captured and are apparently quite docile. The large ones are darker and the lines on belly are not nearly so distinct as in the smaller ones.

June 6. At Gough's, 6th Con. took set of five nearly fresh eggs of *Accipiter velox*, Sharp-shinned Hawk. Nest was situated in dense Arbor Vitæ swamp, twenty feet from ground, built on a number of small branches ; a large collection of twigs of Arbor Vitæ and Larix, mostly the latter ; an oblong pile, a foot thick and running half way around the tree. Nest placed on top of one end of the structure. Eggs fresh or nearly so. Bird remained on nest until I got within a few feet ; flew off but remained near and was clearly identified.

June 7. A Hairy Woodpecker has come regularly once or twice a day until very lately to an oak post near Gough's door, on

which is placed a strand of wire. He drums on this and the effect is quite musical.

July 10. Fine. Up to Model. *Cypripedium spectabile* with twenty-four decayed blossoms on it in swamp. Tried to imagine how pretty it must have looked in its prime. Five young Ruffed Grouse rose from the sedgy swale nearby—a spirited lot. Crossed the river to gather some Sweet Flag, then passed further north to see *Nuphar advena* lifting their golden crowns to the sun. How exceedingly beautiful this plant is when closely examined.

July 26. Last summer found a plant in seed, in blue clay and gravel at the edge of Plover Pond ; name unknown. Sowed the seeds in garden. In bloom today—proves to be *Lampsana communis*—Nipplewort.

TWO RARE FUNGI.

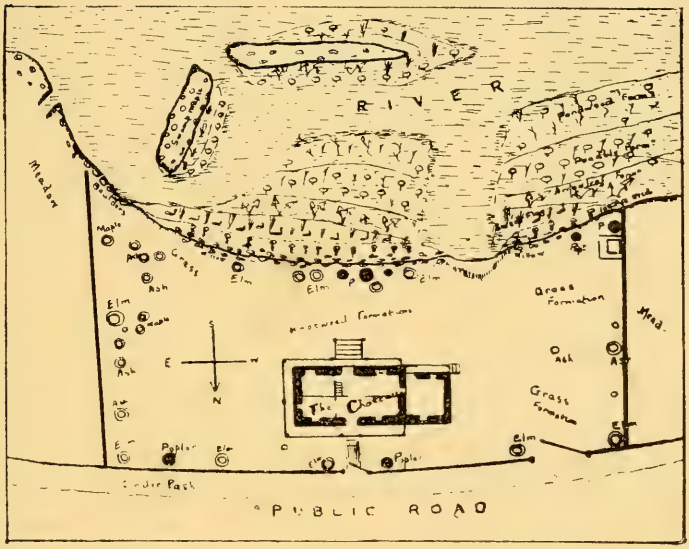
Two very interesting fungi were recently sent for determination to the writer and Dr. James Fletcher, by Mr. Henry Johnson of Simcoe. Neither of us having seen these species before they were submitted to Mr. E. A. Burt for his opinion. One he identifies as *Cyclomyces Greeni*, Berk., the other as *Pleurotus subareolatus*, Peck., both very rare species and not before recorded from any point in Canada, so far as we know. The *Cyclomyces* was found found by Dr. W. A. McIntosh a short distance from the village of Lynnville, in Norfolk Co It was growing on the ground among some rotten wood, but whether on the wood or in the soil Dr. McIntosh could not say. The *Pleurotus* was found by Mr. Johnson "in Lynnwood Park in the town of Simcoe It grew on a small maple tree which stood among a clump of pines. Something had taken the bark off one side of the tree and the exposed part had decayed somewhat and here the fungus was growing."

JOHN MACOUN.

NATURE STUDY No. XXX.

NATURE OBSERVATIONS AT HOME.[1]

By Prof. W. LOCHHEAD, Biologist, Macdonald College, St. Anne de Bellevue, Que.



The observations and suggestions for study indicated in this article have special reference to a well-known property on the banks of a well-known river. This plot of ground, however, is not very unlike other plots of ground, and similar studies may be carried out in nearly all home grounds, more especially those that border on lakes, rivers or smaller streams. By referring to diagram, one will note that the property lies between the public road and the river; that there is a large number of middle-sized, shade-giving trees, most of them along the borders of the lot; that a stone house stands near the middle of the grounds; and that the shallow shore is fringed with plants, while farther out are two small islands, fringed also with plants standing knee-deep in the water.

It may be observed, also, that the property stands at the head of a little bay, or bayou, of the river, where the currents are

not as strong as those farther out, and which the sediment and silt are rapidly filling up. The two small islands stand at the mouth of this bayou and have been formed as bars by the currents of the river.

The white-washed stone house is the first object to attract the eye of a casual visitor, for it has a peculiar appearance, characteristic of many of the old French Canadian houses seen in many parts of the country. Its stone walls are nearly three feet thick, its long concave roof projects far beyond the walls to form the covering of the verandah, and its upper dormer windows stand out half-way up the roof. It was built more than one hundred and fifty years ago, and its age should of itself invite questions. Locally the house is known as "The Chateau," and has been for several generations the homestead of a large French Canadian farm.

The large number of medium-sized trees with abundant foliage make this property a delightful place during the hot days in summer. Unfortunately, no evergreens had been planted by the former owners, so there is little or no protection in the winter from the cold, penetrating winds. The trees were likely planted at different times, for the slow-growing white elms are almost as tall as the more rapid-growing white ashes, soft maples and cottonwoods or poplars. Here are good opportunities for a comparison of the habits of these common trees :—their general appearance from a distance, their manner of branching, their bark, their leaves and leaf arrangement, their fruits, and also their insect and fungous enemies, etc.

Perhaps the most interesting plants flourish in the shallow water along the river bank. There the plants are plainly grouped into formations, or zones, running parallel with the shore, each characterized by certain dominant species. For example, on the low bank are low willows and swamp maples; nearer the water, yet on the sandy beach, are joe-pye weed, elodes and water horehound. In the water along the shore are sweet-flags, cat-tails, bulrushes and arrow-leafs ; in deeper water are pond lilies and Indian rice; and in yet deeper water are the pond-weeds and bass-weeds (see diagram where each zone is called after its dominant plant). Such a shore plant-society deserves and well repays care-

ful study, for it is evident that its members must possess special adaptations for such an aquatic life. What are some of these adaptations? In the first place, we observe that most of them are perennial, and have well-developed rootstock systems in the loose soil below the surface of the water. From the rootstocks arise vertical branches bearing the leaves and flowers. Again, the tissues of such rootstocks are spongy in texture, and contain many air cavities, for some provision must be made for the supply of oxygen requisite for the respiration of the living cells. Moreover, the stems have but little need of mechanical woody tissue on account of the buoyancy of the water, or of cork because the plant is compelled mainly to absorb its food directly through the walls in contact with the water.

The leaves of these aquatic plants are also adapted in many ways to the medium in which they live. The floating leaves are oval or shield-shaped, as is the case with the pond-lilies; while the submerged leaves are either dissected or ribbon-like, as in some pond-weeds, water-milfoils and water butter-cups. Often the under surface of floating leaves is purple to absorb as much of the heat as possible. The arrow-leafs have peculiar arrow-head shaped leaves, but occasionally one finds submerged forms that are grass-like.

The reproduction of these plants is interesting. The flowers are all borne on or above the surface of the water, and the pollen is carried by winds, currents of water, or by insects in the case of conspicuous flowers like the pond-lilies. Moreover, the seeds of most of these plants are able to float on account of the presence of air cavities, and are scattered by currents. Bud propagation also is very common. Special buds containing much food drop off into the mud and develop into new plants the following season.

Further, it will be observed that the intricate net work of upright and horizontal branches at the edge of the water collect silt and entangle fallen dead plants. In a short time the mud accumulates to such an extent that the water becomes sufficiently shallow to allow flags and rushes to develop and oust the former owners. These in turn will give place to joe-pye weeds and willows, and so the struggle goes on for possession of the shallow waters and an extension of the shore.

Here are a few additional questions relating to water lilies which the nature student should try to answer. In what respects are the leaves. flowers, and rootstocks of the white and yellow water-lilies alike? In what respects do they differ? What is the function of the air-canals in the petioles and peduncles? Why is the upper suface of the leaf waxy? Determine on which surface of the leaf the stomates or breathing pores are placed. Do the submerged rootstocks bear leaves? What hold the rootstalks at the bottom? Account for the numerous scars on a rootstock. What is the color of the rootstock? In what part of the rootstock are the strengthening tissues located? What differences in the habits of the flowers of the two species? What changes occur to the pistil when it is mature? What insects visit the flowers? What are the insect enemies of pond-lilies?

Other plant formations may be studied in the ground around the house. At the back door where there is abundant nitrogenous waste are knot-weeds, lamb's quarters, chickweeds, large-leafed plantains, burdocks, ragweeds, shepherd's purse, docks, and nettles. All are hardy, quick-growing, and prolific in seeding.

Here again are special adaptations. The stem of the large-leaved plantain is actually pulled down a short distance into the ground by its many contractile roots, and the plant is better preserved from injury than if it lifted its stem into the air. The chickweed leaves have lines of hairs which direct the rain which falls on them down the stem to the roots. The pointed leaf of the nettle, on the other hand, directs the rain away from the stem, and allows it to drip from the tips of the outside leaves to the ground. The roots of the nettle spread widely, and the rain falls where it will be most refreshing. The docks and burdocks have deeply penetrating roots, and they seldom suffer from lack of moisture.

Beneath the trees the plants are mainly blue grasses. There the vegetation is so rank and close that other plants have but little chance to make headway. Sometimes rib-grass, yarrow, and ox-eye daisy establish themselves, but these, it will be noted, have leaves either narrow like the grasses themselves, or dissected so that they can compete with the grasses. The grass leaf shows an daptation to rain. When rain falls the water running down the

leaf is prevented from passing within the leaf sheath by the ligule, the small scale at the junction of leaf and sheath.

Much could be learned about the insect life of *The Chateau*, but space will allow only a brief notice of a few forms, not to mention the always interesting common white and sulphur butterflies, the swallow-tails, the red-admirals, fritillaries, meadow-browns, and the bluets, which flit here and there and from meadow to meadow, or the bees, wasps, flies and beetles which are on the flowers at the water's edge. Many yellowish maggot leaf-miners inhabit the leaves of joe-pye weed and feed on the soft tissues between the two outer layers.

Plant-lice are abundant on the stems of some of the plants. Those that cluster on the stems of lamb's-quarters are of a greenish color, those on the Canada thistle black, and those on small Balm of Gilead spotted. Ants, too, are there feeding on the sweet honey-dew secreted by their "cows." Small caterpillars form nests on the umbels of the wild parsnips by drawing the flowers together with silken webs, and large black-and-white, plumed caterpillars feed on the leaves of the ash trees, and often make themselves too friendly when they drop from the leaves to the hats and coats of the passers-by.

Insect life is varied enough to allow the close observer a wide choice of subject, and blind he must be who can not find in this great field many and interesting studies.

Down along the shore is a low wall of large stones built by a former owner for a breakwater. To a student with an interest in minerals and rocks, these stones are instructive objects; for there are boulders of gneiss rocks and granite, sandstone almost changed to quartz rock, quartz conglomerate, and dark grey limestone. All of these have stories to tell, and some of them are miles away from their original home, having been carried by the great glacier. All show traces of the action of water and ice; their rough edges are rounded, and their sides are scratched and sometimes flattened.

The public road occupies the summit of the old beach, where the river was both wider and deeper than now. Away across the river the old beach may be seen quite plainly at the same height.

Just as if these evidences were not sufficient to convince us of the fact, another is near at hand, for there are stratified deposits of clay, sand, and gravel exposed in the sides of a small gully which has been made by a little stream flowing across the road not five rods away.

In this home property bird-life, too, is abundant and readily studied. During July and August the warbling vireos whistled delightfully from the tops of the trees, the swallows darted swiftly after the numerous insects which filled the air above the shallow waters, the nuthatches and the black-and-white warblers searched the tree trunks for insect food, and the flycatchers made sallies from their perches on the lowest cottonwood limbs to catch insects on the wing. Besides these were several kinds of water fowl and shore birds down by the river, the woodpeckers, the kingfishers, the catbirds, the American goldfinches, the yellow warblers, the red-winged blackbirds down among the reeds, the phœbes, the chickadees, the domestic sparrows, the song sparrows, the chipping sparrows, and many others, all within a few rods of the observer.

Space forbids further notice of the many other interesting objects of study, and problems which the young student finds awaiting solution about his own home.

This paper is practically a plea for a closer study of our home surroundings, a study too often neglected by our nature students under the impression that nothing interesting or instructive can be found there. As a matter of fact, the home with its garden and lawn is the very best field for Nature study. We require to give more attention to the commonplace things and to understand their real significence in everyday life. And how many commonplace things there are to study when we actually *see* with our eyes and *hear* with our ears, and when we realize that every detail of the structure of a plant, animal or landscape has a history and a meaning, and how few of our commonplace studies are beyond the comprehension of the smallest child!

When we know the things close at hand, we shall understand the things at a distance. When we understand the life-relations of the inhabitants of our yards and gardens, we put ourselves

into a right relationship with the big Nature world about us.—Study our home surroundings.

Down in a low corner of the grounds the soil is covered with much decaying vegetable matter. Ferns and mosses grow there and the leaf-screen of the trees allows but little sunlight to reach the damp soil. Year after year the organic matter accumulates in this corner, for pieces of limbs and bark are added to the leaf-mould, and year after year the decay continues. It is worth our while sometimes to observe the disintegrating agents at work. The leaves and twigs are often eaten by borers, sow-bugs, and centipedes, and the fungi continue the work on the stems which they have made to fall. Rupturing the bark of the dead limbs black pustules of many kinds of "sac-fungi" may be seen. The fine threads of these fungi have already penetrated the wood of the limb in all directions, and have come to the surface to produce their spores. On many limbs are slimy masses of the "slime-fungi," which also sends fine threads through the wood in search of food.

We may observe, moreover, that the bark breaks down less rapidly than the wood, for bark, we know, is largely composed of corky matter, which absorbs water but slowly; and as the destructive agents require moisture, its break-down is quite slow. The lichens, mosses and algæ that live on the bark, no doubt, hasten the operation, but the main agents are certain larger fungi and the bark-beetles. Moulds and bacteria follow and break down the tissues much farther. Soon this vegetable matter becomes mixed with the soil, forming a new soil from which mushrooms and other similar forms get their food-material. The decay continues through the activity of other delicate underground fungi attached to the rootlets of trees, whose threads explore the ground in every direction. In a few years the vegetable tissue, therefore, is completely broken down and incorporated with the mineral matter to form humus soil.

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1906.

Jan. 9.—Illustrated Lecture: *The Geology of Strathcona Park and other Ottawa localities.* Dr. H. M. Ami.

Report of the Geological Branch. W. J. Wilson, Ph.B.

Jan. 23.—*The Migration of Birds.* C. W. G. Eifrig. Illustrated by specimens.

Report of the Ornithological Branch. Mr. A. G. Kingston.

Feb. 13.—Illustrated Lecture: *Trees, Shrubs and Plants for the Adornment of Home.* Dr. W. Saunders, of the Central Experimental Farm.

Feb. 27.—Conversational Evening: short addresses on various subjects.

Prof. J. Macoun: *Botany.*
Dr. J. Fletcher: *Collection of Insects for Schools.*
Dr. Otto Klotz: *Gravity.*
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Mar. 13.—*Fish Culture.* Prof. E. E. Prince, Commissioner of Fisheries for Canada. Illustrated by specimens.

Mar. 27.—ANNUAL MEETING.

Address by Mr. A. Gibson: *Method of Studying Insects followed at Central Experimental Farm.*

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DESCRIPTIONS OF NEW SPECIES OF TESTUDO AND BAËNA WITH REMARKS ON SOME CRETACEOUS FORMS.*

By LAWRENCE M. LAMBE, F.G.S., F.R.S.C., Vertebrate Palæontologist to the Geological Survey of Canada.

(With two plates.)

In the collection of vertebrate remains, made by the writer in 1904, from the Oligocene deposits of Bone coulée, Cypress hills, Assiniboia, are parts of a number of costal plates of a tortoise referable to the genus Testudo. The specimens were found separately but apparently belong to one species, and, although fragmentary, they are of sufficient interest to warrant description, especially as they appear to belong to a hitherto undescribed species. For this species the name *exornata* is proposed.

The three specimens figured (plate III, figures 3, 1 and 2) are the proximal end of the left 1st costal, the distal half of the left 5th costal and the proximal end of the left 6th costal.

All the specimens shew decided groove markings. Selecting the distal end of the 5th costal plate (figure 1) as the type of the species, it is seen to be particularly narrow and thick but its outline indicates that the bone when entire had a considerable breadth proximally. Its upper surface presents a number of parallel shallow furrows in the direction of the length of the carapace. It is thickened along its posterior articular border where it joined the similarly thickened anterior border of the 6th costal,

* Communicated by permission of the Acting Director of the Geological Survey of Canada.

thus forming a stout ridge for the reception of the inguinal buttress.

The specimen shewn in figure 2 is apparently the proximal end of the left 6th costal plate. This costal when complete was evidently much broader toward its outer end. Deep sulci on the upper surface mark the position of the 4th vertebral and the 3rd and 4th costal shields. Distinct grooves also cross this plate from side to side at its inner end where the sutural surfaces for articulation with the 6th and 7th neural plates are preserved.

The third specimen (figure 3) is the inner end of the left 1st costal and on its surface are concentric grooves indicating an epidermal shield pattern such as is found in some of the modern species of the genus.

These specimens shew that the costal plates were alternately narrow and broad distally, and broad and narrow proximally, a common character of species of Testudo.

The writer is indebted to Dr. O. P. Hay, of the American Museum of Natural History, New York, for critical suggestions relative to the specimens on which the present species is based.

Measurements.

	MM.
1st costal plate.	
Maximum thickness at centre of proximal end	7
Thickness of specimen at anterior suture	5
,, ,, ,, posterior ,, ...	4
5th costal plate.	
Thickness at proximal end of specimen	5
,, near distal end at anterior suture	5
,, distally near posterior suture.....	8
6th costal plate.	
Thickness at proximal end	8

This species is peculiar on account of the extreme narrowness and thickness of the 5th costal plate. The surface of the carapace bore a distinct pattern of grooves which were anteriorly at least arranged concentrically within the boundaries of the epidermal shields.

BAËNA PULCHRA. Sp. nov.

Plate III, fig. 4, and plate IV, fig. 1.

The specimens on which this species is based were briefly described in 1902* by the writer who at that time referred them to *Baëna hatcheri,*** Hay, from the Laramie of Converse county, Wyoming.

Further study of the material has since led the writer to believe that it represents a new species and is not to be referred to *B. hatcheri.* Mr. J. B. Hatcher in his lately published report † on the "Vertebrate fauna of the Judith River beds," in remarks on the species *B. hatcheri,* has stated that "the material referred by Lambe to *B. hatcheri* should either be included in *B. antiqua,* or made the type of a new species." With regard to this statement there is little doubt that the Red Deer river specimens do belong to a new species, but they certainly are not referable to *B. antiqua,* Lambe, of which a large part of the carapace is known.

The specimens are from the Belly River (Judith River) beds of Red Deer river, Alberta, near the mouth of Berry creek, and were collected by the writer. They consist of the anterior half of the carapace with the entire plastron of a single individual (Cat. No. 1130), and of the anterior half of the plastron of another individual, of slightly larger size (Cat. No. 1196). The carapace is crushed and slightly displaced to the left and its left margin is damaged. Other specimens from the same locality and horizon

*Geological Survey of Canada, Contributions to Canadian Palæontology, vol. III (quarto), pt. II, "On Vertebrata of the Mid-Cretaceous of the Northwest Territory.

**Annals of the Carnegie Museum, vol. 1, 1901, "Description of a new species of Baëna (B. hatcheri) from the Laramie beds of Wyoming," by O. P. Hay.

† United States Geological Survey, "Geology and Palæontology of the Judith River beds" by T. W. Stanton and J. B. Hatcher with a chapter on the fossil plants by F. H. Knowlton, 1905. This report is in effect a corroboration of Dr. George M. Dawson's correlation in 1875 and later dates of the Belly River series of the Canadian west with the Judith River series of the upper Missouri, and of the conclusions published in 1902 in Contributions to Canadian Palæontology, vol. III (quarto), pt. II, by Henry F. Osborn and Lawrence M. Lambe.

that probably belong to this species are, a poorly preserved carapace (Cat. No. 1302) that has not been crushed nor distorted in any way and that therefore gives the natural convexity* of the upper surface, the right central part of another plastron (Cat. No. 1634), and the corresponding left portion of a fourth plastron (Cat. No. 1633) of a size somewhat larger than the others and of greater shell thickness.

The type of the Belly River species now described as new, under the above name, in the following paragraphs consists of the plastron (briefly described in 1902) with the front half of the carapace of one individual. Additional information is given relative to the plastron but the characters of the carapace are now published for the first time.

The carapace is flattened and therefore appears unnaturally broad although the front margin may still be considered to be broadly rounded. On the left side the first five costal plates are preserved, on the opposite side the 1st, 2nd and 3rd remain. In the median line are the 1st, 2nd and 3rd neural plates. The nuchal plate is succeeded on the right by the first six marginal plates, on the left by the first seven marginals of which the 3rd to the 7th are seen distinctly only in the lower aspect of the shell as they are injured above and are to some extent crushed under the distal ends of the costal plates. In plate III, figure 4, the carapace is shewn as seen from above, the epidermal shields being indicated by heavy lines and the sutures between the plates by faint ones. Marginal 1 is small and triangular in shape, but the succeeding ones present no unusual characters. The neurals are broader in front than behind and vary somewhat in outline. The 2nd and 3rd are roughly six-sided, the 2nd is nearly as long as broad, but the 3rd is considerably lengthened. The 1st neural is much broader in front than behind. It is of particular interest in that it is divided transversely, the division taking place well forward so as to separate it unequally into a short, broad front portion which is received into a concave emargination of the posterior border of the nuchal plate, and a hinder part that mainly separates the pair of 1st costals.

* In this carapace the height of the centre of the upper surface above the plane of the margin is about 50 mm.

The front part has an area somewhat greater than one-third of that of the combined bone. The 1st costal is almost triangular in shape, the 2nd broadens considerably at its distal end, the 3rd broadens but little distally, the 4th narrows slightly outward, and the 5th narrows very considerably towards its outer end.

Of the epidermal shields the 1st vertebral is nearly twice as broad as long, and narrows rapidly toward the front. This shield is very different in shape from the corresponding one of *Baëna antiqua*. The 2nd and 3rd vertebrals, of which the 2nd is the smaller, are narrower in front than behind and their maximum length is about equal to their greatest breadth. The costal shields need special mention. A small additional shield is in line with the 1st vertebral in advance of the 1st costal as in *B. hatcheri* described by Hay. Also, between the 1st, 2nd and 3rd costal shields and the marginal ones occur other additional shields (supramarginals), narrow in comparison with their length, one between the outer ends of the 1st and 2nd shields, a second in a corresponding position between the 2nd and 3rd. The 1st, 2nd and 3rd costal shields instead of being square at their distal ends come to a point. The position of the accessory shields finds corroboration in the second carapace already mentioned. The margin of the carapace in front is indented at regular intervals, viz. where the sulci marking the boundaries of the marginal shields pass over the peripheral border. The marginal shields as seen from above are long and narrow. The proportions of the 4th vertebral and 3rd costal shields, as indicated in the figure by broken heavy lines, are taken from the second carapace in which also another supramarginal shield is partly shewn between the distal ends of the 3rd and 4th costal shields.

The plastron is longer than broad. The anterior lobe is shorter than the posterior one and is narrower, especially at its front termination. Its margin is sinuous in front, indentations occurring where the sulci reach the border. Well developed mesoplastral bones are present, meeting in the median line where they are narrow. The entoplastral is diamond shaped, and is nearly twice as long as broad.

There is a small divided intergular shield in advance of comparatively large gular ones, the intergular sulcus crossing the

plastral lobe from side to side considerably in front of and in a general way parallel to the transverse gular sulci. Four inframarginal shields are present on each side.

Baëna pulchra is about half the size of *B. hatcheri*, from which it differs mainly in the proportions of the lobes of the plastron, the shape of the entoplastral plate and the disposition of the intergular and gular shields. A number of minor differences are seen in comparing the figures of the plastron. That the Belly River species closely approaches the Laramie form is evident and in *B. pulchra* we probably have the ancestor of the closely allied *B. hatcheri* and *B. marshi*, Hay. The presence of a divided 1st neural plate in *B. pulchra* is interesting. Two other Belly River species, *Trionyx foveatus*, Leidy, and *T. vagans*, Cope, have also been shewn by the writer to possess a corresponding divided plate. A detailed description of the carapace of *B. hatcheri* has been promised by the author of that species and possibly a full series of supramarginals, such as *B. pulchra* is seen to possess, may also be found in the former species. It may be interesting to note in this connection that the living species *Macroclemmys temmincki* (Alligator turtle) of the basin of the Mississippi and Missouri rivers has an additional series of about four supramarginals intercalated betweed the costal and marginal shields.

Other species of Chelonia from the Belly River series in Canada are *Trionyx foveatus*, Leidy, *Trionyx vagans*, Cope, *Adocus lineolatus*, Cope, *Basilemys variolosus* (Cope), *Baëna antiqua*, Lambe, and *Neurankylus eximius*, Lambe. Besides the above, three species from the same horizon, have been described from material collected by Dr. G. M. Dawson in 1874 (British North American Boundary Commission*) ; these are *Plastomenus coalescens*, Cope, *Plastomenus costatus*, Cope. and *Compsemys ogmius*, Cope.

After Leidy's description, with figures, of *Trionyx foveatus* was published in 1860, little was added to our knowledge of the shell of this species until 1902 when the writer's description of his

*"Report on the Vertebrate fossils from the Fort Union group of Milk River," Appendix B by Prof. E. D. Cope to "Report on the geology and resources of the region in the vicinity of the forty-ninth parallel" by G. M. Dawson, 1875.

Red Deer river specimens appeared † Previously the species was known from a few fragments of costal and sternal bones only ; the Canadian material has given us an almost complete knowledge of the structure of both the carapace and plastron.

A nearly perfect carapace of a species of Trionyx, and numerous large fragments of the shell of the same spieces, were obtained by the writer from the Belly River beds of Red Deer river near the mouth of Berry creek. These specimens were identified by him in 1902 ‡ with *Trionyx vagans*, Cope, and full descriptions with figures were given of the carapace. The figures, in the Contributions to Canadian Palæontology, showing the details of sculpture are from photographs and may be considered as good examples of reproduction by the heliotype process. Mr. Hatcher in his report on the Vertebrate Fauna of the Judith River beds, 1905, expresses doubt as to the correctness of the identification of the Red Deer river specimens with *T. vagans*, Cope, of the Laramie. The distinctness of the Laramie and Belly River (Judith River) faunas as proved by recent work on the fossil remains of the Belly River series is in favour of the Belly River species being distinct from *T. vagans*. If however the Belly River Trionyx in question is to be proved to be specifically distinct from *T. vagans* structural differences other than those of the surface sculpture as shewn in Cope's type will have to be relied on. The following sentences appear in Mr. Hatcher's report : "By reference to his (the present writer's) figures, however, it will be apparent to all that the specimens described by Lambe pertain to a species distinct from *T. vagans*." "According to Lambe's figures the ridges on the surface sculpturing, instead of being 'thin and much narrower than the intervening pits,' as described by Cope, are heavy and broader than the intervening pits." This the present writer cannot agree with nor can he depart from his original statement that the ridges of the surface ornamentation are narrower than the pits as seen in the specimens themselves and as shewn in the photographic figures accompanying his descriptions. In 1902, through the courtesy of Professor H. F.

† Geol. Survey of Canada, Summary Report for 1901, p. 81, pls. I and II, 1902, also Contr. to Canadian Palæont., vol. III (quarto), pt. II, 1902.

‡ Ibid.

Osborn and Dr. O. P. Hay, of the American Museum of Natural History, New York, who kindly lent the type of *T. vagans*, the writer was able to compare it with the Red Deer river material. This type consists of a small fragment, about two inches long, of a costal bone in which it would be difficult to point out any reliable differences between its surface sculpture and that of the Red Deer river specimens. The original description of the species by Cope is necessarily meagre. It does not seem to be so clear, therefore, as Mr. Hatcher's remarks might lead readers of his report to suppose, wherein lie the differences between the Belly River form and *Trionyx vagans* from the Laramie.

The types of *Adocus lineolatus*, Cope, were, according to Mr. Hatcher,† "almost surely secured from the Laramie." They are fragmentary as are also the specimens obtained from the Belly River formation in Canada by the writer who, in 1902, in Contributions to Canadian Palæontology referred them to Cope's species. In comparing the types with the Canadian material the only character available is the surface sculpture in which there is so great a similarity that, for the present at least, it appears best to use the name of Cope's species for the Canadian specimens, until other characters are obtained to prove or disprove the correctness of the present writer's identification.

The plastron of *Basilemys variolosus* (Cope) is now well known from the material obtained by the writer, from the Belly River beds of Red Deer river, Alberta, and described and figured by him in 1901* and 1902**. Cope's description, based on material from Montana, was given in general terms, and published without figures, which may account for the slight notice that this large rugosely sculptured tortoise had apparently attracted.

Baëna antiqua and *Neurankylus eximius* are two other species, from the Canadian west, described and figured by the writer in 1902 (Contributions to Canadian Palæontology) from material secured on Red Deer river in the vicinity of Berry creek. Addi-

† Vertebrate Fauna of the Judith River beds, 1905.

* Ottawa Naturalist, vol. XV, p. 63, pls. III, IV, V and VI.

** Contr. to Canadian Palæont., vol. III (quarto), pt. II.

tional information regarding the structure of the shells of these forms would be most welcome.

The type of *Plastomenus coalescens* is in the museum of the Geological Survey at Ottawa, and consists of part of the plastron (not parts of the plastron and carapace as stated by Cope in his original description, and by Hatcher* in his remarks on the type material) of a species that will probably prove to be identical with the Belly River series Trionyx that the writer has identified with *T. vagans*, Cope. Dr. O. P. Hay, of the American Museum of Natural History, New York, found, in 1901, undoubted contact between the piece that had been described as belonging to the carapace and the larger portion that had been rightly considered as part of the plastron, the complete specimen representing a considerable portion of the right hyo—and hypoplastral bones with the sutural division between them clearly indicated.

The types of *Plastomenus costatus*, Cope, and *Compsemys ogmius*, Cope, are also in the museum of the Geological Survey at Ottawa.

The material on which *P. costatus* is based is very fragmentary but the sculpture shewn on part of a costal bone is quite different from that of any species from this horizon known to the writer. The sculpture will no doubt prove to be sufficiently characteristic for the identification of any additional parts of the carapace that may be discovered.

Compsemys ogmius, Cope, (type specimens at Ottawa) is, as was pointed out by the writer in 1902,** probably identical with *Basilemys variolosus* but the specimens are fragmentary and so poorly preserved, although Mr. Hatcher in his 1905 report referred to them as "fairly good material," that the specific name *ogmius* has not been made use of by the writer. The name *variolosus* is identified with well preserved material representing the greater portions of both the carapace and plastron. The name *ogmius* has been used in connection with the description of two small and poorly preserved weathered fragments of the shell of a species that

* Geology and Palæontology of the Judith River beds, 1905, p. 74.

** Contr. to Canadian Palæont., vol. III (quarto), pt. II, 1902.

cannot with certainty be referred to *B. variolosus*. If *Compsemys ogmius* and *Basilemys variolosus* could be proved without doubt to be identical, the name *ogmius* would have priority.

EXPLANATION OF PLATES.

PLATE III.

Figure 1. Distal half of left 5th costal plate of *Testudo exornata*, as seen from above; natural size. Type.

Figure 2. View of upper surface of proximal end of left 6th costal plate of same species; natural size.

Figure 3. View from above of proximal end of left 1st costal plate of same species; natural size.

Figure 4. Anterior half of carapace of *Baëna pulchra*; viewed from above; one-half the natural size. Type.

V, vertebral shield; *C*, costal shield; *SM*, supramarginal shield; *n*, neural plate; *c*, costal plate; *m*, marginal plate.

PLATE IV.

Figure 1. Plastron of *Baëna pulchra*; viewed from below; one-half natural size. Type.

IG, intergular shield; *G*, gular shield; *HUM*, humeral shield; *PEC*, pectoral shield; *IM*, inframarginal shield; *M*, marginal shield; *AB*, abdominal shield; *FEM*, femoral shield; *AN*, anal shield; *ep*, epiplastral plate; *entp*, entoplastral plate; *hyp*, hyoplastral plate; *msp*, mesoplastral plate; *hpp*, hypoplastral plate; *xp*, ziphiplastral plate; *m*, marginal plate; * centre of front margin of carapace.

The American Association for the Advancement of Science publishes an annual volume of proceedings which is received by all members of the Association. The weekly journal, "Science," is also sent free of charge to all members. The annual volume contains about 2,000 pages, and includes most of the best scientific work of America. Any person may become a member of the Association upon the recommendation of two members. The admission fee is five dollars and the annual dues three dollars.

A NEW NORTHERN ANTENNARIA.

By EDWARD L. GREENE.

ANTENNARIA ATHABASCENSIS. Stout and low, the pistillate plant at flowering only 2 to 2½ inches high, the spread of the depressed and rosulate foliage in some approaching 3 inches: leaves subcoriaceous, spatulate-obovate, very obtuse, without evident mucro, the peliolar basal part not at all well differentiated and short, upper face dull pale green, glabrous except as to some rolls of light loose flocculent or cottony wool along the margin, beneath densely silvery, tomentose, some of the tomentum projecting beyond the edge of the leaf and appearing from above as a white margin to the leaf: infloresence of 3 to 5 large sessile heads: involucre loosely tomentose at base, the bracts all with very long white tips, the outer broad and nearly truncate, the next narrower and acutish, the inmost series fairly subulate and exceeding all the others in length: male plant not seen.

Fort Chippweyan, Athabasca, 4 June, 1903, Edward A. Preble; type specimens in U. S. Herb. A very strongly marked member of the group of *A. neglecta*, but a coarse and stout plant as to habit, though low in stature. The heads are as large as those of the Rocky Mountain *A. aprica*, but in character very different from those of that species.

THE SWAN SONG OF THE LEAVES.

By MARY ELIZABETH MCOUAT, B.A.

These leaves that redden to the fall.—*Tennyson.*

Among the more commonly observed phenomena of nature it is doubtful if there is any more commonly misunderstood than the coloring and fall of leaves in autumn. When the plain green of summer changes so suddenly to gold and crimson most people take it for granted that the frost is responsible for the transformation. But anyone who will take the trouble to think a little will see that this is a mistake. It is in August, long before the frost comes, that the red maple "crimsons to a coral reef," and it is in years when the frost comes late that the leaves color most beautifully.

It is true that the autumn colors, with all their beauty, are those of death and decay. They are in fact the swan song of the leaves. But this death and decay are not due to frost. The leaves know that their hour has come without any such reminder, and of their own accord, as it were, they prepare in truly royal fashion to leave the stage.

In this preparation there is a general breaking up of the elements which compose the foliage, and this is what causes the change of color. Yellow, the commonest of the autumn colors, is produced by the decomposition of the summer's green. The chlorophyll, which imparts this green color to all plants, is made up of two substances, one bluish and the other yellow, and in autumn when the leaf is getting ready to die, these two substances are separated. The blue disappears and the yellow remains to give its color to the foliage.

The origin of the red color is not so well understood, but it is believed to be produced by the waste mineral matter which collects in the tree during the summer. This is taken up by the roots in the water which it is their business to supply to the tree, and is stored chiefly in the leaves, where it is very much in the way, but partly through the whole tree. Now before the leaves fall the tree takes from them everything it wants to keep and gives to them everything it wants to get rid of, and the collection of all this waste matter in the leaves has much to do with their coloring. For this reason the color is most beautiful after a rainy summer, provided the fall is of the right kind. In rainy seasons there is more water for the roots to take up, and the more water taken into the tree, the more waste matter is stored up to color the leaves in fall.

The only color that the frost has anything to do with is dark brown. When the delicate cells of the leaves are frozen they die and turn brown.

With the fall of the leaf the frost has equally little to do. Trees shed their leaves in countries where it never freezes, and in the North a great many fall before the frost comes. Neither is it the autumn winds that make them fall, though both they and the frost help a little. A wind strong enough to blow the leaves off would take the twigs too and very likely uproot the tree.

The leaves fall simply because the tree cuts them off. They have done their work and are no longer needed. The tree does not eat during its winter sleep and therefore does not need the food that the leaves manufacture, and though it always has to breathe, it can breathe through its roots and bark, just as animals can breathe through their skins. So it casts aside its useless leaves as a woman discards her summer gowns, cutting them off silently and without observation, but as surely and smoothly as they could be cut with a sharp knife.

Besides being useless the leaves would also be dangerous if left on during the winter, as they would catch the snow and wind and thus cause the breaking of twigs and branches. Sometimes an early snow finds the trees unprepared, and then they are sure to suffer severely The snow collects on the leaves and the weight breaks off great branches as thick as one's arm. This would happen every year if the trees had not learned to take off their summer clothes in good time.

The cutting-off process begins when summer is at its height. As early as the dog days the trees begin to grow some cork cells between the leaf stem and the twig. This is to prevent an open wound when the leaf falls, for a tree can be wounded just like an animal. Then above the cork cells they grow a layer of another kind of cells. This is called the layer of separation or cutting-off layer, and can easily be seen on the blackberry, for instance, where it forms a yellowish green ring on the purple leaf stalk. There are three rows of cells in this cutting-off layer, and after a while the middle one dissolves into a kind of mucilage, so that nothing is left to hold the leaf to the twig except some woody threads which pass through the cutting-off layer and the layer of cork. Then the cells that are left begin to swell and push the leaf stem from the twig, until at last a puff of wind or a frosty night snaps the threads and the leaf falls to the ground.

The reason frosty nights help is because they freeze the water in the cutting-off layer. The resulting expansion causes the threads that still hold the leaf to the twig to break and as soon as the ice melts in the morning it falls. After frosty nights in the late fall, therefore, there is apt to be a great fall of leaves. That is why people think that the frost makes them fall. But if the

trees had not almost cut them off before, the frost would not do it, and a great many fall without either frost or wind.

After the leaves have fallen some trees cover up the ends of the broken threads with gum, as in the case of the horse chestnut. Here the cork cells that grow at the base of the leaf stalks are shaped something like horseshoes, and the gum-covered ends of the broken threads look like nails in the horseshoe.

NOTES ON SOME BRITISH COLUMBIA MAMMALS.

By WM. SPREADBOROUGH.

The mammals enumerated below were collected or observed along the International Boundary :

BLACK-TAILED DEER—From the Skagit River to the coast. Common on the monntains just west of the Skagit.

MULE DEER—Common from Elko to the Skagit. A few seen west of the Skagit

WESTERN WHITE-TAILED DEER—Common in the valleys along streams from Midway to the Skagit.

DOUGLAS SQUIRREL—A number seen in the Skagit valley. Common from Chilliwack Lake to the coast.

SAY'S SQUIRREL—Very abundant about timber line on the mountains just west of the Skagit and from Princeton to the Skagit.

MOUNTAIN GROUND SQUIRREL—Very abundant from Midway to Sidley's near Lake Osooyos.

YELLOW-BELLIED MARMOT—Common from Cascade to Nine-mile Creek. A few seen about five miles west of Rossland.

HOARY MARMOT—Common on nearly all the high mountains from the south fork of the Salmon River to the coast.

APLODONTIA, "Mountain Beaver"—Common from the Skagit to Sumas Lake,

BEAVER—Saw a number of fresh signs along the Skagit from the Lake House to the boundary. Only one seen.

BUSHY-TAILED RAT—From the south fork of the Salmon River to the coast.

MUSK RAT— Observed from Midway to Osooyos Lake, and from Sumas to Blaine.

POCKET GOPHER—Common from Lost Creek to the summit of the Hope Mountains. A few in the Skagit valley.

POCKET MOUSE—Common at Osooyos Lake in the sage and other low bushes.

MEETINGS OF THE BOTANICAL BRANCH.

The first meeting of the Botanical Section of the Field-Naturalists' Club for the season 1905-6 was held at the residence of the unde signed. Those present were Dr. Fletcher, Prof. John Macoun, Dr. Blackadar, Dr. Ami, Messrs. James Macoun, Attwood, Campbell, R. B. Whyte, and the writer. Although no programme had been prearranged, there were enough interesting questions brought forward to keep all busy in a lively discussion. Mr. Whyte read an article from the "Rural New Yorker" on Luther Burbank, the "wizard of horticulture," in which it was stated that the praise given to him as being a creator of new species, etc., is exaggerated and distorts his achievements and merit; that he is simply a skillful plant breeder and a sincere lover of plants who achieves his successes much on the same lines on which plant breeders have scored successes before him, only his experiments are carried on on a much greater scale. Mr. Whyte and most of those present concurred in this view. In connection herewith it was said that DeVrie's mutation theory was superfluous and useless, and that his "mutations" were simply the *varieties* of other botanists. The origin of the balls of spruce needles sometimes found in or near water was commented upon. Some held they were formed by the wave motion in lakes in shallow water near the shore, others thought they were formed by eddies in pockets or holes in the beds of streams. Dr. Fletcher exhibited a cross-section of a *Eucalyptus* sapling four

years old, which, however, showed a number of secondary rings between the four principal year-rings. The consensus of opinion was that these minor rings seemed to show the record the tree kept in its growth of times of drought and abundant rainfall. This brought up the question, whether the rings in a red beet are of similar origin as those in a tree or not, and as to the difference in structure between that vegetable and similar ones, like the carrot. Another question which was variously answered was, why the tamarack sheds its leaves and other conifers do not. These two questions were given to Messrs. Campbell and J. M. Macoun respectively to look up and report on at the next meeting.

A collection of mounted plants made this year by the writer was shown for inspection in which two specimens proved of some interest, namely, *Gallium verum*, Yellow Bed-straw, which had been found in a very restricted locality by Mr. Whyte twenty-five years ago, and not since then; and *Monarda didyma*, Oswego Tea, from High Falls, Labelle Co., Quebec, new for the district. An interesting collection made by Mr. W. H. Harrington was shown by Dr. Fletcher.

G. EIFRIG.

The second meeting of the Botanical Section was held at the residence of Mr. J. M. Macoun on Dec. 14th, the members present being Messrs. Eifrig, Whyte, Attwood, T. E. Clarke, Campbell and Prof. John Macoun. Some time was spent in examining specimens collected near Ottawa by the Rev. G. Eifrig. Messrs. Campbell and J. M. Macoun read several extracts referring to the falling of the leaves of coniferous trees, the conclusion arrived at being that the foliage-leaves of most conifers are very persistent and may live for several years, but that they do not fall at fixed periods; the leaf cushions keep pace in growth for a long time with the increase in size of the axes. In *Larix* and *Salisburia* the leaves alone are deciduous each autumn, in *Taxodium distichum* the axes that bear them are also deciduous.

The discussion of the structure of a beet-root, begun at the previous meeting, was resumed but no satisfactory conclusion was arrived at.

J. M. M.

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THE OTTAWA NATURALIST.

VOL. XIX. OTTAWA, FEBRUARY, 1906. No. 11

THE FLY AGARIC *(AMANITA MUSCARIA)* AND HOW IT AFFECTS CATTLE.

By NORMAN CRIDDLE, Aweme, Manitoba.

It is a well known fact that the effects of eating *Amanita muscaria*—commonly called the Fly Agaric—in mistake for common mushrooms or other edible fungi, is a very serious one; so much so that death usually takes place within a very few days afterwards. I have, however, searched in vain among my small stock of books for any information that relates to this fungus—or any other—in connection with its being eaten by cattle. It is possible, therefore, that a note on the subject may prove of interest.

The Fly Agaric *(Amanita muscaria)* is found rather plentifully during July and part of August, growing in wooded country where the land is inclined to be sandy, clumps of Ground Cedar *(Juniperus Sabina*, var. *procumbens)*, when growing in such localities, being favorite spots. This fungus is a large-sized species and should be easily recognized by its color, which, on the upper part (the pileus), is of a bright yellow, getting darker or more reddish towards the centre. The surface is shiny, with numerous scaly warts of a whitish color. The gills and stem are pure white.

This fungus—as well as nearly all the other stalked kinds—is much sought after by cattle, which undoubtedly, I think, scent it from some distance away, so that in some instances a dozen or more may be eaten by a single animal in the course of a day, besides numerous other species of a less poisonous nature.

The effect of eating the Fly Agaric, though sometimes fatal

to calves, has never, in my experience, been known to be so to animals that were a year or more old, though it is quite serious enough. Extremely violent purgation sets in some hours after the fungus has been eaten (the exact length of time has not, unfortunately, been ascertained), and sometimes with very little abatement for two or more days. The animals meanwhile appear to suffer considerable pain, and in the case of milk cows the milk greatly decreases in quantity. This, however, is probably due more to the violent purging than to the direct action of the poison, especially as no ill effects have been noted to human beings from drinking the milk.

With regard to calves, two or three cases of death, probably caused through their eating this fungus, have come to my notice, though unfortunately no thoroughly scientific investigation was made in any case, barring the fact that *A. muscaria* had undoubtedly been eaten some hours previous to one of the animals being taken ill; and, as several other calves were partly affected at the same time, there appears to be no reason to doubt that the Fly Agaric was the cause of death.

The ill effects related above as having taken place through the consumption of *A. muscaria*, have been known to occur, though in a much smaller degree, through eating other fungi, notably a species of *Boletus* which occurs in great abundance in open woods and on Ground Cedar patches where the ground is moist. *Amanita phalloides* is also occasionally eaten, but it is usually rare here and, apart from this, does not seem so attractive to cattle.

No remedies have been found effectual against the deadly effects of *A. muscaria;* but, as cattle generally eat all manner of unusual food when not properly salted, it might be worth while to try whether giving them all the salt they want—which they should of course have at all times—would prevent them, at least to some extent, from searching so eagerly for fungi.

In conclusion I wish to state that, though this note is written from personal experience, it makes no pretence of being more than of a very fragmentary nature, and that it relates only to Manitoba.

BIRDS NEW TO ONTARIO.

By W. E. Saunders.

The following list of birds comprises those new to Ontario which have been taken in the Western Peninsula since the issuance of McIlwraith's revised work. Some of the notes here given have been already published in THE OTTAWA NATURALIST and Macoun's Catalogue of Canadian Birds, but some of this material is new and it has not previously been brought together.

CAROLINA WREN *(Tryothorus ludovicianus).* The first one was shot by Montague Smith in Forest in February, 1891, after having been observed in the village for nearly a month. No more were reported for Ontario until this year when Mr. O. J. Stevenson, St. Thomas, found one in the Elgin ravine in that city, where it lived from some time in the winter, until September at least, and may be there yet. It was not ascertained whether the bird had a mate or spent the summer alone, but the observers there suspect that a brood was raised. I went to see this bird on April 25th, 1905, and spent half an hour watching him. He had a fine, clear whistle in thirds, which he repeated rapidly four times as a rule. After singing for two or three minutes he would betake himself to trees, shrubs or brush on the ground and feed for a while before again mounting to one of the high locations from which he sang.

In a study of the fauna of Pelee Point and vicinity in September, 1905, by a group of ornithologists, Mr. A. B. Klugh, Guelph, found a brood of this species and took at least one of the fledglings, and Lynds Jones, Oberlin, Ohio, found others at the same time on Pelee Island. Details of this work have appeared in *The Auk.*

CLAY-SPARROW *(Spizella pusilla).* A specimen was found by myself on May 9, 1894, fifteen miles west of London and taken. The record was published in volume 1. Biological Review of Ontario.

KENTUCKY WARBLER *(Geothlypsis formosa).* The record previously published of a specimen taken by Robt. Elliott near Bryanston, on May 16, 1898, is the only Canadian one to date. The bird is a male in high plumage.

HENSLOW'S SPARROW *(Ammodramus Henslowii).* On May

24, 1898, I made the acquaintance of this species at the mouth of the Thames River and took a specimen. In July of the same year I took two at Sarnia and having become better acquainted with it, I found on an expedition taken in June, 1905, that it was quite common in the territory we examined at the mouth of the Thames, and we saw and heard about twenty in the day, although we failed to find a nest. It seems hardly likely that there is another species left to be discovered in Ontario of which such numbers can be found.

BICKNELL'S THRUSH *(Hylocicha aliciae Bicknelli)*. On Sept. 16, 1898, Robt. Elliott took a specimen of this bird at Bryanston. The identification was confirmed by R. H. Howe, Jr., of Cambridge, Mass. No further occurrence has yet been recorded.

WILLOW THRUSH *(Hylocichla fuscescens salicicola)*. The first of this variety to be recognized was due to a careful study made of my specimens by the late Robt. Elliott, whose suspicions were subsequently confirmed by R. R. Howe, who identified the bird as a Willow thrush. Since then a specimen in the McIlwraith collection, now in the possession of J. H. Fleming, and previously supposed to be a Wilson's, was found to be a Willow thrush.

BEWICK'S WREN *(Thromanes Bewickii)*. A single specimen of this bird was taken by the writer near Appin, Ont., on Dec. 13, 1898. There was nearly a foot of light snow on the ground and the day was clear though not very cold. The bird was feeding and working along through upturned roots and piles of brush and after some trouble I shot him on a root. Up to the present no further record of this species as been made for Ontario.

KIRTLAND'S WARBLER *(Dendroica Kirtlandi)*. The only Canadian specimen of this species was taken on the Island at Toronto, May 16, 1900, by J. Hughes Samuel and has already been recorded in THE NATURALIST. It stands today the only Canadian record.

PRAIRIE WARBLER *(Dendroica discolor)*. Mr. Samuel took a specimen on the Island at Toronto May 10, 1900, and I believe Mr. Ames took another in the same spring; nothing further was learned of this species in Ontario until this year (1905) when

on May 28th, while paddling down a stream running out of Cameron Lake, near the top of Bruce peninsula, I saw in a nearby tree a warbler unknown, yellow beneath, with a few black streaks and I exclaimed to my companion that it was a Kirtland's Warbler. I immediately shot it and on picking it up found it to be a female Prairie Warbler. A search among the trees nearby revealed no others, the specimen apparently being alone. My erroneous identification was due to the fact that Kirtland's Warbler was regarded as a possibility on this trip, the latitude and general character of the country being similar to that of the district in Northern Michigan where it breeds. The Prairie Warbler on the contrary is not known to breed nearer than Ohio and this bird was regarded when taken as a straggler very much out of its course indeed. But on May 30, on the return journey, and about nine miles south of where the other specimen was taken, I heard an unknown warbler-song which ran up a chromatic scale clear above the range of the ordinary piano, on the syllable "S' wee," repeated every note. Dismounting from my wheel I hunted for this bird for some time, hearing, meanwhile, a few Pine warblers, and when finally I saw the unknown songster it took me a few moments to decide that it was not a brilliant colored Pine warbler, and before I got to the point of shooting it, it vanished and I saw no more although I spent an hour hunting over a very small territory and heard at least two, if not four, of these strange songsters; so that I am quite confident that there was in 1905 a little breeding colony of Prairie warblers in this northern peninsula when the next nearest to the south was probably 300 miles away in Ohio. During the investigation of Point Pelee in September of this year another of this species was taken there, the details of which have probably already appeared in *The Auk*.

THE WHITE-EYED VIREO (*Vireo noveboracensis*). The capture of a specimen of this bird at Woodstock on Apri 25, 1902, by Mr. W. D. Hobson was published in THE OTTAWA NATURALIST for November, 1902. Since then it appears that Mr. Kells reported to the Canadian Institute in 1891 the capture of one of these birds in the middle of October, 1890. The bird was badly damaged by shot and was not preserved and the identitification was made entirely by the color of the eyes and while it is quite likely that Mr. Kells is correct about the identification it can hardly be accepted as proven by this one point only.

SOME NEW CANADIAN RECORDS FOR GYRFALCONS.

By J. F. WHITEAVES.

THE GRAY GYRFALCON *(Falco rusticolus)*.

Through the kindness of Mr. G. F. Dippie, of the firm of Messrs. Mackay & Dippie, taxidermists, etc., of Calgary, the Museum of the Geological Survey of Canada has recently been enabled to acquire two fine specimens of this species, from Alberta.

One of these is a female, shot in the Knee Hills district, about sixty miles north-east of Calgary, by Mr. Alexander Wyndham, on November 10th, 1905. Mr. Dippie writes that he "would not be positive, but thinks that this specimen is an adult bird, probably three or four years old." Its measurements, when in the flesh, are stated to have been : length twenty-three inches, wing fifteen and three-quarters, tail ten.

The other is a male, supposed to be not more than two years old, shot twenty-three miles west of Calgary, by Mr. R. G. Robinson, on December 9th, 1904. Its measurements before it was skinned, were; length twenty-two inches and a half, wing fifteen inches and three quarters, tail ten.

THE BLACK GYRFALCON *(Falco rusticolus*, var. *obsoletus)*.

Mr. Harold F. Tufts, of Wolfville, Nova Scotia, writes that he has a specimen of this dark, eastern variety of the Gyrfalcon that was shot at Long Island, King's Co., N. S., by Mr O. Fullerton, on the eighth of June, 1898. It is an immature female, and its stomach was empty when the bird was killed. A living Black Gyrfalcon was observed near Wolfville by Mr. Tufts on December 23rd, 1905.

In this connection it may be stated that a clutch of three eggs that are thought to be those of the Black Gyrfalcon, in the Museum of the Geological Survey, was collected at Fort Chimo, Ungava, by Mr. G. Boucher in 1897.

THE WHITE GYRFALCON *(Falco islandus)*.

A female of this species, shot on the sand bar south of Ash-

bridge's Bay, Toronto, by Mr. Frank Otto, on November 20, 1905, is now in the possession of Mr. S. T. Wood, of Toronto, who says that it was in good condition and weighed three pounds eleven ounces when shot. Its stomach was empty, and its bill and feet were pale blue, like the bill of the "blue bill" or Lesser Scaup duck, but both are "fading out."

The three fine specimens of the White Gyrfalcon in the Museum of the Survey, are from the neighborhood of York Factory, Keewatin.

Ottawa, Jan. 9th, 1906.

REPORT OF THE GEOLOGICAL BRANCH OF THE OTTAWA FIELD-NATURALISTS' CLUB FOR 1905-1906.

(Read : January 7th, 1906.)

The work done by the geological branch of the O. F. N. Club during the past summer has been for the most part of the usual routine character. One or more of the leaders have attended the various excursions and explained as far as possible the geological phenomena of the localities visited.

Interesting studies were made of the gravel and stratified sand deposits in the vicinity of McKay Lake. Numerous examples of false bedding are seen in the sand quarries and also strata lying uncomformably on the lower beds. These beds have yielded several well preserved specimens of a *Leda* sp., of small size. The overlying marl beds afford a good collecting ground for fresh-water shells.

One of the leaders made a careful examination of Strathcona Park and will present the information gathered in his address to-night. The excavations which have been carried on in the Utica of that locality have afforded an excellent opportunity for studying that interesting geological horizon, and it is fortunate that so much work has been done as it is not at all likely a similar chance will again offer itself.

On the visit to Fairy Lake the outcrop of Birdseye and Black River limestone containing the coral reefs or Columnaria beds at the northeastern end of the lake were noted and the Trenton for-

mation to the southeast. While attending an excursion at Blueberry Point a few obscure fossils were found in the Chazy shales which are exposed on the shore of the lake ; and at Hull near the Cement Works the Trenton limestone was studied and some fossils collected. The erratics and clay deposits of this place present an interesting field for study.

Several of the members attending the general excursion to Chelsea joined the geological party and had a good opportunity of studying the garnetiferous gneiss and other Archæan rocks exposed in the railway cuttings, also the boulder clay, Leda clay and Saxicava sand and the marine shells found in the two uppermost formations. About two miles west of King's Mountain Mr. Joseph Keele discovered a pot-hole in the gneiss near the edge of the cliff which faces the south. This cliff is at about the same height as King's Mountain and is therefore 1100 feet or more above sea level. The pot-hole is perfect in form and is eighteen inches in diameter and about the same depth. How this was formed at that height is a very interesting problem. A kettle hole near the east end of Meach's Lake has also been noted. It can be easily found as a hotel has been erected on its southern rim. This is no doubt an old valley of erosion.

BESSERERS, ONT.

On the 26th of October, a party of ten, in conjunction with the Geological Branch of the Club visited Besserers Grove, down the Ottawa river some eight miles, and searched the shore for concretions containing fossil organic remains. A fire was built and the concretions collected were heated and opened, some of which revealed the well-known and much-prized fish, *Mallotus villosus*, Cuvier, the modern capelin of the Lower St. Lawrence. Fragments of stems of plants, of leaves of deciduous trees, of algae or sea-weeds, of water-plants, were also obtained, besides a number of shells, *Saxicava rugosa*, Linnæus, and *Macoma Balthica*, Linnæus, being the most prevalent. There was an unusually large number of concretions visible on the clay shores of the Ottawa river along that portion of the south bank between the Grove and the mouth of Green's Creek. These concretions occur at different horizons in the clay formation skirting the south shore of the Ottawa at this point and four distinct layers containing

nodules were seen. They vary in size from two feet in length to the size of a pea. Not one in fifty that may be picked up indiscriminately appears to hold remains of organic origin worth collecting. These calcareous or lime concretions appear to be the result of the gathering of materials around some nucleus or centre which forms an initial point.

CARP, ONTARIO.

On the 10th of June the O. F. N. C. visited Carp, Ont., and the Geological Section paid a flying visit to various openings for minerals in the vicinity of the village. On pages 91 to 94 of THE OTTAWA NATURALIST, Vol. XIX, No. 4, for 1905, an account is given of the principal finds made. Amongst these must be mentioned the curved crystals of the mineral hornblende. Similar crystals have been noticed by Dr. Victor Goldschmidt, of the University of Heidelberg, in the Bulletin of the University of Wisconsin, No. 108, Science Series, Vol. 3, No. 2, p.p. 21-38, March 1904, in which he describes the measurement of crystals by means of the two-circle goniometer. To the members of the Geological Branch such curved crystals were new and hitherto unrecorded. The distinct curves formed by the sides of the crystals appear to be continuous at times, and at others somewhat shattered. Whilst the inside curves are continuous the shattered and cracked or V-shaped openings on the outer curves appear to indicate that distinct breaks have taken place subsequent to and attending the curving process whatever that was. The nature of the force which caused the curvature has not been determined. Goldschmidt points out in the same paper that there are two sorts of curved surfaces of crystals, namely, that due to the growth of the crystal; and the second due to dissolution. The curved crystals indicated appear to be those of hornblende and are associated in the vein of mica and magnetite with crystalline Calcite, much of which has suffered dissolution or in other words has been dissolved leaving the hornblende crystals standing in relief in colonies.

The deformation of the crystals from their normal erect form in the Carp specimens may be due either to force developed during crystallization or since they were formed. In the light of the experiments in the flow of rocks by Dr. Frank D. Adams, of McGill University, Montreal, it is not improbable that these crystals

were subjected to pressures subsequent to their crystallization. The cracks and V-shaped breaks evident along the outer and convex curves of the crystals favor this view. Microscopical investigation would no doubt reveal the true nature of the origin of such features, whether they are constructive forms or forms of destruction. The Leaders of the Club merely wish to point out the occurrence of these curved crystals and urge upon the mineralogist or the student of geo-physics to study the phenomena observed at this locality. Biotite crystals also occur in the vein at Carp.

THE CHAZY AT ROCKCLIFF.

Close to the water's edge and along the base of the cliff fronting the Ottawa river at the Rockcliff terminus of the Ottawa Electric Railway, as well as below the Manor House or residence of Mr. T. C. Keefer, F.R.S.C., the Chazy formation is well developed. Its strata, as exhibited in the lower portion of the bluff, consist of comparatively coarse materials, more or less rounded grains of quartz cemented by a ferruginous paste or matrix of impurities in which clay, lime and magnesia appear to be the chief ingredients. Numerous fragments of *Lingulæ* occur in the coarser sandstone beds, and those best preserved appear to represent the species described by Mr. E. Billings as *Lingula Lyelli*, from the upper Ottawa extension of the Chazy near Pembroke, Ontario, about 100 miles from the City of Ottawa. These Lingulæ are associated with numerous minute irregularly rounded black grains resembling those "phosphatic nodules" described by T. Sterry Hunt from the Chazy of different portions of Canada. At Hog's Back, near the Central Experimental Farm, where the Chazy formation is also developed and may be studied to advantage, the Lingulæ found there, namely: *Lingula Belli*, Billings, and *Lingula Huronensis*, Billings, are likewise associated with phosphatic nodules, or concretions which are held to be of organic origin.

Besides these remains of *Lingula* and the phosphatic nodules, the Rockcliff strata have yielded during the past year an excellent series of slabs exhibiting interesting tracks and trails of marine organisms made upon the layers of the sea-mud of the ancient shore deposit or shallow water as they journeyed from place to place in search of food, etc. These trails are for the most part

preserved as casts in relief, giving the reverse of the trail as originally formed upon the surface of the soft mud of the sea.

It appears that the softer and finer materials of the stratum on which the trail was originally made has disappeared and been for the most part washed away and denuded whilst the harder stratum of which the overlying bed consists (made up of coarser materials than the track or trail bed proper) remains to tell the story. There are several distinct forms found upon the underside of the overlying stratum from that on which the track was made. Some are narrow, others are wide, some simple, others are ornamented and some are very tortuous, while others are less tortuous and evidently made by larger and less mobile creatures. These tracks and trails, so far as they afford palæontological evidence of the life which existed during the period when the Chazy rocks were being laid down, may be referred to several genera, such as palæontologists have described and include under such impressions on the rock-formations. The Rockcliff trails and tracks appear to have been made for the most part by worms such as are known to have existed during Odovician times. A more detailed study and report on these will form an interesting paper for THE OTTAWA NATURALIST, when it is hoped that photographs or reproductions illustrating these forms will be forthcoming, without which no written description should be published. On several occasions members of the Club have visited Rockcliff during the past summer season and numerous slabs exhibiting these trails and tracks have been collected.

TEACHERS' ASSOCIATION—SUMMER SCHOOL.

During the Summer School of Science under the auspices of the Teachers' Association, Principal White called upon one of the Leaders of the Club to address the teachers assembled during their outings, and it was with pleasure that he acceded to his request. Four talks were given and a number of specimens examined aud described on the spot. The shores of the Ottawa and some of the railroad cuttings along the C. P. R. west of Hull and above the Chaudière Falls gave abundance of fine material for examination and study. Not only did the more ancient rock-formations come in for a share of examination, but also the later deposits forming the ancient river channels and part of the old

Ottawa Valley in prehistoric times. The peculiar outline of the north shore of the Ottawa was described and the geological causes which led to the same. The various faults and dislocations which were observed along the route of the outings were interpreted in the light of their results upon the physiography and general topography. The diversified features of the landscape in this vicinity are very attractive, and many a chapter is still unwritten in the history of the formation of that portion of the Ottawa river. A number of interesting photographs were taken which serve to illustrate the geological phenomena observed.

H. M. AMI,
W. J. WILSON,
Leaders.

Geological Survey Offices,
Ottawa, Jan. 7th, 1906.

REVIEW.

Abbé V. A. Huard. Traité élémentaire de Zoologie et d'Hygienè, Québèc, 1906. In 8 vo. pp. 260; 202 figures in the text. Cloth, $1.00; paper 70c.

This most useful and concise work on zoology and hygiene, expected for some time, has just been published and will no doubt be hailed with special pleasure by all who have any taste for natural history studies, even outside of the French population of Canada; for it is, as far as we know, the only book containing a general conspectus of the Canadian fauna, which has as yet appeared; all the most important or most interesting genera of the fauna of all lands are, however, mentioned and in many cases also figured, so as to give a more complete survey of the animal kingdom.

The author is a born naturalist, having the love of what he speaks about; his treatment of the various subjects is characterized by its clearness of expression. The author has taken great pains to be precise and true in all of his statements, so as to produce a scientific book, that is a book of exact knowledge. Both amateurs, teachers and students will find in it a reliable guide to the study of the Canadian fauna; at the same time animal anatomy and physiology are treated with considerable detail; and it is to be hoped that this book will be generally introduced in the French schools of the country.

J. A. GUIGNARD.

NATURE STUDY—No. XXXI.

MOTHER NATURE AND HER BOYS.—AN INSTITUTE THAT BRINGS THEM TOGETHER.

BY C. J. ATKINSON, Toronto, Ont.

Nature Study at the Broadview Boys' Institute, Toronto, begins with the study of boy nature. It finds that the unnatural surroundings and conventionalities of city life dwarf the boy physically and narrow him mentally, and that to have the boy at his best they must counteract the influences of man-made environment by getting him back to Nature. The annual summer camp assists in this. For a few weeks the boy lives under canvass in the wildwood ; he is next door neighbor to the squirrel and the chipmunk; he breathes the aroma of the pine and the hemlock; he eats the fish he has caught in the lake and the berries he has gathered in the thicket, writes letters home on birch-bark, becomes tanned and seasoned, but best of all he is unconsciously listening to the wonderful whisperings of Nature and becoming broader in mind and sympathies.

Camp experiences are excellent, but all too short. An experience that calls out more labor, effort and thought, is required. This the Institute has found in its Miniature Township. This is a boys' world, with its disappointments and losses, as well as its successes and achievements. Boys soon learn that they can tickle the earth with hoe or spade and it will laugh with bright flowers and delicious fruits ; that Mother Nature rewards diligence and punishes neglect; that what a boy sows, that shall he also reap—multiplied manifold—if he cultivates faithfully in the meantime. The Miniature Township consists of a portion of land divided by section lines and cross-roads into 86 little farms and 10 flower gardens. The farms are 10 x 40 feet, and flower gardens 10 x 8 feet. These are cultivated by individual boys or partners, who style themselves "farmers" and delight to don overalls, top-boots, and broad-rimmed hats. To be called "hayseed" is an honor, because it implies that they are landed proprietors and yeomen of the commonwealth.

The farms are leased to the boys, a regular printed form being

used, which is duly signed and sealed. The stipulations of the lease are: One hour's work per month is to be performed upon the common plots as rental; farms are to be carefully cultivated and kept free from weeds; roadways adjoining farms are to be kept clean; rules, regulations and by-laws of Municipal Council are to to be obeyed. The farmers provide their own tools and seed. The produce of the farms is the property of the producer to take to his home, sell, or dispose of as he pleases. Names are chosen for the farms by the proprietors and are neatly painted on uniform sign boards and placed in the center of the plot. Some of the names of last season were: Lakeview Farm, Old Homestead, Geneva Farm, Great Western, Glencoe Farm, Enniskillen Farm, Enterprise Farm, Shamrock Farm, Jumbo Farm, etc.

A course of Monday evening lectures on "Agriculture and Nature Study" are given by experts during May, June, August and September. Among the lecturers are such men as Prof. Zavitz, of the Agricultural College at Guelph; Principal Scott, of the Toronto Normal School; Wm. Rennie, Sr.; C. W. Nash; practical gardeners and florists and teachers in Nature Study. Such themes as these are discussed: "Preparation and Care of the Soil," "Weeds and How to Treat Them," "Our Friends, the Birds," "Insects Injurious to Vegetation," "Nature Study in Parks and Gardens," etc.

The Broadview Miniature Township is a self-governing Municipality. On the last Saturday in April the citizens nominate, and on the first Saturday in May elect, by ballot, a Reeve and five Councillors, who compose the Municipal Council and hold office for one year. The ballots are printed, the poll manned by deputy returning officer, poll clerk and constable, and the voting takes place in the regulation way. The Municipal Council appoint a Weed Inspector, Pathmaster, and other officers, make and enforce regulations and by-laws, impose statute labor, collect fines and cancel leases. The Reeve is the Justice of the Peace for the Township by virtue of his office, and tries all offences, whether against the laws of the Municipality or otherwise.

Prizes are given for the best kept farms, and inspections take place at regular intervals during the season. No better vegetables are grown anywhere than can be found on these little

farms. A third prize was won this year at the National Exhibition, Toronto, for the best collection of vegetables, in competition with regular market gardeners. A Fall Fair is held by the Institute in September of each year. At the fair for 1905 there were over 1,000 entries in agricultural products, flowers, collections of seeds, pressed flowers and weeds, insects, shells, birds' nests, polished woods, manufactured articles, fine arts, and boys' pets of all kinds, such as dogs, poultry, pigeons, rabbits, Guinea pigs, etc. The prizes this year totalled $240, and the attendance on two afternoons and evenings reached 2,400. The "Farmers' Harvest Home Dinner," held each autumn, is another interesting feature of the township idea. Upon its extensive menu nothing is allowed to appear, from soup to dessert, that has not been grown, in part at least, upon the boys' farms. Even the menu itself is printed on corn-husks. Ministers of the Crown and some of the most prominent agriculturists in the province have been guests at this function.

The objects gained through the Miniature Township are manifold and may be summerized as follows :—

1. A comprehensive course in Nature Study. An insight into the principles of agriculture, which has led a score or more of the boys in the past four years to take up farming as a life pursuit.

2. A practical experience in citizenship. Respect for law and order has been cultivated, and the sacredness of the ballot emphasized.

3. The development of judgment and business instinct. Judgment has to be exercised in the choice of seeds, treatment of the soil and rotation of crops. The enterprise and business ability of the boys has been brought out in a most striking manner in the disposal of their own produce, the speculation in the purchase and marketing of the produce of other boys, and the formation of combines to enable the carrying on of a vegetable supply business on a large scale.

4. Healthful exercise for city boys, and the acquiring of habits of industry, perseverance and thrift.

A few particulars in regard to the work of the Broadview Boys' Institute as a whole may be of interest. It is incorporated as an educational institution and is run along lines much the same

as a Y.M.C.A. The ages of the boys range chiefly from 12 to 17 years of age, and the citizens of the Miniature Township are all 15 years of age and under. The membership of the Institute during the year is about 600, and the boys are chiefly the sons of artizans. Premises, consisting of a large club house and five and a quarter acres of land, have been purchased. They are situated on the east side of Broadview Avenue, a central location for the east end of the city of Toronto. A portion of the grounds are used as an athletic field in the summer and as a skating rink in the winter. During the fall, winter and spring months, evening classes are conducted by a staff of competent teachers in manual training, technical printing, clay modelling, wood carving, cooking, free-hand drawing, designing and lettering, typewriting and correspondence, music, Bible study and gymnasium work. The equipment for this work includes a twenty-bench manual training plant, full sets of wood carving and clay modelling tools, natural history and art models and designs, domestic science tables with fourteen individual gas circles, a complete printing plant, etc. Reading and recreation rooms are provided, also accommodation for literary and other subordinate clubs. A circulating library of books suitable for boys is maintained. Well equipped shower baths, with hot and cold water, are open to members. A savings bank finds many depositors, and an employment bureau has more applications for boys than can be filled. A brass band of 26 pieces, under a proficient leader, is open for engagements. Religious meetings are held, and entertainments, club suppers, banquets and various social gatherings are attractive features of the work. The superintendent, the staff of teachers, and all who assist in the work, do so voluntarily and without remuneration. The Institute is supported by contributions, membership fees and its own enterprises. Visitors are cordially invited.

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THE OTTAWA NATURALIST.

VOL. XIX. OTTAWA, MARCH, 1906. No. 12

THE EGGS OF THE FRESH-WATER LING.

By Professor E. E. PRINCE and ANDREW HALKETT, Marine and Fisheries Department, Ottawa.

The discovery of the eggs of the burbot or fresh-water ling (*Lota maculosa*, LeSueur) deposited by the parent fish, exhibited in the tanks of the Ottawa Fisheries Museum, is a matter of unusual scientific interest.* While the burbot is not a valuable or esteemed species, it is, in many ways, an interesting fish to the naturalist. It is known in different parts of Canada by no less than fifteen different names,† most of them uncomplimentary ; indeed, as the late Frank Buckland said, many years ago, of the British burbot or burbolt, "they are such a stupid and ugly fish that I cannot advise trouble to be taken with their dissemination . . . . . they are so destructive to the eggs of all other fish . . . . they eat an enormous quantity of fry, and they swim after the manner of eels." The same author stated that they are a nocturnal fish, spawn in the deepest holes in lakes, 480 to 540 feet deep, and after having been frozen stiff will revive. Belonging, as the burbot does, to the family *Gadidæ*, which includes the cod, haddock, hake, whiting, and other valuable food fishes, it might be imagined that it is excellent as a table fish. Of its edible qualities the most opposite opinions are held. On some lakes of the Northwest it is highly regarded ; but in other localities, indeed generally, it is not regarded with favor, and has been even pronounced poisonous. In this connection, the following extract from a special report, published in the Blue Book of the Marine and Fisheries Department, 1900, has an interest and may be appropriately quoted here (*vide* report mentioned pp. lv-lvi).

*The eggs were collected by Mr. Andrew Halkett for study in a fresh living condition, while others were preserved by him in formalin.

"If great variations obtain regarding the naming or misnaming of this fish, a corresponding diversity of opinion exists regarding its edible qualities. At a remote Hudson Bay post, in the Canadian Northwest, I found that the flesh was regarded as poisonous, indeed, cases of poisoning after Indians and employees of the post had eaten the fish were mentioned, and it was pointed out that even the dogs would not eat it. The dogs are usually fed on the excellent whitefish and decline being put off with inferior fare, and it is a fact pointed out by various explorers that the dogs of the Northwest, used in the dog-trains, refuse to eat the burbot. I found, however, at another Hudson Bay post, that the fish was often eaten and was regarded as most excellent, no ill effects having been noticed. Belonging as it does to the cod family, it should be an excellent fish for the table, like its near relatives the cod, haddock and hake. In one of the lakes of New York State (Lake Winnipiseogee) it is pronounced equal to the whitefish for table use, and the liver is generally considered a rare delicacy.

"Dr. Richardson *(Fauna Boreali-Americana)* is recorded to have said that 'the flesh of the fresh-water cusk is firm, white and of good flavor; the liver and roe are considered delicacies, when well bruised and mixed with a little flour, the roe can be baked into very good biscuits, used in the fur countries as tea bread.' Professor Brown Goode spoke of it as a very excellent fish, especially for boiling; though Dr. T. H. Bean pointed out that apart from the liver, the fish is not esteemed in the Great Lake region and northward, but in the rivers of Montana the burbot is in great favor."†

Pennell states that the flesh of the English burbot is white and firm, and is considered superior in flavor to that of the eel.

It has a very wide geographical distribution in the old world and on this continent. It has been recorded in Germany, Austria, Russia and other countries; but it is of very local occurrence in the British Islands, being wholly absent from some rivers and plentiful in none. The belief prevails that it is decreasing in numbers and doomed to extinction. It does not appear to be

† Report of Department of Marine and Fisheries (Fisheries) 1900, p. lv.

found in Scottish or Irish waters. From New England and the basin of the St. John River, New Brunswick, it extends through the Great Lakes and more northern waters to the Manitoba and Athabaska lakes and rivers, while specimens have been procured in the Okanagan and Columbia river regions in British Columbia. Drs. Jordan and Evermann speak of it as abundant in the north as far as Bering Straits and the Arctic Seas, but rare in the Ohio and Upper Mississippi. A number of specimens are preserved in the Ottawa Fisheries Museum, some being local, *e.g.*, Lake des Chene, Ragged Lake, Algonquin Park, Healy's Falls, and Rock Lake, Haliburton Co., Ont., and one specimen sent from Swan River, near Vernon, B.C. As a rule it is regarded as a pest, and fishermen are of opinion that it is a great destroyer of the spawn and young of valuable fishes; but its feeding habits require accurate investigation

As the cod and most of the *Gadidæ*, so far as known, produce eggs, which, as Dr. A. S. Packard states, "rise to the surface of the water, on which they float," it has long interested naturalists to know of what character are the eggs of the burbot, the only fresh-water member of the family. If, as seems practically certain, the burbot is a species of the cod family which has changed its habits and become a non-marine form, it was highly interesting to ascertain whether its eggs retained the characteristics of its ocean-inhabiting relations or not. Fish authorities and embryologists have long been on the look out for the eggs of the burbot for that reason. The minute delicate glassy transparent globes, floating lightly, like invisible soap-bubbles near the sea's surface, are called pelagic or buoyant eggs; and the eggs of the cod, haddock, pollock, whiting, hake, marine ling, and other *Gadidæ*, are typically pelagic. Could it be that a species of that family, permanently resorting to fresh water, would have retained that interesting type of egg, or has the character of the egg changed with the change of the habitat of the fish ?

Thirty years ago a Belgian investigator, Dr. C. Van Bambeke, described the egg of the fresh-water ling, inhabiting rivers and lakes in Europe,* but he never secured them after being deposited

* Mém. Couronn. l'Acad. Roy. de Belgique, tome XL. 1876.

naturally. He took them from the parent fish before they were deposited, and while he obtained and described the egg and published a drawing of it, no one could say if the features described were normal or not, and it was not posslble to say whether or not it possessed buoyancy, and belonged to the pelagic type of ovum. Van Bambeke's account described the egg of the burbot as an extremely small, spherical, translucent ovum, with a pale greenish oil globule, surrounded by a thin coat of protoplasm, the globule being held in a fixed situation, in the yolk matter, by a column, or thick strand, of tenacious protoplasmic material. How does this description compare with the features of the eggs, several hundreds of which were deposited, at the end of January, by the parent fish in the Ottawa Fisheries Museum and examined under moderate powers of the microscope? A study of these eggs yielded this remarkable result, that they have all the features of the typical pelagic eggs which occur abundantly in the ocean where cod, sea-ling and other Gadoids spawn. The burbot's egg is somewhat buoyant, of minute size, extremely transparent, and delicate in structure. As Van Bambeke stated, there is a single large oil-globule, greenish in hue, though almost colorless in transmitted light, but not fixed or held in place by a strand of protoplasm. Now, the burbot is a close relative of the sea-ling (*Molva vulgaris*) and of the sea-cusk (*Brosmius brosme*, Muller), and bears a strong external resemblance to them, having an elongated eel-like body, a flattened head, a small first dorsal fin, and a very long second dorsal and anal fin, as well as a rounded spatulate tail. The sea-ling and sea-cusk produce small pe agic eggs, each of which contains a single large bright oil-globule, that in the ling's egg pale greenish; that in the sea-cusk's egg being terra-cotta in tint. The egg of the fresh-water ling almost exactly resembles the ovum of its marine relative in all essential features. The ova of the marine ling (*Molva vulgaris*), to quote from the large Scottish monograph (the most elaborate account of fishes' eggs ever published),* "are less buoyant than some other Gadoids, *e.g.*, *Gadus morrhua* and *G. æglefinus*, and sometimes, though living, sink to the bottom in quiescent water, yet success-

* Professors McIntosh and Prince, Trans. Roy. Soc., of Edinburgh, Vol. xxxv, Pt. iii, No. 19, p. 668.

fully develop. The ova of the ling are, indeed, more delicate and more susceptible to unfavorable conditions than those of the cod and haddock." Now, these observations would apply exactly to the present egg. It is so light that the slightest movement in the water carries it hither and thither. In still water it falls to the bottom, and, indeed, unlike marine eggs, which are in water of greater specific gravity, the egg of the fresh-water ling cannot permanently float. It is perfectly spherical and has a diameter of 1·77 mm. (=.0695 inch) and the globular oil sphere measures .354 mm. (=.039 inch) in diameter. The egg of the marine ling measures 1.68 mm. (=.066 inch, or even .0916 inch) in diameter and the oil globule .96 mm. (=.037 inch), so that the fresh-water species produces an egg in general of smaller size, indeed in proportion, it may be said to the different size reached by the full grown form in both species. Whereas the burbot reaches a length of only 12 to 30 inches and a weight (according to Pennell) of 2 to 8 pounds; the marine ling may measure 24 to 72 inches in length and a weight ranging from 15 to 60 pounds.

None of the burbot's eggs were fertilised, so that no germinal disk was formed, though a thin layer of protoplasm surrounded the ball of clear yolk fluid. The yolk was not granular, and the bright globule of oil lay free in the yolk and moved readily about as the egg revolved when pushed by a scalpel on the stage of the microscope. In some of the eggs a thin irregular envelope of protoplasm collected round the globule, but in most examples it was not present. A perivitelline space separates the yolk-globe from the thin capsule of the egg. The capsule itself is a simple transparent shell, as in all pelagic types of ova; and in optical section it appeared as if double, and concentrically striated—a false effect—but repeated and careful examination showed radial striations in the thin capsule; these striations apparently corresponding with minute dots or pits occurring all over the exterior. The micropyle showed the usual features, a slight conical thickening in the centre of which was the aperture seated in a crater-like depression. As in the case of the marine ling, the eggs of this fresh-water form are delicate in the extreme, and very readily

burst when manipulated under microscopic examination.* The tension, due to capillary attraction when a cover-glass was placed upon the glass-side, caused them to burst, and the bright oil-globule lightly bounded out of the egg, while the thick yolk slowly poured out like clear mucilage. Unfortunately, no ripe male fish was available or the early embryonic stages of the fertilised ovum, and larval form of this species, could have been studied for the first time. In view of the character of the eggs, as now discovered, the larva is without doubt a very minute and delicate creature, far more minute and delicate than possibly any other young fresh-water fish. The post-larval stages of the marine ling, we know, are very wonderful and extraordinary owing to the enormous wing-like ventral fins, "their most striking feature being the extraordinary length of the ventral fins . . . . . of an ochre yellow color, with specks of black pigment scattered over the inter-radial membrane."*

No doubt Buckland when he defined the spawning period of the European burbot as from the end of January to the beginning of March based his conclusion upon an examination of the ovaries in dissected specimens, and his conclusion was accurate, as the mature eggs now described were deposited about the twentieth of the month of January. The statement that the spawning sites selected are in the deepest holes in lakes, etc.,† cannot be correct, as a delicate and practically pelagic egg, such as that now demonstrated to be the burbot's egg, must be deposited in clear shallow water, and judging by analogy, the development will be rapid, and the young hatch out in a few days, possibly ten to twenty days. Actual observations alone can decide the validity of these surmises, but the newly-deposited egg, as now described, differs from that of any other fresh-water fish hitherto recorded.

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* Professor McIntosh noted this feature in *Molva vulgaris* and said, "The zona is not so soft and tough as in the cod and haddock ; but shows greater resistance, bursting rather than collapsing under pressure." Trans. Roy. Soc. Edin. Vol. xxxv, p. 827.

** McIntosh and Prince : *op. cit.* p. 830.

† Buckland, Nat. Hist. Brit. Fishes, 1881, p. 35.

EUPITHECIA YOUNGATA.

A GEOMETRID MOTH FROM OTTAWA NEW TO SCIENCE.

By GEO. W. TAYLOR, Wellington, B.C.

During the past three years I have devoted nearly all my leisure to the study of North American Geometridæ, and I have been very greatly helped by a number of entomologists who have allowed me to examine the specimens in their cabinets and who have, moreover, liberally added to my own collection. In this way I have made the acquaintance of a large majority of the American species so far made known to science. There are, however, many forms that are still undescribed, and, though these "new species" are naturally more numerous in the West and South than in the Eastern Provinces of Canada or the older States in the Union, where entomological researches have been carried on for a century or more, there are still some—perhaps more than we suppose—of these nondescripts to be found even in Ontario.

Indeed, the subject of the present paper was captured close to Ottawa itself, which, when we consider the many eminent entomologists who have worked there so enthusiastically during the last twenty-five years and the activity of the members of the Field-Naturalists' Club generally, might be looked upon as the least likely place in all Canada to produce novelties. The captor of the species I am about to describe, was Mr. C. H. Young. Mr. Young has sent me for study, from time to time, specimens of nearly all the Geometridæ he has taken at Ottawa, Meach Lake and the Mer Bleue ; and, after seeing these specimens, many of which he has generously allowed me to retain in my own cabinet, I am compelled to say, as so many others have said, that more beautifully prepared specimens could not be imagined.

Mr. Young sent me not long ago a number of small Geometridæ from Ottawa for determination. Among these I found no fewer than eight species of the interesting genus *Eupithecia*. Of these little moths, "Pugs," as we used to call them in England, there must be over one hundred species native to North America; but only about one-half that number have been

described, and most of these have been made known in quite recent years.

When Walker catalogued the Eupitheciæ of the world in 1862, he only credited North America with five species. In Packard's Monograph published in 1876, only twelve species were recognized. But the labors of Dr. Hulst have vastly increased our lists in this genus and the allied genera, so that in Dyar's Catalogue we find enumerated no fewer than 55 species of *Eupithecia*, four of *Gymnocelis* and eight of *Eucymatoge*—67 pugs in all; and, yet, even this number falls considerably short of the number of apparently distinctspecies which are represented at the present moment in my own collection.

The species sent by Mr. Young all belong to the typical genus *Eupithecia*, and I have determined them as follows :

1. *Eupithecia geminata*, Pack., (which is probably, but not certainly, the *Eupithecia coagulata* of Guenee and is certainly *not* the *E. absinthiata*, Linnæus, under which name it appears in all our recent lists,
2. *Eupithecia ornata*, Hulst,
3. ,, *latipennis*, Hulst,
4. ,, *palpata*, Packard,
5. ,, *albicapitata*, Pack. (a very rare species, so far as I know, this being the first specimen to come under my notice),

and three species which are apparently without names. Two of these require further study of more abundant material before they can be safely characterized ; but the third I propose to describe now and to name after my kind correspondent from whom I have received the very beautiful and absolutely perfect specimen which I shall designate the type of the species.

I may add here that I shall be greatly obliged, and I am sure science will be benefited, if Canadian entomologists will endeavor to collect good series of *Eupitheciæ* during the coming season, in order that the species native to the Dominion may be correctly determined, and those that prove new, furnished with suitable names.

Eupithecia youngata, n. sp.—Expanse, 25 mm. Palpi not very long, bushy, blackish. Front dusky, cinereous. Thorax

brown with a dark transverse band anteriorly. Abdomen as thorax, 2nd segment a little darker, posterior edge of each segment whitish. Forewings obtuse at apex, outer margin well rounded, same color as thorax, the costa rather darker and the cross lines distinctly lighter than the ground color; basal line double, very irregular, being angled sharply outwardly at cell and below vein 2; median line also double, not well marked, making a sharp outward angle to include the conspicuous black discal dot, then running in an almost straight line to middle of inner margin; extra discal line also double, dislocated at vein 6, then in a regular curve parallel to outer margin; both median and extra discal lines show in more or less well-defined whitish spots on veins 2 to 6 inclusive; and there are short black dashes on each of these veins between the median and extra discal lines; submarginal line white, conspicuous, regularly scalloped at each vein and forming a distinct V at anal angle; a fine black marginal line; fringe dotted with dark brown between veins. Hind wings well rounded, lighter brown than fore wings with six darker lines: the first two are basal and do not extend further from inner margin than to vein 2; the next two lines are extra discal and almost complete; the two outer lines extend completely across the wing; a very small and faint discal dot; marginal line and fringe as on fore wings. Beneath paler; fore wings with a linear discal dot and the extra discal markings of the upper surface reproduced; basal portion of wing without markings except a dark spot on the costa, indicating the position of basal line. Hind wing as above, but with all the lines more regular and reaching to the costa; the discal spot is distinct, black; the 1st extra discal line is diffuse and very evident; the 3 outer lines appear as spots between the veins, the outermost line being least conspicuous. The under side of thorax and of the basal segments of the abdomen is very pale, almost white, but the posterior portion of the abdomen is nearly black.

Type, one specimen. Meach Lake, Ottawa, 7 June, 1905, C. H. Young. Co-types, two specimens. Catskill Mountains, 2 and 10 July, 1901, (No. 1) R. F. Pearsall.

THE CULTIVATION OF OUR NATIVE ORCHIDS.

By J. H. C. DEMPSEY, Hamilton, Ont.

About four years ago I was shown a specimen of *Cypripedium pubescens* by Dr. Douglas Storms, of Hamilton. Often as I had been rambling around the mountain and ravines in our neighborhood, I had never found it; but I made up my mind to discover its retreat, no matter how secluded. So one Sunday a couple of friends joined me in an expedition up the ravine leading from the "Valley Farm," where Mr. Hendrie keeps his racing stable near the Valley Inn on the Waterdown road. We came on it in all its glory, a truly fairy flower, with its canary-colored sabot, and its red-veined corkscrew sepals standing straight out. It looked so odd, so out of place, that being unacquainted with it before we declared it more beautiful than any rose. It proved quite plentiful in this particular spot, the shade was not too dense, and the sun flickered through the foliage, the land had been undisturbed, saving that the big forest trees had been thinned out; and just enough space and light and sunshine for their proper growth and to paint the blossoms in their brightest hues, and not have them looking sickly from being in too much shade.

Through the ravine ran a stream, and about thirty feet up the hillside on a substratum of red clay with a top soil of leaf-mould it grew. Occasionally we found a stem with two blooms on it. On the hill-top, in an oak wood, we found the "bird-on-the-wing," a lovely lavender-pink orchid-colored flower much like an orchid. We brought away about thirty plants of *Cypripedium pubescens*, and next year they all bloomed and some have borne seed. I planted them in a fern bed in a shady spot where they got the sun part of the day for a few hours, as I have found them under similar conditions.

Since finding *Cypripedium pubescens* I have found *Cypripedium parviflorum* at Lake Medad and planted it on similar ground, and it was in blossom last year about the end of April, and grows successfully and multiplies.

Last year I went for a drive with some friends to a concession back of Lake Medad about three miles, and found the *Cypri-*

pedium spectabile, and when we saw it at first I thought of those lines from Gray's Elegy :

> " Full many a flower is born to blush unseen,
> And waste its sweetness on the desert air."

We found it, as large as an Iris, hidden amongst the cedars in the damp mold, sometimes pure white in the shade, and where it drank in the sunshine, suffused with a rosy purple blush or striped on the sabot as if it had been done by some peri. We brought home a couple of dozen plants, some in blossom, sometimes two on a stem, and others in bud. This was the middle of June, but they stood the removal all right after a night's refreshment in a pail of water, and they got well heated in the ground and the unopened buds came out. They were found in a ravine about 100 feet in depth on either side and about 300 yards wide, with a cedar swamp in the bottom, and a tropical atmosphere, an ideal place for orchids. We also found several varieties of Habenaria coming into bloom in the swamp, and on the hill-top in a rich wood the Showy Orchis in great abundance, just out of bloom a week or so, with three or four stems of bloom on a clump which had borne from five to six flowers; it was in seed pod at the time.

In treating them after removal I imitated natural conditions as much as possible, dug a trench one and a half feet deep and put a bottom layer of broken flower pots and stones, on top of that a layer of moss from the limestone rocks at the mountain, and again on top of that a layer of sphagnum moss, about eight inches of moss in all, and on top of that a couple of inches of leaf mould, set my plants on it, and again three or four inches of leaf mould and swamp muck.

In April last I sent to Mr. Edward Gillett, of Southwich, Mass., U.S., for some bulbs of the native orchids advertised in his catalogue. Among the varieties I sent for were : *Calypso borealis*, which grew but did not bloom, but I hope to see it next year; *Calopogon pulchellus*, a dainty little purple-pink flower, very beautiful, with from four to five blossoms, which blossomed in the same bed with *Cypripedium spectabile* ; *Cypripedium acaule*, which I planted in higher ground, and out of a dozen plants I got four blooms, very lovely and most delicately veined with pink of a reddish hue. I am very doubtful if I will see it again next year,

as Mr. Alexander, of the Customs Department, brings it down every year from his island in Georgian Bay. I saw a lovely bunch of it in his garden in bloom, but he said it slipped away and he did not expect to see it again next year ; *Cypripedium montanum*, which blossomed all right and bore four or five small white blossoms on a stem, the sabot pure white with purple dots inside and red wings, not curled as in *pubescens*. It is not a native here but of the west beyond the Rockies ; *Cypripedium spectabile*, which was gorgeous in the extreme. I had three clumps with ten or eleven blossoms on at once. Two clumps had each two stems with twin blooms on a stem. I had them photographed, they looked so rare and lovely, as if they came from the "Garden of Allah" ; *Habenaria blephariglottis*, which grew but did not bloom; *Habenaria ciliaris*, which grew but did not blossom. I hope to see them next year ; *Liparis liliifolia*, which blossomed with a raceme of six or seven purple-brown flowers, a true orchid but inconspicuous ; *Pogonia ophioglossoides*, a lovely pink and white flower which blossomed successfully ; *Spiranthes cernua* (ladies' tresses) grew but did not blossom.

As to the growing of our native orchids, nature must be imitated as much as possible both in location of planting and nature of soil. Those found in sphagnum moss in bogs and swamps should be planted in about a foot of sphagnum moss with a top dressing of four or five inches of swamp muck and leaf mould, and the ground and place prepared with as much care, and no manure of any kind used with them other than pine needles or cedar leaves, and a sprinkling of powdered charcoal which can be given them every three years, as it sets the color and makes it of a richer hue. These take the place of more violent manures.

Cypripedium acaule and *Calypso borealis* are the hardiest to grow. I think in a bed made of chopped granite mixed with coal ashes, with plants set in rotten leaf mould and pine needles well rotted, the turpentine would kill insect pests and cut-worms, and the undersoil would be too poor for cut-worms and other enemies to exist in. I inferred this from the fact that in Manitoba and Parry Sound, where it is so hard to get worms for bait for fishing, the ground seems denuded of them, and the earth seems free from the pests that attack most plants.

The orchids found in the vicinity of Hamilton are *Cypripedium pubescens*, in quantities when you find its hiding-place ; *Cypripedium parviflorum*, at Lake Medad and its neighborhood, sometimes pale yellow, sometimes rich canary, according to location and the richness of the soil, but it is not plentiful ; *Cypripedium acaule*, said to be found near Grimsby, but I have never met it yet in nature ; *Cypripedium spectabile*, in a ravine back of Lake Medad and very plentiful there ; several varieties of *Habenaria*. I found *Goodyera*, or rattle-snake orchid, at the Marsh, or "Cattle's Paradise" n a ravine where the broad beech fern was plentiful. This is the only place I know where you can find it here. *Orchis spectabilis* I had in bloom in my garden last year, a pretty waxy white and lavender, found in a ravine near Desjardin's canal (but not very healthy or luxuriant plants), about ten feet above a little brook. I have found it since back of Lake Medad, and hope to have it fine next year.

In closing, I would say that those found in boggy places, like *Cypripedium spectabile*, *Calopogon pulchellus*, *Habenaria blephariglottis*, *Habenaria ciliaris*, *Liparis liliifolia*, *Pogonia ophioglossoides* place in a false bog as I have described and they will grow with success, and water them twice a day while the sun is not on them with a good soaking each time.

For *Cypripedium pubescens*, *Cypripedium parviflorum*, *Orchis spectabilis*, *Goodyera*, and *Spiranthes*, put a subsoil of red or blue clay to retain the moisture and a top dressing of leaf mould three or four inches and you will have them year after year as I have had them for the last three years ; and water them well once a night with a plentiful supply of good cold water.

Ferns and orchids are more of a fad with me. I have taken up the collecting of them in my spare moments in a particular line of botany, and it has proven very interesting. I have about thirty-two or thirty-three varieties of our native ferns, and had five varieties of *Cypripedium* in blossom at once last June.

I can assure my readers that it has given pleasure and also brought me into a closer acquaintance with the aristocrats of the floral kingdom—the orchid, so shy, so exclusive and so secluded.

Jan. 6th, 1906.

BOREMYS, A NEW CHELONIAN GENUS FROM THE CRETACEOUS OF ALBERTA.*

By LAWRENCE M. LAMBE, F.G.S., F.R.S.C., Vertebrate Palæontologist to the Geological Survey of Canada.

The writer described in the January number of this journal a new species of Pleurosternid turtle from the Cretaceous rocks (Belly River or Judith River formation) of Red Deer river, Alberta. The material on which the species was based, was obtained by the writer on Red Deer river in 1898 and 1901, and consists of the entire plastron with the anterior half of the carapace of one individual (type), a second carapace, and parts of other plastra, all of the specimens being from the same locality and horizon near the mouth of Berry creek, a tributary of Red Deer river. The species in question was named *pulchra* and was referred to Leidy's genus Baëna. It is now considered that this species belongs to a new genus, distinct from Baëna, for which the name Boremys, indicative of a northerly habitat, is proposed.

The carapace of *Boremys pulchra* is remarkable in having a row of three large supramarginal shields on each side, in line with the 2nd, 3rd and 4th vertebral shields, between the costals and the marginals. The total number of costal shields is twelve, there being the normal number, eight, with one on each side of the 1st vertebral and one on each side of the 5th vertebral.

The presence of supramarginals is regarded as a generic character of some importance which, taken in conjunction with the structure of the plastron, indicates a hitherto undescribed type of Pleurosternid quite distinct from Baëna, its probable nearest ally.

As regards the anterior and posterior costal shields of *Boremys pulchra*, the anterior ones at least occur in *Baëna arenosa*, *B. undata* and *B. hebraica*, as described and figured by Cope in his "Tertiary Vertebrata," vol. iii, 1884.

The genus Boremys may be characterized as follows :—

Supramarginal shields present in the carapace ; mesoplastra well developed, in contact in the median line for some distance ;

* Communicated by permission of the Acting Director of the Geological Survey of Canada.

intergular shield divided; inframarginal shields present on the bridges.

The specific characters of *Boremys pulchra*, the type of the genus, are :—

Costal shields short and pointed distally; supramarginals well developed, longer than broad; first neural plate divided; entoplastral plate narrow, diamond shaped; plastron longer than broad; anterior plastral lobe smaller and more pointed than the posterior lobe; bridge long and rather narrow.

In *Baëna arenosa*, Leidy, 1870, from the Bridger Eocene of Wyoming, the type of the genus, there are no supramarginals, nor are there any in *B. undata*, Leidy, 1871, also from the Bridger Eocene of Wyoming. In the latter species the mesoplastral plates (not shewn in Leidy's figure of the plastron of the type specimen) converge to a point inwardly and meet in the median line.

The following Eocene, Laramie and Cretaceous species have been assigned to the genus Baëna :—

B. hebraica, Cope, 1872. Bridger Eocene of Wyoming; no supramarginals.

B. ponderosa, Cope, 1873. Bridger Eocene of Wyoming; known only from small fragments of carapace.

B. hatcheri, Hay, 1901. Laramie of Wyoming; no mention of supramarginals in the carapace.

B. marshi, Hay, 1904. Laramie of Wyoming; no mention of supramarginals in description.

B. cephalica, Hay, 1904. Laramie of Wyoming; known from the skull only.

B. antiqua, Lambe, 1902. Belly River (Judith River) formation of Alberta; type specimen does not include the distal ends of the costal shields.

Relying on the presence of supramarginals as the chief character of the carapace of Boremys by which this genus is to be distinguished from Baëna it is clear that information regarding the structure of the carapace in some of the species of the above list is needful before their true generic affinities can be fully determined. Judging from the shape of the mesoplastral element (in combination with a divided gular shield and the development of

inframarginals on the bridge) in *Baëna hatcheri* and *Baëna marshi* it is possible that these two species may be found to be referable to Boremys rather than to Baëna.

Supramarginal shields are described as occurring in *Proganochelys quenstedti*, Baur, from the Upper Trias (Keuper) of Wurtemberg. They are stated to be present in *Platychelys oberndorferi*, Wagner, of the Upper Jurassic of Bavaria, although in the figures of the carapace it is not made clear to what extent they are developed. Also they are found in the living *Macroclemmys temmincki* (Alligator Turtle) of the Mississippi and Missouri valleys.

The presence of supramarginal shields in the carapace of this Cretaceous species is regarded as an archaic character handed down from earlier forms. The presence of six costal shields on each side also appears to be a stage in the gradual reduction of the total number of shields of the carapace.

BOTANICAL BRANCH.

On the evening of January 4th, the following members of the Botanical Club met at the residence of Mr. A. E. Attwood: Prof. Macoun, Dr. Ami, Dr. Blackadar, Messrs. W. T. Macoun, R. B. Whyte, T. E. Clarke, W. C. Ewing, and D. A. Campbell.

The greater part of the evening was devoted to discussing the merits of a plan or key for the easy identification of the ferns of Ontario. It was decided to test the efficacy of the so-called popular key next summer.

Some time was devoted to microscopic work, after which Dr. Ami showed a large number of specimens of fossil fruits collected some years ago in the State of Vermont. Dr. Ami has written an interesting account of these fossil fruits, and his paper will appear in a future number of THE OTTAWA NATURALIST.

A. E. A.

NATURE STUDY.—No. XXXII.

The School Garden and the Country School.

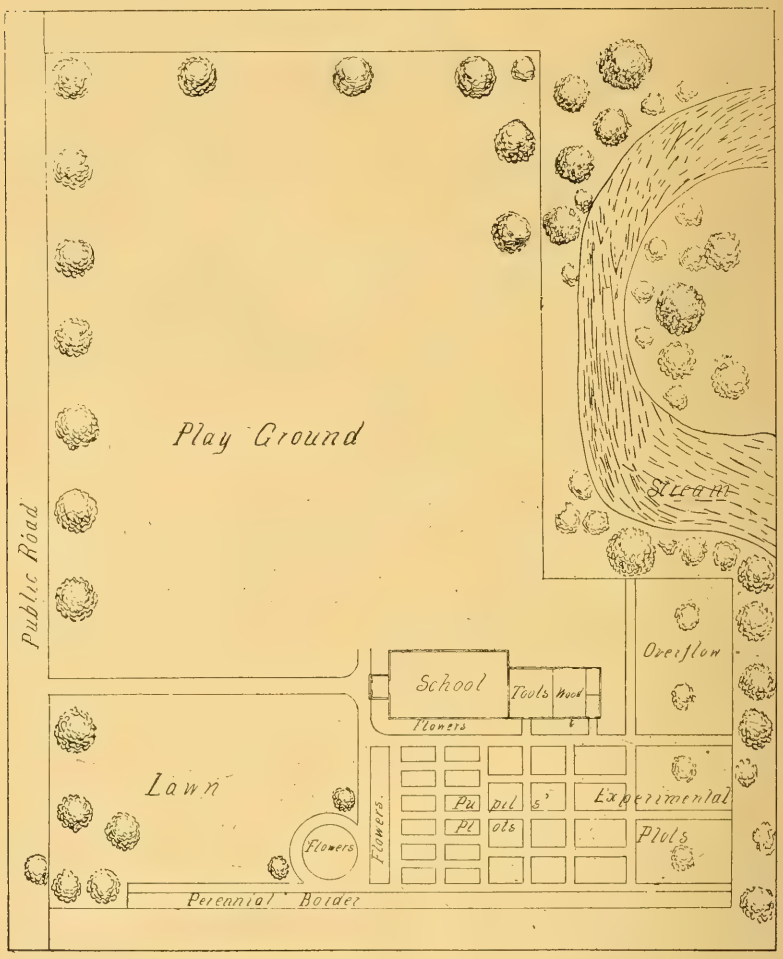
By Geo. D. Fuller, Director of School Gardens, Macdonald Rural Schools, Knowlton, Que.

The place the school garden is to occupy in connection with the country schools of Canada is yet an unsolved problem. We are told of its advantages and are beginning to realize something of its possibilities as a field for nature study, as the laboratory for the student of natural science, and as a training school for the progressive farmers of a coming generation. Certainly its advantages are great, but there are many difficulties to be surmounted before the school garden can become recognized as a necessary part of the equipment of every rural school.

The solution of this problem has been begun in a systematic way in the Macdonald Rural schools, which have been endowed by Sir William C. Macdonald, and are being directed by Prof. Jas. W. Robertson, and perhaps there is no better way to indicate the progress made, to tell of the difficulties encountered, and to enlist the co-operation of others, than to describe one such school garden and tell what it has done for one country school. Such an account may point the way to teachers who wish to test the benefits of a school garden and may help them to surmount the difficulties and avoid some of the failures others have encountered.

In the spring of 1903, at Brome, Quebec, a little red school house, dull and dingy, seated with hard plank benches, was occupied by a teacher and some 25 pupils. Although in the country surrounded by large farms and farm houses with attractive grounds, the school yard was only four rods square, so that the wood shed crowded the school house almost into the road. For play ground there was the smooth, well travelled road. The poorest houses in the vicinity were less bare and uninviting. Fortunately the soil was fertile, well cultivated and with good natural drainage, so that the problem was not complicated by the question of moving to a locality where soil suitable for a garden could be obtained.

An acre of land immediately adjacent to the original school yard was bought and fenced by the Macdonald Rural School Fund, and plans for a suitable play ground and a school garden



Macdonald Rural School, Brome, Que.

were begun. This aroused the people of the school district to action, and they determined that, as suitable grounds had been provided, they would not have the front door of the school house

open into the street; so the school house was moved 100 feet back from the road and the wood shed placed behind it; both were painted and modern desks were placed in the school room.

These changed conditions made changes in the garden plan necessary, and an effort was made so to lay out the grounds that they might with advantage be copied by other rural schools in making the school environment a potent factor in promoting the refinement, courtesy and happiness of the pupils.

The trees fringing the banks of a stream made a good back ground for the whole. As one enters the gate a straight path leads directly to the door. On the left is the main play ground clear of trees except in the corners and along the sides, while on the right is a smooth lawn with trees which in a few years will make it cool and shady. Beginning towards the road, a border runs along the fence to the back of the garden, now well filled with perennials brought by the pupils and donated by friends. Beds of annual flowers front the garden and border the school house. Immediately back of the flower border come the vegetable plots, one for each pupil, while still farther in the rear are a few experimental plots, a few young fruit trees and extra space for coarse growing vegetables.

This arrangement provides a good open play ground, a pleasant bit of lawn and a garden convenient in size and design, the whole surrounding the school building so as to make an attractive picture. At a very small expenditure the school and its surroundings have been made cheerful and beautiful, in striking contrast to their former desolate condition.

The flower plots are under the charge of the older girls, but all the pupils join in caring for them. During the past season, from May till October, there was not a week but saw some bloom to delight the young gardeners, and often large bunches of flowers were picked every day. Pansies were the first to come and the last to go. The crocus and tulip too were favorites on account of their early flowering. Sweet alyssum, sweet peas, Phlox Drummondi, balsams, asters, verbenas, nasturtiums, poppies and sunflowers have proved the most satisfactory of the annuals. A

few of the plants were started in window boxes in the school, but most of the seed was sown in the open ground.

The coming of autumn frosts did not end the enjoyment of the flowers ; as the heating did not permit window gardens at the school, the school flower garden was transferred to the pupils' homes. In October some of the more easily growing winter-blooming bulbs, such as paper white narcissus, Roman and Dutch hyacinths, and freesias, were potted at the school garden. These the pupils took home, and, treating them according to directions, they were soon able to report a fine lot of flowers. The pupil gardener was often so proud of his home-grown flowers that he would wrap up the pot and bring it to school to exhibit his success.

A most convenient size for the individual vegetable plots was found to be 4 x 10 feet for the younger pupils, and 8 x 10 feet for the older ones. Each pupil eight years old or over, was given a plot and allowed much freedom in choosing what should be grown in it; but radishes, lettuce, carrots, beans, cabbages, cauliflowers, beets and turnips have been most satisfactory. At the back of the garden, in an extra space, larger and more ambitious pupils grow corn, potatoes, squashes and cucumbers. All the produce of the individual plots is the property of their pupil owners and is removed and disposed of as each particular boy or girl decides, a wise restriction being that it shall only be removed when the instructor is present.

"But how," you may say, "is the school garden work done ?"

While it is still winter, plans are made for the spring planting. These plans may be drawn to scale by the older pupils and will provide a good drawing lesson. Then, as warm days indicate the approach of spring, boxes of soil are placed in the windows and seeds are sown so that the plants may be well grown when spring has really come. This is also the best time to study the germination of seed and the growth of young seedlings; for, when the time for planting out of doors arrives, with it will come a profusion

of material and work to crowd the nature study hour to its utmost.

The garden is treated like the ordinary kitchen garden in the spring. It is fertilized with stable manure, ploughed, harrowed, and the services of a laborer are secured to assist in laying out the paths and removing a few inches of soil from them. Then the pupils assume ownership of their miniature gardens, level and rake their plots and sow them with the seed they have planned. Classes working together prepare the flower beds and sow the seed. During the planting season an hour or two each day are spent in the garden; or, if rain prevents work for a couple of days, the greater part of the afternoon is devoted to the garden as soon as the soil is dry enough to work.

Garden work is the most popular thing at school, and there is never any trouble in getting the garden planted and well cared for during the school session. The size of the plots is a troublesome question. Larger plots are more difficult to have kept clear of weeds during the summer months, but they promote interest on account of the larger material returns. The larger boys in particular wish to see a crop worth growing. Plots 10 x 16 feet have been well cared for by boys and girls 13 or 14 years of age.

After the planting season a half hour twice or three times a week keeps the garden clean and free from weeds. This time may be taken so as to interrupt the regular work very little. A little longer intermission in the afternoon, or closing the school room classes a half hour earlier, will provide plenty of time, and the book studies will not suffer; indeed, where school gardens have been started, the teachers have nearly always reported more interested pupils and a greater regularity of attendance, while parents at first opposed to the garden idea admit that it has not made progress in other subjects less rapid.

As the seeds have sprouted and the young plants have increased in size, the pupils have learned the conditions necessary for plant life, and, as they have seen buds unfold and leaves expand, the garden has provided material to be used in the class room as the subject of drawing lessons or English composition work.

The school garden has taken advantage of the love of activity so prominent in child nature, and by providing a field for the exercise of these activities has afforded an excellent opportunity for training the hand and the eye, and thus reaching the mind.

The care of the garden during the summer holiday has proved the most troublesome of all the school garden problems, and its solution is yet incomplete. Last summer very satisfactory results were attained by having the instructor and pupils meet once each week at the garden and spend two or three hours in caring for the plots. This vacation attendance was entirely voluntary; yet, so thoroughly were they interested in their work that there was a weekly attendance of 33 to 60 per cent. of the pupils enrolled. This was regarded as very satisfactory and sufficed to keep nearly everything in good order. One or two of the larger boys were usually hired to do any further work required to keep the weeds in check. Should the teacher be absent during the holidays, a hired caretaker for the summer will be necessary.

While it will not be desirable to abolish the summer vacation, where school gardens are established it may with advantage be shortened. The school should not close before the end of June, nor open later than the middle of August.

The commercial side of garden work has received no emphasis, although at one school a globe was purchased with money coming from the sale of vegetables, while many of the pupils have augmented their supply of pocket money by the sale of the produce of their plots.

The possibilities of the school garden as a field for nature study and as a treasury from which material may be drawn for class work in natural science, are as yet only touched upon. The drawing books contain representations of things from the garden, while diaries and reports of observations made, and experiments attempted, have given pupils practice in expressing their ideas in good English.

The experimental plots have done good work educationally. Plots of better varieties of vegetables and grain have attracted

attention of both pupils and parents by the larger yields thus obtained. The crop resulting from good seed has been compared with the produce of poor seed of the same variety, but the most satisfactory experiments have been those made with potatoes, both in comparing the different varieties and in showing the advantages of using the Bordeaux mixture to keep the plants free from disease.

The effects of spraying with the Bordeaux mixture were eagerly watched by the surrounding farmers, and the results were considered remarkable. In 1904 the sprayed plots in two gardens yielded 30 per cent more than the others, while in one garden the sprayed potatoes produced more than twice the quantity of marketable tubers dug from plots which had received no Bordeaux mixture. In 1905 spraying added over 10 per cent. to the crop in three gardens, 25 per cent. increase in one garden and 50 per cent. in another being the best results obtained.

Seeing potatoes grown under scientific treatment, which when dug yield over 100 bushels per acre more than those grown as their father's manage the crop, makes a more lasting impression on embryo farmers than any number of lectures or reports. This work in the school garden will bridge the chasm which has in the past existed between the experimentalist and the practical farmer, and, if these experiments with potatoes lead a fourth of the farmers in the district to adopt similar methods in their own fields, the community will be yearly enriched by cash returns many times greater than the cost of maintaining the school garden.

The aim of this part of the school garden work is not to teach technical agriculture but to lead to such an appreciation of scientific methods that pupils will come to regard the work of the scientist with favor, and be ready to accept his improved methods to aid them in more successfully meeting the conditions of modern life, whether that life be spent in the office, the workshop or on the farm.

The teachers in the schools where the gardens have been maintained for two years, have all declared that the results have surpassed their expectations, and they favor a continuation of the

work. It is true that it has added to the teacher's cares and responsibilities; but this has been more than repaid by the added interest and enjoyment it has brought into the school life.

As the pupils have planned their plots, have measured and staked them out, planted the seed and cared for the plants, they have become more skilful of hand and more accurate of eye, while working from a definite plan has trained the judgment and taught them to foresee the future. All these results would warrant the existence of school gardens, but more noticeable has been the response to the appeal made to the higher nature of the child.

As the school environment has been improved, there has been a marked change in the moral tone of the school. The pupils' attention has been turned to a consideration of the beautiful to the exclusion of many baser thoughts, and the resulting moral culture has found expression in more orderly behavior. A smooth bit of lawn and a lawn mower have proved themselves aids to good discipline, for the play hours are more rationally enjoyed on well kept grounds than on the old rubbish-littered premises, where the chief joy was often found in working greater destruction. In some schools there has been a very noticeable change in the attitude of the pupils towards the school room and grounds, and they now take pride in beautiful surroundings and care for them where formerly they sought but to make desolation more hideous. Some of the pupils have been led to attempt flower and vegetable plots at their own homes, and it seems hard to over-estimate the better training for good citizenship which pupils receive in such schools where school gardens have broadened the educational horizon and improved the school environment so greatly.

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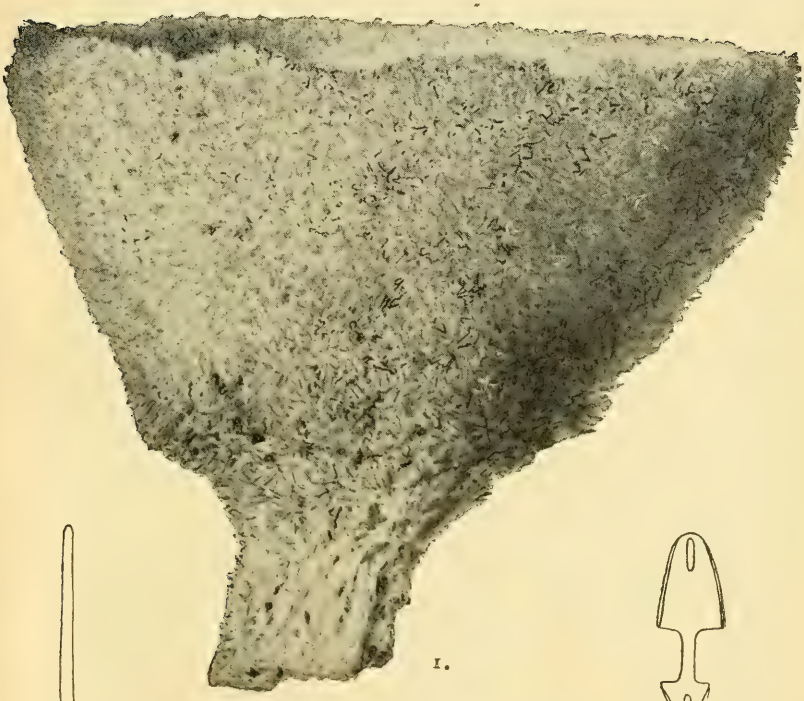

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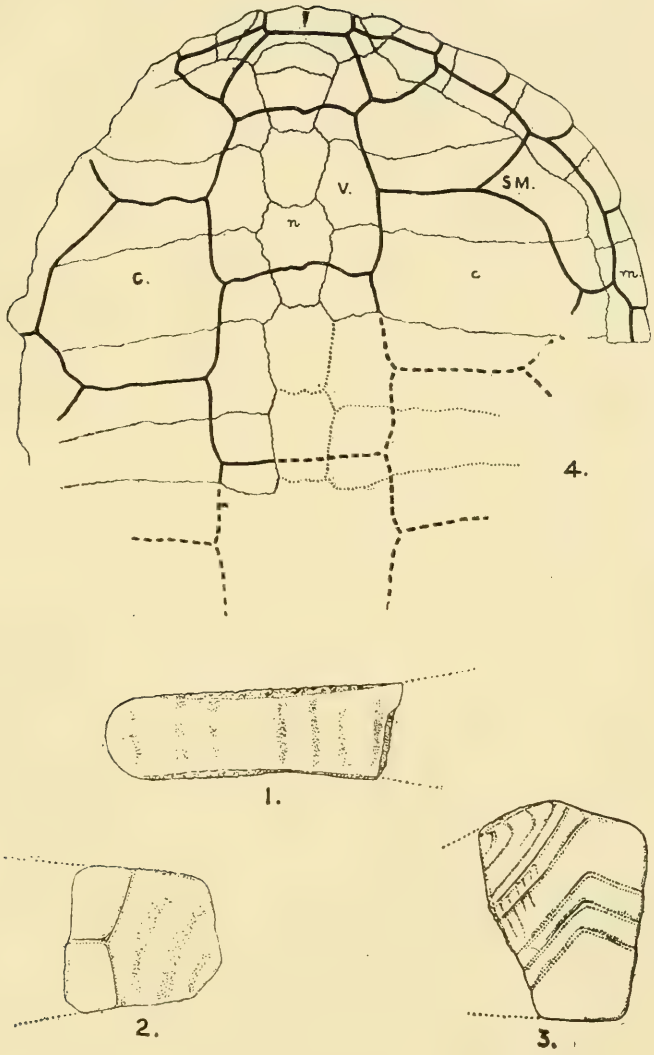

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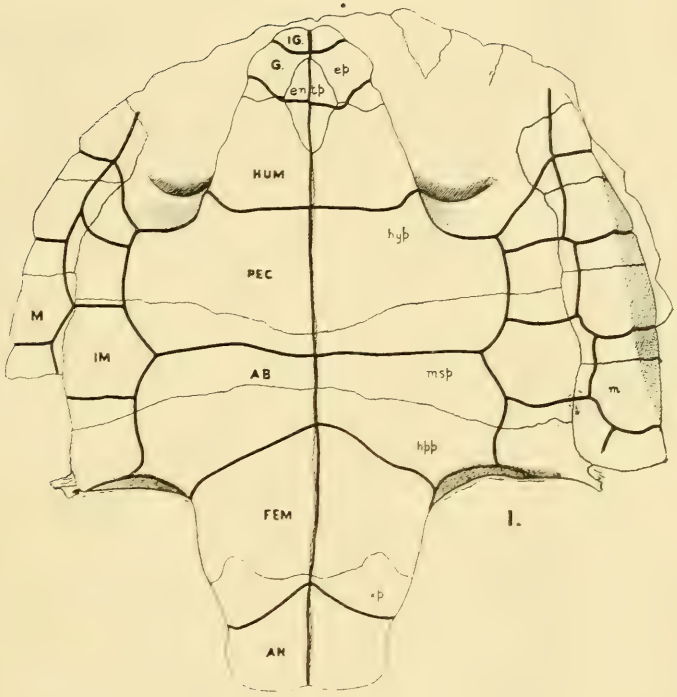

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