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THE

OTTAWA NATURALIST

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TRANSACTIONS

OF THE

OTTAWA FIELD-NATURALISTS' CLUB

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The Ottawa Field-Naturalists' Club.

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THE OTTAWA NATURALIST

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ANNUAL REPORT OF THE OTTAWA FIELD-NATURALISTS' CLUB, 1914-15.

The council of the Ottawa Field-Naturalists' Club, on the completion of another Club year, begs to report on the work during the past season. The work of the Club has been conducted along much the same lines as have been followed in past years and, with some features especially, good progress has been made.

Standing committees, the editor and associate editors of THE OTTAWA NATURALIST, the librarian and excursion leaders, were appointed at the first meeting of the council, held on March 31. Five meetings of the council were held during the year. Fewer meetings than usual were required on account of more work being handled directly by the sub-committees. Connection with other scientific organizations has been maintained through correspondence, exchange of publications and other means. The Club was represented at the meeting of the Royal Society of Canada, held in Montreal, by Dr. C. Gordon Hewitt.

During the year substantial progress has been made in securing new members, 43 being elected, compared with 14 last year. Against this 25 members have resigned or have been removed from the list by death, leaving a net gain of 18. The membership of the Club is now 329. Unfortunately, an unusually large number of members have not paid their dues, which has hampered the work of the Club considerably. At the close of the year there is a balance of $36.25, with some accounts unpaid.

PROTECTION OF BIRDS AROUND OTTAWA.

The arrangements announced in Dr. Hewitt's lecture before the Club on February 10, 1914, (OTTAWA NATURALIST, March, 1914, pp. 161-171), for the distribution of nesting boxes in Rockcliffe Park and the Central Experimental Farm and Botanical Gardens, which areas were declared bird sanctuaries, were carried out in

the spring. The Ottawa Improvement Commission instructed their Superintendent, Mr. Stuart, to have 250 nesting boxes of the two sizes recommended made, and these were distributed throughout Rockcliffe Park. The Department of Agriculture purchased and distributed at the Experimental Farm 160 nesting boxes of the Berlepsch pattern of three sizes suitable for birds using such cavity nests, from wrens to flickers. Many of the boxes in Rockcliffe Park were not very suitably hung, which would prevent a large proportion of them from being used, as would otherwise have been the case; nevertheless it was seen that some of the boxes were utilized. Many of the boxes at the Central Experimental Farm were inhabited in spite of the fact that this distribution was unavoidably delayed. Wrens, bluebirds and three swallows were observed making use of them; in one case a box was appropriated by a pair of wrens the day after it was hung.

Before the opening of the spring it is intended to make a complete examination of all the nesting boxes in Rockcliffe Park, and at the Central Experimental Farm, for the purposes of cleaning and ascertaining the number of the boxes occupied during the season of 1914.

Encouraging reports have also been received from private individuals who adopted our recommendation and provided nesting boxes in their gardens. The example that has been set and the educational work since carried on is having very gratifying results in other parts of Eastern Canada.

THE OTTAWA NATURALIST.

The official organ of the Club, THE OTTAWA NATURALIST has appeared regularly during the year. Volume XXVIII, comprising 180 pages, has been completed. Mr. Arthur Gibson has continued to edit it. The following are the most important papers published in the volume:—

"On a new genus and species of carnivorous Dinosaur from the Belly River Formation of Alberta, with a description of the skull of *Stephanosaurus marginatus* from the same horizon." By L. M. Lambe.

"The Waterways of the Mackenzie River Basin." By Charles Camsell.

"Lichens from Vancouver Island. By G. K. Merrill.

"Abscission." By F. E. Lloyd.

"Gall Midges as Forest Insects." By E. P. Felt.

"The Problem of Bird Encouragement." By W. E. Saunders.

"Myosurus in Canada." By E. L. Greene.

"The genus Antennaria in Greenland." By M. P. Porsild.

"Geological Survey Museum Work on Point Pelee." By P. A. Taverner.

"Pleistocene Raised Beaches at Victoria, B.C." By C. F. Newcombe.

"The Snow-flea." By Charles Macnamara.

"List of Tachinidae from the Province of Quebec." By J. D. Tothill.

"The value of some Mammals and Birds as destroyers of Noxious Insects. By Norman Criddle.

"Ceramographtus ruedemanni." By G. H. Hudson.

"The Banded Pocket Mouse, *Perognathus fasciatus* Wied." By Stuart Criddle.

"The New Zealand Peripitus." By E. E. Prince.

"Notes on the Preparatory Stages of *Proserpinus flavofasciata ulalume*." By Arthur Gibson.

"Hybridization in the genus Viola." By M. O. Malte and J. M. Macoun.

"Fauna Ottawaensis: Order Lepidoptera: Family Noctuidae subfamily Phytometrinae." By Arthur Gibson.

"Botanical notes from Portneuf Co., Que." By Bro. M. Victorin.

THE LIBRARY.

During the past year a large number of requests for back numbers of THE OTTAWA NATURALIST have been received. In some instances the current issues were not all received by the members, but in most cases only a few numbers were required to complete volumes.

The Club library is now in a somewhat more satisfactory condition than a year ago. During the year the books and other publications stored in the Carnegie Library were catalogued and systematically arranged on the shelves. The catalogue is now undergoing revision, the most valuable publications being selected and listed for the purpose of publication in THE OTTAWA NATURALIST.

At present no use whatever is being made of the library, but it is hoped that in the near future arrangements will be completed, which will enable members to make some use of the valuable literature belonging to the Club.

EXCURSIONS.

A meeting of the Excursions' Committee, to arrange for the spring excursions, was held in the Carnegie Library on Wednesday, 8th April. There were present Mr. Halkett in the chair, Mr. Carter, Dr. Williams, and Miss Fyles. It was decided to hold excursions as follows, subject to the approval of the council:—

May 2nd—Rockcliffe.
9th—Above the Chaudiere Falls—north shore Ottawa River.
16th—Britannia.
23rd—Ironside.
30th—Leamy's Lake.

June 6th—Rideau Canal by motor boats.
13th—Stittsville.
20th—Fairy Lake *via* Chelsea Road.
27th—Experimental Farm.

Seven of these excursions were held—that on the Rideau Canal being cancelled as no motor-boats could be had, and that to Stittsville also cancelled as arrangements could not be made for the C.P.R. express to stop at that station. There was some misunderstanding, too, as to an early afternoon train up the Gatineau line, so that the excursion arranged to be held at Ironside on 23rd May was postponed until 6th June, and that to Fairy Lake substituted for it.

Two excursions were also held during the autumn—one to McKay's Lake and the other to the Experimental Farm, both of which were well attended.

LECTURES

The series of lectures presented during the winter was also very successful. The attendance was good, and the subjects discussed of much interest. The following is the programme as carried out:—

December 8th, 1914, (Tuesday). "Sea Fisheries of Norway." Illustrated with lantern views. By Dr. J. Hjort, of Norway. In the Normal School Assembly Hall.

January 12th, 1915, (Tuesday). "The Royal Botanic Gardens, Kew." Illustrated with lantern views. By Prof. R. B. Thomson, Botanical Laboratory, University of Toronto. In the Normal School Assembly Hall.

January 26th, 1915, (Tuesday). "The Indians of the West Coast." Illustrated with lantern views. By Dr. Edward Sapir, Department of Anthropology, Geological Survey, Ottawa. In the Normal School Assembly Hall.

February 9th, 1915, (Tuesday). "Fossils." Illustrated with lantern views. By Mr. L. D. Burling, Geological Survey, Ottawa. In the Carnegie Library Assembly Hall.

February 23rd, 1915, (Tuesday). "Milk." Illustrated with lantern views. By Mr. J. H. Grisdale, Director Experimental Farms, Ottawa. In the Normal School Assembly Hall.

March 9th, 1915, (Tuesday). "Some Interesting Canadian Birds." Illustrated with lantern views. By Dr. M. Y. Williams, Geological Survey, Ottawa. In the Carnegie Library Assembly Hall.

March 23rd, 1915, (Tuesday). Annual Meeting and Presidential Address, "The Habits of Insects in Relation to their Control." By Mr. Arthur Gibson, Entomological Branch, Department of Agriculture, Ottawa. In the Carnegie Library Assembly Hall.

THE BOTANICAL BRANCH.

This branch of the Club held seven meetings during the 1914-15 winter season; two each at the residences of Mr. Geo. H. Clark and Mr. R. B. Whyte, and one each at the residences of Mr. D. A. Campbell, Mr. W. T. Macoun and Mr. J. M. Macoun.

At these meetings there was an average attendance of about 14 members. Reports of these meetings are printed in THE OTTAWA NATURALIST. The subjects presented were as follows:

"The Possibilities in Canada for Home Grown Seed," by Messrs G. H. Clark, M. O. Malte and W. T. Macoun.

"Some Canadian Wild Fruits," by J. M. Macoun; "Climatic and Soil Conditions as They Influence Plant Life," with special reference to Canadian Grasses, by M. O. Malte.

"The New Greenhouses at the Experimental Farm" and lantern slides illustrating some "Native Shrubs and Trees," by W. T. Macoun.

"An Account of a Trip to Egypt and Palestine," by R. B. Whyte and lantern slides of "Plant Adaptations," by D. A. Campbell.

"Forestry Problems in Canada," by J. R. Dickson and "Facts regarding the Organization of the Forestry Branch," with lantern slides, by C. J. Tulley.

"Wood Fibre—Its Uses in Pulp and Paper Making," by J. S. Bates, of the Forest Products Laboratories, McGill University, Montreal.

THE ENTOMOLOGICAL BRANCH.

The Entomological Branch has held no meetings during the winter of 1914-15. This has been largely owing to the fact that there are very few workers in entomology, other than those employed officially in the Department of Agriculture.

Throughout the Ottawa district large numbers of insects in the various orders were collected during the season of 1914 for systematic study and many new records have been obtained. Many of these captures are being recorded in the Entomological Record for 1914, which will appear in the annual report of the Entomological Society of Ontario for that year.

ACKNOWLEDGMENTS.

The Club has again been fortunate in securing suitable accommodation for lectures and committee meetings through the courtesy of the management of the Carnegie Public Library and the Normal School, and our thanks are also due to the city press for free insertion of lectures and excursion notices and reports.

Respectfully submitted,

E. D. EDDY,

Secretary.

ERRATUM.

In Mr. Melville Dale's article on "August Bird Life at Pleasant Point, Ont." which appeared in the March (1915) issue of THE OTTAWA NATURALIST, the four paragraphs on page 174 beginning with "The discovery of this bird . . . . " and ending with "within the range of the observer" should have been placed under the Caspian Tern, *Sterna caspia*, and *not* under the Bluebird, *Sialia sialis*. Ornithologists please make note.

SUBSCRIPTION 1915-1916.

Members of the Club are reminded that membership fees for 1915-1916 are now due, and that the same are payable to the new Treasurer, Mr. G. Le Lacheur, Seed Branch, Department of Agriculture, Ottawa.

TREASURER'S STATEMENT 1914-15

Receipts.

Balance from 1913-14		$ 28.59
Membership fees:		
Arrears	$ 16.00	
1914-15	138.00	
1915-16	33.00	
	$ 187.00	187.00
Advertisements in THE OTTAWA NATURALIST.		93.90
Authors Extras sold		82.29
Provincial Government Grant		200.00
Miscellaneous		1.43
		$ 593.21

Disbursements.

Printing THE OTTAWA NATURALIST, 8 Nos. of Vol. XXVIII	$ 305.09
Illustrations	27.18
Authors' Extras	92.14
Miscellaneous printing, envelopes, etc	24.30
Postage, THE OTTAWA NATURALIST to members	23.89
Editor	50.00
Lectures expenses	18.00
Postage, bank exchange, etc	16.36
Cr. Balance	36 25
	$ 593.21

Examined and found correct.

J. BALLANTYNE,
E. C. WIGHT. J. F. WATSON,

Auditors. Treasurer.

SUGGESTIONS FOR ORNITHOLOGICAL WORK IN CANADA*

BY P. A. TAVERNER,
Geological Survey, Ottawa.

In surveying the results of ornithological work done in the Dominion to date, one is struck with the number of blank spaces in our knowledge, and the fine field yet offered for original research.

In the subject of life-histories, there is hardly a species, amongst our typical Canadian forms, that has been comprehensively worked up. Most of the work accomplished along these lines has been done in the adjoining republic and describes conditions abroad, slightly foreign to us zoologically as well as politically. Of course, our workers have been fewer both actually and proportionally in Canada than in the United States, and perhaps under the circumstances the broader generalizations that our few have accomplished has been of more pressing nature than the detailed surveys accomplished in the older community.

In geographical distribution our knowledge of Canadian avifauna is fragmentary and, if it were not for the results of work accomplished in the United States, would still be but an outline. The Maritime Provinces have been touched but locally. The Labrador and the Gulf of St. Lawrence has been worked intermittently. From Montreal west to the Toronto region but high spots have been touched; in fact, the southern peninsula of Ontario is perhaps the only area of any size in Canada, that has had anything like adequate attention from an ornithological standpoint. From a line east of Georgian bay to the Manitoba boundary we know practically nothing of bird conditions. Continuous systematic work in Manitoba ceased some years ago and the other Prairie Provinces—Saskatchewan and Alberta—have received but desultory attention from visiting naturalists. British Columbia is being investigated in spots but most of its area except locally in the southern portions is a *terra incognita* as far as exact ornithological knowledge is concerned.

In the northern regions, on the Yukon river and some of its tributaries and main highways, considerable work has been done by occasional visitors. Along the route from Lake Athabasca

* Published by permission of the Deputy Minister of Mines.

to the mouth of the Mackenzie river various investigations have been conducted from time to time and, considering the accessability of the locality, our records are comparatively full.

The Arctic coast of Coronation gulf has been, and is being studied. Of Hudson's bay and Ungava we have but scattered notes and short lists. Though considerable geographical exploration has been conducted by various parties amongst the islands of Franklin and the far north, our knowledge of the ornithological conditions there is fragmentary and imperfect.

In economic ornithology, Canada has done little if any original work.

In systematic science our working collections have been, and still are, too small to accomplish anything comparable to the work done on our own forms in the United States, even if we had our natural quota of trained zoologists to use such material to advantage.

Thus, it seems that ornithology in Canada still has most of its history before it, and outside of a few brilliant exceptions the work that should have been done by our own people has been accomplished by naturalists from the United States who have turned their attention in our direction.

The introduction of nature study in our schools and the general interest that has been awakened in allied subjects of late years has not, to date, entirely fulfilled the results expected of it. In fact, reliable observers of ornithological phenomena, both in Canada and the United States, are, perhaps, fewer to-day both numerically and in proportion to population than they were a generation ago. An elementary introduction to nature in our schools has failed to awaken any serious interest in natural problems. General and elevating interest in nature may be more widely read to-day but no ornithologist of marked ability has found his or her avocation or has been developed through these means. Whether this has been the fault of methods pursued, or causes more deep seated, the writer cannot tell. Certainly if, a generation or so ago, when the opportunities for learning even the rudiments of natural history were few and difficult to obtain, naturalists were developed at all, we should expect that to-day when the subjects are taught in every public school and the introduction to the study is almost forced upon large numbers of people, the percentage of serious and enthusiastic workers would be greater. These are the facts; the causes of the apparent failure must be left to pedagogs to argue over.

Does it not seem that Canada has reached that stage in its development where it can take its rightful position in the world as well along ornithological as in other lines?

For many years the Geological Survey of Canada has devoted what attention its limited staff could spare from its numerous other activities towards gathering Dominion ornithological data and there have been a few private investigators that have been observing and noting with commendable industry. With the broadening out of the work of the Geological Survey and its Museum, great impetus should be given to bird work in Canada. Museums are also being started or rejuvenated in the various provinces and the time seems ripe for a general wakening of interests in zoological subjects. To call attention to our shortcomings in data and workers it seems advisable to outline a few fruitful fields of endeavour that can be worked by various individuals whose tastes incline in that direction.

Ornithology can be approached and studied from various sides and by individuals of many different tastes and inclinations. For the general nature lover, interested in birds from a poetic or asthetic standpoint, the study of life-histories offers a most attractive field. Careful watching and observing of feathered friends in their secluded haunts, bloodlessly stalking them with camera and note or sketch-book and divining the hidden secrets of their lives is a pleasure that can be indulged in by all and enjoyed by many. The most common bird of our vicinity is an object worthy of the most careful and painstakin attention. The Wren building in the improvised nesting box in the garden, the Song sparrow of the near-by thicket are both awaiting a careful record of the story of their daily lives. The amount of original, valuable and interesting information, that can be gathered from such homelike sources is almost infinite and unexpected surprises will almost daily repay the close observer. To those whose time and opportunities are limited such birds about home are fruitful. By those with more leisure, greater ambition or ampler opportunities work farther afield may be pursued and species less commonplace can be studied. In fact there is work in this line for everybody of widely divergent taste and situation and even city parks and backyard gardens will amply repay attention.

As a suggestion for investigation, the following outline of problems to be solved may be followed. It is merely suggestive and can be enlarged indefinitely.

Is the species a resident or a migrant?

When does it arrive and leave?

What are the determining influences upon its migrations,—food supply, weather, or does physiological development produce a periodical desire to migrate?

Which individuals come or leave first, male or female, young or old?

Are they mated when they arrive or do they select mates after arrival?

Are there any courtship ceremonies?

What characters seem to determine sexual selection? Vigor? Beauty? Song?

Do the same individuals return year after year to the same localities, and do they mate together annually?

How wide is the local range of the individual, do they keep close to this home area or wander widely?

When, where and how do they nest?

Which sex choses the site?

Which sex builds the nest and how much and in what way do they aid each other?

What seems to be the qualities that they look for in selecting a nesting site?

Do they work on the construction throughout the day or only at regular intervals?

What is the technic of nest building?

Is the technic the result of instinct, experience or memory and does it improve with experience.

Are all individuals of the species equally expert in nest building?

How far can they adjust nest to new materials, situations or conditions?

Is there any change in the routine habits before, during or after nest building?

Are the eggs deposited immediately after the nest is finished?

What is the incubation period?

How many eggs are laid and when, how often, what is a normal set?

Does the egg laying seem under the conscious control of the individual?

What determines the number of eggs,—the size of the nest, the judgment, age or vigor of individual?

How are the eggs brooded, by which sex, do they divide the labor? Are the feathers removed from the abdomen of the brooding bird consciously or do they wear off by friction with the eggs? What is the incubation temperature? How often are the eggs turned by the parent?

How are the eggs protected during exceptionally inclement weather?

This list covers but a short time in the bird's life, but it shows how much can be learned and studied in but one phase of its existence; other moments in the lives of any species are equally interesting.

One of our greatest desiderata is an accurate investigation of distribution of bird life in the Dominion. The uninitiated rarely realize how many of the published ranges of our birds are based upon geographic probabilities, a *priori* reasoning or are copied and recopied, from previous writers. Examples are many. A great proportion of our southern Canadian lists give the Northern Hairy woodpecker as the common form and the Eastern Water thrush as ranging to the plains. The fact is, that the first is but a very rare winter visitor to the area, and Grinnell's Water thrush is the common form in the Lake Erie peninsula. Many more such cases could be cited. The only basis acceptable for such determinations are specimens examined by trained experts. Even when the forms are collected, comparison with series of specimens of allied forms is necessary to certainly established its identity. In these we are woefully lacking and still have to depend upon the courtesy and interest of our friends across the line in the separation and substantiation of many difficult forms.

To establish the Canadian ranges of our birds, their migration routes and general status, we need skilled observers at all possible points, to note and collect local data and specimens. Ideally there should be an observer and collection in every county in the Dominion; each keeping track of his own area and comparing and checking it with results from adjoining stations. Provincial Museums should gather up these local details within their sphere of influence and the whole should be amalgamated and correlated by the Dominion authorities, represented by the zoological branch of the Geological Survey at Ottawa. In this way we would have co-operation and series of local collections illustrating intensive work throughout the Dominion.

All such work, however, to be of service must be based upon exact personal knowledge and substantiated in every way possible. We look back to-day upon apparent mistakes made by our predecessors, even those of marked and recognized ability, and wish for data by which to check their statements. The next generation will demand the same of us and with more reason for impatience, if it is absent. Ornithology has advanced and the necessity for substantiating everything is more generally recognized now than in the past.

(*To be continued*)

MEETING OF BOTANICAL BRANCH.

February 5th, 1915, at the residence of Mr. D. A. Campbell. There were present Messrs. Blackadar, Buck, Clark, Dymond, Donaldson, Fryer, Grindley, Honeyman, Lelacheur, Newman, Simpson, Tully, Whyte and the host, Mr. D. A. Campbell.

Mr. R. B. Whyte described his recent trip to Egypt and Palestine, and exhibited interesting specimens, photographs, etc., collected during the trip. Mr. Campbell showed a series of lantern slides, consisting of certain examples of the adaptation of plants to their environment, etc., which are used in his botanical and nature study courses at the Collegiate.

Mr. Whyte, in addition to describing many interesting experiences in Egypt and Palestine, drew attention to places through which they passed en route. Madeira, for instance, the first stopping place, produces large quantities of grapes and sugar canes; Gibraltar, the great fortress; Algiers, the city with beautiful Moorish architecture; Monaco and Monte Carlo, with their unique histories and present tragedies; the trolley-ride to Nice with the blue waters of the Mediterranean, 200 feet below; Naples and Pompeii—all received passing notice. The country between Alexandria and Cairo was described as flat, with canals about a mile apart intersecting it in all directions. The houses, in many cases, are built of mud, and elaborate pumping systems distribute the water to the agricultural land, from which several crops are taken every year. In this district a forage crop, somewhat like alfalfa, known locally as berseem, is produced in great quantities. It is really one of the clovers, and is listed as Egyptian or Alexandrian clover, an annual winter variety used in warm countries where irrigation is practiced. Wheat is also produced in great quatities around Alexandria.

At Cairo, Mr. Whyte found many things of interest in its numerous bazaars and incidentally picked up a new method of buying. At Ghizeh, noted for its pyramids, 14 in all, the canals are far below the level of the Nile. Heliopolis, five miles from Cairo, was the old university city of Egypt. Only an obelisk is now left to mark its site.

From the standpoint of the botanist, there was not very much of great interest in the Nile valley. Only a few weeds or wild flowers had an opportunity of becoming established, owing to the annual overflow of the river. A small iris and a few odd weeds were all that could be found. All the public parks of Egypt, such as those in Cairo, had flower beds, in which were grown popular garden flowers like the annual phlox, verbena, etc., Farm hands in Egypt received from 15c. to 25c. per day.

At Jaffa, the port of entry to Palestine, Mr. Whyte picked the fine flavoured Jaffa oranges. The orange groves extend

for about eight miles around the city. Most of the crop is sent to England. A very effective hedge, consisting of a form of cacti is generally used around the orange groves. The country around Jaffa is fairly prosperous. The field crops consist largely of wheat. The flowers of this region are poppy anemones, and cyclamens. many of the latter being as good as our cultivated forms. Thirty miles inland from Jaffa, the country begins to get barren and desolate. Palestine has few trees and in the Jerusalem district the Olive is the only tree. There are a few annual flowers.

Mr. Whyte spent four days in Jerusalem and from there visited such places as Bethlehem. His large collection of picture postcards added interest to the talk.

F. E. B.

EXCURSIONS.

The Excursion Committee of the Club has arranged the following spring excursions :—

May 8—Rockcliffe.
" 15—Iron Mines at Ironside.
" 22—Britannia.
" 29—Aylmer.
June 5—Rideau Canal by Motor Boats.

PRIZES OFFERED FOR COLLECTIONS TO BE MADE DURING 1915

For the best collection of not less than 50 different species of native Canadian deciduous trees and shrubs, illustrating the reproductive, vegetative and dormant stages of the same. Prize valued at $5.00 offered by Miss F. Fyles, Experimental Farm, Ottawa.

For an essay on any topic relating to Canadian Botany—No limit to length. Prize valued at $5.00 offered by Mr. H. T. Gussow, Dominion Botanist, Experimental Farm, Ottawa.

For the best collection of dried specimens of fungi of no less than 100 species. Prize valued at $5.00 offered by Mr. H. T. Gussow, Experimental Farm, Ottawa.

For the best collection of at least 200 species of insects from the Ottawa District, special marks to be given for species attacking garden and field crops. Prize valued at $5.00 offered by Mr. Arthur Gibson, Entomological Branch, Ottawa.

For the first information of a prehistoric village site or cemetery within ten miles of the Victoria Memorial Museum, available for exploration. Prize valued at $5.00 offered by Mr. Harlan I. Smith.

Directions re the making of above collections and further information may be had on application to the donors.

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SUGGESTIONS FOR ORNITHOLOGICAL WORK IN CANADA.

By P. A. Taverner,
Geological Survey, Ottawa.

(Continued from page 18).

The local worker, then, should collect industriously and determine his specimens with accuracy, getting expert opinion whenever necessary. The fact that no one can be equally familiar with all the recognizable forms of every species should be recognized and no hesitation shown in referring to those having greater experience in special directions. It should be the endeavour to study the bird life of the chosen locality thoroughly and no means should be neglected to extend an understanding of conditions in past times as well as present. For this purpose old literature pertaining to the locality should be searched and the accounts verified as far as possible. In fact the compiling of a bibliography of local application is an important line of research. The aim should be to tie up every record, when possible, with an extant and fully confirmed specimen, if not one in the observer's collection, its whereabou's should be noted so that it may be available for future examination and reconsideration. Examination of old collections of stuffed birds in out of the way places and old houses is a fruitful source of information, but the greatest care should be exercised in substantiating the data in connection with them. When there is any doubt whatever on this point the fact should be noted. In fact, to a local faunal list it is better to add a hypothetical list for all species whose occurrence cannot be substantiated by specimens or on equally unimpeachable evidence. A long hypothetical list is often an indication of careful work rather than the contrary.

In collecting, the local student should attempt to gather representative series of all the birds of his area, showing every possible plumage in which they occur in the locality. This means

more than single individuals or even pairs, nor is one only of each stage sufficient. Any single individual may be and usually is abnormal in some particular. It is only by a series of several that the average can be established. Freaks, albinos, melanos and other abnormal occurrences are of little general scientific interest, the normal is a much more desirable subject of study.

In gathering up information of specific occurrences the local taxidermist is a man to cultivate, not only to secure specimens but to learn and see what passes through his hands. It is well also to keep in touch with the shooting and sporting fraternity, for they often obtain material of great interest.

The desirable form in which to keep such collections is undoubtedly as dry skins and not stuffed and mounted specimens. The taste for the latter is waning for one thing, and they are otherwise too bulky to house and keep in any number. As the object is the indefinite preservation, the skin is much to be preferred, for the action of dust and light, to say nothing of insect ravages upon mounted specimens, is highly destructive and their life is limited. Besides this, a mounted specimen is not available for the handling necessary for close examination. One hesitates to maltreat a nicely mounted bird to get at hidden characters, that are easily seen in properly made skins.

A word here may be included as to the much vexed question of subspecies and how far it is desirable to recognize and study them. Originally, when the conception ruled that living forms were the result of special creation, a species was considered a fixed quantity, whose limits could be definitely placed. The acceptance of the evolutionary theory of the growth of species from others pre-existing necessitated a rearrangement of our ideas and it was found that what were regarded as permanent types were more or less unstable and that geographic variations occurred, extremes of which when compared without considering intermediate stages, exhibited differences of almost specific value. As all stages of differentiation between these extremes were to be found, it became evident that they must be regarded as evolutionary departures from the specific type and be, in fact, "species in the making," before the connecting sequence between them and the parent stock has been disrupted or broken down to form isolated species.

Our modern system of nomenclature gives each species a binomial name, one term representing the genus to which it belongs and the other the species. As it seemed desirable to apply definite cognomens to geographical variants from the typical form in order to facilitate referring to them, "give them a handle," as it were, a third name was added, making our system

a trinomial one and thus carrying out Linneaus' great invention in the spirit in which it was conceived. The result is logical and necessary, but it should be remembered that such geographical races, varieties, subspecies or whatever the student cares to call them are mere divisions of the species and the specific binomial is to be regarded as a collective name, including all the trinomial variants within its meaning. Thus a "Western Robin" is as much an "American Robin" as the "Eastern one" and the name *Planesticus migratorius* is equally applicable to any of the forms into which the "American Robin" divides. It is in fact only necessary to name subspecies either vernacularly or scientifically where special exactness is required by context or scope of consideration. In any event, it is wiser to ignore it altogether unless there is definite and accurate knowledge for justification. Subspecific designation should only be based upon examinations and authoritative determination of specimens, and not upon probabilities or assumptions.

In every subspecifically divided form there is one race that is called the "type form," loosely called the "species;" this is scientifically named by repeating the specific name in the trinomial; as, the Eastern Robin, *Planesticus migratorius migratorius*. Theoretically this should represent the original stock from which the variants departed but as these are often impossible to determine and scientific nomenclature must be exact, it means in practice that this form is the one that was first discovered or described and to which, by the canons of nomenclature, the name must permanently adhere. The type race then, is really of no more scientific importance than its co-races.

The realization of the proper relative importance between type and subspecific forms and the applications of sane principles in practice will go far towards rectifying the abuses from which a valuable system has suffered.

Some subspecies are marked and conspicuous in character; but as there must be species in all stages of making, some exhibit but minute differences only evident from the examination of series of comparable material by trained perception and judgment.

Theoretically, the numbers of subspecies of a widely varying race must be innumerable, but the most of them are too fine for human recognition. The question is, of course, where to draw the line. Subspecies are actual facts and do exist. Whether it is serving the best interests of science to deferentiate and name the finer variations that only an expert, especially trained, can recognize is a subject, that is still being argued. However, whether we hold with the "Splitters" or the "Lumpers" it

seems best for the majority of us to follow the lead, perhaps under protest, of the consensus of representative opinion as evidenced by our American Ornithological Union Check List, though we can reserve to ourselves the liberty of departing from their findings in cases where mature judgment or data justifies it. However, for the sake of uniformity it is better to err on the conventional rather than the radical side and to keep as largely as possible in harmony with accepted contemporary authorities.

Others, to the contrary, notwithstanding no enduring faunal work, can be accomplished without the collection of specimens. The field-glass and camera are most valuable auxiliaries, but cannot altogether take the place of a bird in the hand. Due regard must, however, be given to the principles of humanity. Collecting is a necessary evil to scientific study and is amply justified by it, but the responsibility of the collector is great and his influence should be always thrown against the useless killing of anything. The collector kills for a good and sufficient reason and should never do it, without that justification. Man, who has been given or has assumed the rights of the earth, should recognize his responsibilities and bear the relation of a guardian to harmless lower life. Our laws recognize this and it is necessary for a collector to get a permit from the game warden of his province. This, however, is issued to duly qualified students who should be careful that the privilege is not abused. Nothing should be killed without a good and sufficient reason and when so killed particular care should be exercised that the best use possible is made of it and that it is preserved for all times.

The privilege to collect specimens, the legal property of the people, is granted by the representatives of the people for the benefit and increase of knowledge of the people. Hence such specimens are in a manner public trusts and when once taken should be preserved as such and not for individual gain or hoarding. They should be kept as safely from damage by time, dust, light, insects or accident as circumstances permit and, as the owner has morally but a life interest in them, arrangements should be perfected, so they may be for the present available for study by other workers and finally deposited in some known repository where they will be available to coming generations of investigators.

The fear that the legitimate collector will deplete our bird life is groundless. Even were the number of our collectors increased many times and stimulated to greatly increased energy they would have a negligible effect. Large collections are sometimes pointed to as causes of a supposed reduction in bird life but all the collections in North America, the results of fifty years

industrious work, would not nearly equal the destruction caused in one year by millinery plumage hunters. When we consider the constant, widespread persecution and the number of widely distributed sportsmen it has taken to reduce our game birds, it is obvious that a few scattered collectors can have little, if any, influence upon the bird population. The ideal conditions suggested before, call for a collector in every county. If we had but one dozen sportsmen shooters in every county would game be scarce to-day?

There is also a sentiment against the scientist collecting "rare birds" on the supposition that if these were allowed to breed they would become common. There are practically no birds, but game, raptorial and plumage forms, that suffer systematic persecution. The number of small or rare birds that are killed by human agencies, except for profit or food, is on the average negligible. Are there a dozen people in Canada, seeking or hunting for Cory's Least Bittern? How many would know one if they saw it? The species has had hundreds of generations in which to become common, if they are rare now it is due to the action of still operating natural causes. The rarity of a creature not especially or generally hunted for profit is an indication that it is not adapted to conditions and is nearing extinction through natural causes. Rarity obviously just precedes extinction.

Of course with species that are much hunted, or that are rare, owing to the geographical limitations of the habitable or breeding ranges, the question is different. Scientific collectors have occasionally gone into small, isolated colonies and practically wiped out a species that, but for them, might have survived for a while longer. But even in these cases the fact of such limited range itself indicates that the species is declining and its end has been only hastened. A dominant, virile race will tend continually to spread; that it has not done so, it is an indication of inherent weakness in the species.

The Passenger Pigeon is often pointed out as an example of man's ruthlessness, and a great deal of sentimentality has been exercised over it. In the first place, great flocks of birds of this species would to-day be incompatible with agricultural pursuits. If man destroyed the Passenger Pigeon it was by extensive netting operations against them and not by the desultory shooting of scattered farmers and sportsmen. Yet the last year of netting at the Petosky rookeries left countless pigeons alive. The fact that few of these returned the next spring was no fault of the trappers. For years thereafter occasional flocks and bunches of Passenger Pigeons were seen;

enough to have stocked the continent, at any rate to the limit of economic safety, had they been adapted to present conditions. The Bluebird population was almost entirely wiped out one winter. Fewer were left of them than of pigeons just after the Petosky rookery was deserted; yet in five years the Bluebird regained its old numbers. But the Bluebird is a strong, virile race, suitably adapted to the conditions of a cultivated country. The pigeon was not; hence it passed away while its close relative, the Morning Dove, still thrives and increases.

It must be borne in mind that our bird population is limited by natural conditions. In most cases this limit was reached long ago, and no more birds can inhabit North America than can find support during the season of least food supply. In a normal or stationary population, the death rate must equal the birth rate or else the population ceases to be stationary. The breeding season increases the population enormously and one way or another this increase must be, and is, reduced to the smaller supporting power of the land through winter.

It is evident that this allows of a considerable margin of reduction and shows that even quite considerable numbers can be destroyed without interfering with the ultimate numbers of the population and that the comparatively few individuals taken by collectors cannot have an appreciable effect upon their number.

The professional collector has come in for popular abuse, far beyond his deserts. In the first place, the professional collector is almost an unknown quantity. He is too scarce in fact to find when wanted. In the next place, there is little or no market for his wares. Few scientists are wealthy or able to pay prices that allow the professional a livelihood. The trade in big game heads and trophies with wealthy sportsmen is considerable and the plumage business for millinery purposes has wrought devastation amongst certain species but the opportunities for professional scientific collectors are small indeed. This is to be regretted as, allowing that the study of birds is justifiable, it follows, as a matter of course, that the man who supplies the material is justified also and is engaged in commendable work. No one person can personally gather material from everywhere, yet extra-limital material is just what the serious investigator requires in his work. Without a system whereby the earnest student can, at least partially, pay the expenses of his explorations, modern science would still be in the dark condition of middle ages. The epoch making field works of Bates or Wallace would have been impossible if they had not found a market for their wares.

To hope that each of our counties will have facilities for the proper and safe storage for such valuable objects is perhaps to wish for the millennium. However, many of the provinces are establishing museums, that should develop into just such repositories for provincial data and we hope the time is not distant when this use of them will be more highly and scientifically developed. In the meantime we have a Dominion Museum, that is prepared not only to store but to scientifically use such material and is slowly building up a national collection for future Canadian students in proportion with the growing dignity of the country it represents. It is to be hoped that the time will come when it will take equal rank with other national museums of the world, the British Museum, the Smithsonian Institute and others of like repute. To do so, however, requires the co-operation and sympathy of the Canadian people as a whole. No public institution can do all the necessary work itself but must rely largely in the building up of its collections and prestige upon the interest and aid of the people it represents. Thus grew the great British Museum through the practical help of its private friends into an institution that is an imperial pride. On this side of the water the scientific and enthusiastic generosity of such men as Roosevelt, Abbot and others who donate large collections resulting from their sporting expeditions at home and in various parts of the world to the public good, as represented by their national institutions, has gone far to place the Smithsonian Institution well into the forefront of scientific progress. Our people should be no less interested in the advancement of our institutions than those abroad are to theirs. The government alone can never raise its museums to a commanding position in the world; the people in their private character as individuals only can bring about that consummation and with them the future of zoological science rests in Canada, as well as elsewhere.

On the economic side of ornithology much work remains to be done. So far we have been content to draw from the results of the United States Biological Survey and other workers across the international boundary. In so far as they treat of our species, their problems are our problems and it is questionable whether we want to duplicate their work. They have already developed an elaborate technical staff of specialists and special facilities besides gathering an immense amount of material and data. We could not compete with their efficiency for many years. It seems, except in the case of special problems of peculiar Canadian interest, we can do better by leaving the bulk of such investigation to them, co-operating when possible

and helping when we can, secure in the knowledge that any results arrived at in Washington are applicable here and available for our use. In the meantime we will have our hands and time free for other original work and avoid unnecessary and wasteful duplication.

Systematic zoology is pre-eminently the work of the closet naturalist and though to the laity it is the proverbial dry-as-dust work of the naturalist of caracture it ultimately underlies our whole modern conception of life. The tracing out of the relationships of species is our means of retracing the chain of life back through the ages to its beginnings. The conditions under which development arises gives us clues by which we are beginning to understand the fundamental principles of living creation. It is work, however, for the specially trained and can only be successfully engaged in after considerable experiences and preparatory study. In the ornithological field, so far, Canada has been too busy with practical development to give much attention to this field of endeavour. For the present, therefore, we cannot hope to seriously compete with older countries who have already trained their staffs and where collections represent material in series such as ours do not as yet contain.

However, we can all do our mite towards preparing the country for future work and future needs, gather data and specimens and gradually train a scientific body competent to attack the "riddles of existence" from the ornithological side as well as from other directions. We are all searching for the truth, the biologist, the geologist, the physicist, the chemist and the astronomer. Far apart as we seem to be in our work, we are all attacking the one great question from different directions. The answer to an astronomical detail is often found by the geologist or the chemist and the geologist receives illumination from the physicist and the biologist.

It is not an overstatement to say that zoology has had more to do with the development of modern thought in its various branches than any other science. The enunciation of the evolutionary theory had a more fundamental effect upon current thought and conception of life than anything that ever went before it. Ornithology is a branch of biology and has done its honorable share in making the intellectual world what it is to-day. If we, as ornithologists labor and do our work conscientiously, with due appreciation of our responsibilities both to science and to mankind, we can shed the light of our individual tapers in some of the dark places and add our quota to the general enlightenment. In the foregoing I have attempted to outline or indicate a course for such work.

MEETINGS OF THE BOTANICAL BRANCH.

February 20th, 1915, at the residence of Mr. R. B. Whyte. Mr. J. R. Dickson, of the Forestry Branch, spoke on the subject "Forestry in Canada." Mr. Tulley, of the same Branch, also gave a synopsis of the administrative data relating to the Forestry Branch and showed a series of very interesting lantern slides, illustrating forestry problems.

Mr. Dickson aptly emphasized the inconceivable quantities of timber used each year in Canada by pointing out that the railway companies used one hundred and fifty millions of ties each year, that the 1911 cut was five billion feet board measure, and other facts involving stupendous figures. In a condensed yet clear and forceful way, he touched on most of the great subjects comprehended in the term "forestry," forestry, as he described it, being "The Parent of Industries."

He stated that information available shows that on 60% of the cropable land, timber can be more profitably grown than farm crops. The science of forest management seeks first to ensure the permanence of the lumbering industry, and, secondly, to gain the many other auxiliary benefits, which nourish the life of a nation. The fundamental importance of wood in nearly all phases of industrial life was emphasized. At present, there is a very small stand of merchantable timber in the so-called "Great Northern Spruce Forest," the mature timber having been nearly all swept away by repeated fires during the past century. An analogous condition exists in our southern hardwood belt—but due to cutting rather than fire. Last year some 60% of the hardwood used in Canadian woodworking industries was imported.

It was pointed out that the main elements of a forest policy for Canada must be:

(1) Education of public opinion in order to provide the authority, the money, the driving power.

(2) Classification, according to its producing capacity, of all publicly owned land, to provide for permanence of use.

(3) A plan of cordial and mutually profitable co-operatiou on an equitable basis of duties and rewards.

(4) Organization on a strictly non-partisan basis, of a trained and efficient forest service personnel.

(5) Provision and equipment for investigation and research work relating to forest problems.

(6) Whatever legislation may be required to place trained men in charge of our forest lands, and insure uniform requirements from every forest user.

Reference was also made to the relation of the forest to stream flow as affecting domestic supply, irrigation and water-power, municipal and city forestry, and the immense wealth of fish and game in Canadian forests.

Mr. Tully, in dealing with the administrative side of the work, stated that there were thirty-one organized Forest Reserves, under the control of the Branch, each in direct charge of a trained forester. The area covered by these reserves was 43,800 square miles. In addition to these reserves, there were Fire-ranging Districts and two Forestry Stations, from which young forest trees, etc., were distributed to settlers in the Prairie Provinces. One of these stations was at Indian Head and the other at Sutherland. From the former over three million young trees were distributed in 1914. The Branch also had research laboratories at McGill University, where problems relating to the products from forest timber of all sorts were dealt with by trained investigators. Those present were:—

Messrs. Attwood, Buck, Campbell, Clark, Dickson, Eddy, Fryer, Honeyman, Lelacheur, Newman, Tulley and Whyte.

F. E. B.

March 13th, at the residence of Mr. Geo. H. Clark. Dr. J. S. Bates, Superintendent of the Forestry Products Laboratory for Canada, at McGill University, Montreal, dealt with the subject "Wood Fibre, Its uses in Pulp and Paper Making." The subject was handled in a very able and thorough manner and was made still more educative by a series of well prepared lantern slides illustrating the fibres of various woods and the pulp making process in the mills.

Mr. Clark, the host, in introducing the speaker, assured him that the members appreciated his coming from Montreal for the purpose of addressing the Club and to Mr. D. A. Campbell also thanks were due for arranging Dr. Bates' trip for this purpose.

After referring to the botanical classification of the principal and minor trees and many varied plants, which were used, or could be used, in the manufacture of paper, and the history of the various processes of making forest timber into paper, Dr. Bates stated that at the present time it cost about two cents per pound to manufacture paper from the forest timber, or stated in another way, forest timber suitable for paper making realized, when sold as paper, the equivalent that it would if sold as lumber at $40.00 per 1,000 feet board measure. There were about 70 factories in Canada manufacturing pulp and paper. About 50 per cent of the lumber cut for this purpose was shipped out of the country as pulp wood, and of the 50 per cent made into

pulp, one-third of that was also shipped as pulp, the remaining two-thirds being manufactured into paper in Canada.

There were four main processes of manufacture, and some minor processes, which were not commercially profitable. The beginning of the manufacture of paper, from wood, dated from about 1863, and the new extensive sulphite process from about 1883. The reason why forest timber could be used to such advantage in paper making was due to the fact of the relative shortness of its fibre. The length of fibre in the Black and Balsam Spruce was better for the manufacture of news print paper than it was in the other woods of the forest. Black Spruce contributed 70 per cent of the pulp used for this purpose and Balsam Spruce about 25 per cent. In addition other conifers such as the Jack Pine and Hemlock Spruce were also used in limited quantities, as also were Poplars and Basswood among deciduous trees. The conifers were easily amenable to the chemical treatment necessary in paper making, while the Black Spruce and Balsam were the two which were also very easily bleached. The lignin, which is in larger proportion in some woods than in others, is the cause of discoloration. The chemical process, used to reduce spruce wood, dissolves out most of the lignin, leaving the 65 per cent of cellulose, which spruce contains, available for paper. In one process an alkaline solution is used by which the gums, resins, etc., of the woods are dissolved out.

By means of the several chemical processes now used the best quality of paper is made. The large proportion of 54 per cent of the total, however, is made from mechanically ground pulp in which the lignin, etc., still remains. In many cases this mechanically made pulp is mixed with a smaller percentage of chemically treated pulp, which then gives a paper of better color and quality.

The sulphite is the most important of the chemical processes. This process is one which uses a liquor, made by burning sulphur etc., in which the pulp wood is cooked. The chemical reactions which result, involves the ketone compounds, which unite with the sulphur and separate from the cellulose. The wood previous to the ten hour's cooking is barked and chopped into small blocks. In addition to the sulphite process the sulphate and the soda processes are also used in the manufacture of pulp-wood into paper. Craft or brown and all unbleached papers are made by a soda and sulphide process.

Those present were:—Messrs. Bartlett, Buck, Blackader, D. A. Campbell, R. H. Campbell, Dexter, Dickson, Eddy, Grindley, Low, Lawler, Masters, Rice, Robertson, Tulley, and the host, Mr. Geo. H. Clark. F. E. B.

NOTE ON A WOUNDED DEER.

On December 1st, 1914, the writer shot a male deer, the condition of which, owing to strange circumstances, seems worthy of record.

The animal, a Mule deer (*Odocoileus hemionus*) had been wounded, the wound being inflicted almost surely the previous year. The bullet had entered from the right side and penetrated the flesh of both hind legs, just missing the bones, and in passing through had destroyed the genital glands. Owing to the injury to the muscels both legs were slightly drawn up behind and appeared somewhat stiff, otherwise the deer was as active and healthy as any other.

While this animal had in every respect, but one, made a perfect recovery, it presented, nevertheless, several abnormal conditions. For instance, the deer was unusually large, weighing when "dressed" 184 pounds; it also appeared far more like a doe than a buck. This was particularly noticeable in the neck which had lost all that strong muscular appearance, so characteristic of a stag, the neck, instead, being slender and doe-like. Lastly, the horns are much aborted. Close to the head is a club-like excrescence from which several points protrude. The main points, one on each side, are about ten inches long without branches, the remaining ones, consisting of two on one side of the head and five on the other, vary from mere knobs to points of five inches in length. One of the most interesting features connected with these horns is their immature condition, for while it was December, when all normal horns had long since become hard, these were still soft and in the "velvet," that is to say, still covered with short, more or less wiry, gray hairs. The horns appeared, also, to be still growing, this being evident from the fact that in falling the animal had broken one of the points, from which blood trickled.

From the general appearance of the deer, taking into consideration its size and the condition of its teeth, I am convinced that it was at least five years old, probably older. The immature conditions of the horns were doubtless due, in part, to the wounds having taken many weeks to heal; while their crumpled abnormal shape and the unusual condition of the animal generally would be directly due to the nature of the wound.

This deer was extremely fat and the venison unusually sweet and juicy.

STUART CRIDDLE, TREESBANK, MAN.

A CHEAP CASE FOR SMALL MUSEUMS.

BY HARLAN I. SMITH.
Geological Survey, Ottawa.

For many years we have heard complaints from museum curators and others interested in museums, that there was not sufficient money available for the purchase of specimens, the erection of a desired building, and the making of cases. It is true this complaint was not always, though often, made as a sort of apology for the lack of arrangement and labelling, the presence of dirt, and the failure of the museum to be useful to the community, or even interesting to the average visitor. Some museums spend for specimens thousands of dollars annually, for many years in succession, while their exhibition halls lack sufficient labels of all kinds, and especially the general divisional labels and case labels which are among the first needed to make a museum useful to the public. It is like paying $5.00 for a volume and not reading it when it were better to buy a five cent book to read. It is known by actual experience that a few hundred dollars invested in lumber, stain and the services of a painter, will remove this main stigma of faulty labelling from a fairly large museum. After all, a museum had better be without many specimens than to be lacking in essential labels. One specimen, such as a diamond or an elephant, may cost more than thousands of equally instructive specimens, such as a piece of coal or a kernel of corn, and will actually use up funds needed to completely label a large part of a great museum or an entire small one. Many institutions waste years in discussing what color, and weight of cardboard, or other material is to be used for labels, and many years pass before any exhibit is adequately labelled; it would be better to attach labels—either written in longhand, or by typewriter, so that the present generation may get useful service from the exhibit. Such tentative labels may be replaced whenever a better kind is decided upon.

Waiting for a fire-proof, or permanent, or larger building is certainly a waste of time. I once knew of a professor who complained that he could not teach a number of interested students because he had no class room, but I believe I can recall hearing of certain great teachers of antiquity, who taught their disciples by the road side, without either class room or place to lay their heads, and this idea also applies to museums, for after all, the whole out-of-doors is the best museum. A corner in every school-house may be a museum; a nook in every Board of Trade building may serve the same purpose; even the Sunday

School room may have its museum. A cheap inflammable building may be a more useful museum building than a fire-proof structure costing millions. In an inflammable building it would not be wise to store valuable material, but in it could be displayed labels, pictures, maps and books illustrated by such cheap and common specimens as elm leaves, squash seeds, broken pebbles, English sparrows, mice, or the skull of a dog. A museum of such specimens, accompanied by appropriate labels, books, maps, pictures and models, might easily be of more service to a community than some existing museums costing say ten times as much.

Case problems may delay curators not months but years. First there is the discussion as to what kind of a case and how to make it dust proof; what it should be made of, the color the back-ground is to be painted, or whether burlap will be used instead of paint. In this way, while waiting for cases, years go by. People who would use the museum grow old and die. Children who have time in their receptive condition of mind to profit most in the museum grow up and have their time occupied by necessary labor. Their minds become blunted to the useful impressions which they might gain in the museum, and still the museum curator has not secured the case he needs for the exhibit in time to benefit all the classes of people, from the old people to the school children. As a matter of fact, all these people could have gotten the maximum amount of benefit from the museum, had the specimens been exhibited without any case at all, on the wall, on tables, on the floor, or even out in the big out-door world, had there been sufficient and appropriate labelling. Thus the kind of material and color of case seems to have little to do with the usefulness of a museum. I have seen museums with black cases, white cases, reddish cases, yellowish cases and portions of museums with no cases at all, and every one of these had some exhibits that were superior in graphic usefulness to some class of the public than were any other exhibits known to me. No doubt the back-grounds should be carefully considered, certain colors being better than others. Perhaps the relationship of colors or general harmony and the relationship of light and a subdued quietness of color are of extreme importance, but visitors have been in a museum where the cases were entirely white, been interested and obtained useful information some little time before noticing whether the cases were white or black. While black cases may not be advisable, several of our best museums have them, and in some instances one sees the exhibit before it is realized that the case is black. No doubt either a white or a black case may

be very bad in a wrong setting, wrong relations, or if it is not harmonious, and not used wisely.

The museum of the Natural History Society of New Brunswick, located at St. John, has a comparatively small amount of money to spend each year. In this the museum is perhaps fortunate, for in so far as the curator's funds permit, some of the most up-to-date museum methods are actually being put in force. The curator has insufficient help, a comparatively poor building and miserable cases, yet he carries on field research, conducts a lecture course for adults and one for school children, so that two lectures are given each week during the school season. Large parties of young people are taken out to investigate and study in the field; some publications are issued, material collected by school children and sent to him by their teachers is identified, and the teachers of the schools are provided with nature study leaflets suggested by the object sent within twenty-four hours of its receipt. Every school child is interested in what Willie Jones of School No. 2 found yesterday.

In autumn when the Canadian Pacific Railway supplies two cars to be drawn over its lines and side tracked for a few hours, more or less, at each station, where an audience may be had, and when these cars are filled with exhibits under the auspices of the Provincial Government of New Brunswick, the curator accompanies the train. One of the cars usually contains exhibits of pigs, chickens and other live stock; other exhibits relating to agriculture consist of bees, nursery trees, cream separators, or whatever the Government experts consider may uplift the agriculture of the Province. Our curator friend installs material from his museum, supplemented by specimens collected for the purpose. Specimens of birds which benefit the farmer's crops, insects which damage them, are shown, as well as drawings hastily made with cheap materials, but which may be fastened to the walls of the car or held up while lectures are delivered to the rural audiences on subjects which will make their work more successful and pleasant. But more interesting to us in the present connection is the cheapness of the cases which the curator of the above museum has had built as a beginning towards those which he intends to have throughout the museum for the housing of instructive and useful exhibits, his idea being that while these cases are not all he would like to have them, still they will serve the purpose so that the public, old and young, scientist and layman, may derive benefit from the museum until such time as he has secured funds for ideal cases, and has decided what an ideal case is and what color to paint it. But now, he has found that if the school children of to-day derive benefit

from the exhibits in these cheap cases, when they are women and men of to-morrow, his museum, though he may then be dead, will not want for ideal cases, an ideal fire-proof building, its own railroad train, or even the most valuable though perhaps not very instructive specimens.

With this inspiration, and having in the Rocky Mountains Museum a need to build at least one case as a sample and install it within three weeks, I designed a cheap case for a small museum or a museum having small funds. A contractor in Ottawa will make such a case for $10.00 or less, casing a museum for less than one-fiftieth the cost of our finest cases. Any ordinary house carpenter can make such a case. The materials may be obtained wherever window sashes are to be had. All the woodwork may be cut to sizes at the local mill, and this is especially desirable where a large number of cases are to be made, as it will save much of the expense of the carpenter work.

The kind of wood and moulding may be varied according to what is cheapest and most easily obtainable where the cases are being made, care being taken, however, if any moulding is used, to choose that which is simple, dignified, and will not gather dust. It may be desirable to let the size of the glass panels and even of the case depend somewhat on the size of glass that can be obtained.

The advocating of a cheap case, its manufacture, installation and use, in no way militates against advocating the best and most expensive cases on the market, their manufacture, installation and use, but on the contrary paves the way for them. The museum that waits to be useful until it can have cases costing many hundreds of dollars each will probably wait a long time for financial support. The museum that teaches and otherwise becomes useful to the public with clean, neat, though cheap cases, will gain the sound financial support which it deserves, at least as soon as the children of the present generation grow to positions of authority, and then the cheap cases may be discarded, or, better still, sold or given to a branch museum or a small struggling museum, and replaced by the very best cases to be obtained on the market or to be manufactured.

(To be continued).

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ON THE VALIDITY OF THE GENUS *PLETHOPELTIS*, (Raymond).

By Richard M. Field.

While studying some fossils collected by Dr. Percy E. Raymond from the Hoyt Quarry, Saratoga, the writer became interested in the relationship of the two forms which have been described by Walcott as *Agraulos saratogensis*. In his recent description (7) of the Hoyt fauna Dr. Walcott has figured a form with strongly outlined glabella, bearing glabellar furrows, while in his first description of the fauna he illustrated under this name a specimen with smooth glabella and very faint circumglabellar furrow. This latter, or "smooth-glabella" variety, is found to predominate in the collection. A still closer inspection of the material seemed to show that although both forms may belong to the same species, it is extremely doubtful if they are to be placed under the genus *Agraulos*. The writer believes that the following evidence shows that Raymond was justified in erecting his new genus *Plethopeltis* for trilobites such as *Agraulos saratogensis* Walcott.

To determine the validity of the genus *Plethopeltis* it is necessary to discuss the following facts. Raymond, in the "Revision of the Bathyuridæ" (8) designated *Agraulos saratogensis* instead of *Bathyurus armatus* Billings, as the type of the new genus *Plethopeltis*. It is undertsood that he did this because only a single cranidium of *P. armatus* was known and no pygidium, while numbers of pygidia were found associated with *P. saratogensis*. Some doubt has recently been expressed as to whether after all the species *saratogensis* should be removed from the genus *Agraulos*. If the latter be the case, then the genus *Plethopeltis* automatically drops out of the nomenclature. Raymond's generic diagnosis of *Plethopeltis* is as follows:—

"Cephalon strongly convex, wider than long, without concave border or marginal rim. Glabella faintly defined, without glabellar furrows. Eyes small, situated well forward. Free

cheeks rather wide, smooth, with short spines at the genal angles. Pygidium small, with few traces of segmentation; convex; no border."

The writer finds from the investigation of the material lately collected by Dr. Raymond that the characteristics given by him as "glabella faintly defined, without glabellar furrows" is neither a generic nor a specific characteristic. The present collection fortunately allows a close comparison of the variety first figured and described by Walcott (5), his holotype, and the plesiotype later figured by him in his description of the Hoyt fauna. Here we have the two varieties closely associated, having lived and died under the same physical conditions. Judging from the few well preserved specimens examined by the writer, not more than nineteen in all, it would seem that the form with the smooth glabella predominated. Further and more careful collecting is necessary, however, before this assertion can be proved. It should be noted that Walcott in his first description already noted (p. 276) noticed "two pairs of slightly indented glabellar furrows that curve inward with a slight backward obliquity; on the casts of the interior of the larger specimens the furrows are scarcely to be seen——." But he shows no trace of these furrows in his figure. At any rate the presence or absence of glabellar furrows has in this case at least, nothing to do with the generic classification. We shall have more to say regarding the development of glabellar furrows later.

Walcott (7) in his second paper gives the following description of *Agraulos saratogensis:*

"Head convex, slightly semi-elliptical in outline and terminating in round, short, postero-lateral spines; glabella moderately convex, truncate conical, sides converging slightly towards the broadly rounded front, about $\frac{1}{6}$ longer than wide; marked by two pairs of slightly indented glabellar furrows that extend inward with a slight backward obliquity; on the casts of the interior of the larger specimens the furrows are scarcely to be seen; occipital furrow well defined and arched forward at the centre; occipital segment rising to a short blunt spine at the centre and narrowing toward the sides; dorsal furrow well defined about the glabella. Fixed cheeks narrow; anteriorly they merge into the broad, rounded, frontal limb and posteriorly into the short posterior lateral limbs; palpebral lobes small and situated a little in front of the tranverse centre of the head. The frontal limb about $\frac{1}{4}$ the length of the head and curved down to the margin without an intervening furrow. Free cheeks convex and somewhat tumid, irregularly triangular in outline and without a marginal border. The associated pygi-

dium is convex, strongly lobed and without a distinct marginal furrow. Axial lobe intermarginal, convex and divided into four annulations and an interior doublure by four distinct transverse furrows; lateral lobes crossed by three main furrows and two shorter ones, corresponding to the furrow on the lateral lobe of the thoracic segments, thus outlining the anchylosed segments in the pygidium; a fourth segment and the terminal portion are also outlined by a faint ridge. Thorax unknown. This is a very distinctly marked species allied to *Bathyurus armatus* Billings." (4).

Corda (1) was the author of the genus and the first to figure *Agraulos* (in 1847) but his drawing is so inaccurate that one can hardly recognize any similarity between it and the original type described by him as *A. delphinocephalus*. Later, Barrande (2) gave an excellent description of the same species under the name *Arionellus ceticephalus*, declining to use Corda's generic name. Barrande's figures are so accurate that the indices worked out from these compare favorably, indeed very closely, with those worked out on the actual specimens. Barrande does not appear to have noticed the presence of eye-lines, a primitive aspect of this species and of many other Cambrian trilobites. One has but to compare the indices (38-64) to appreciate how widely Corda's figure differs from those of Barrande. A drawing from an actual specimen found in the type locality of Skrey, Bohemia, is shown on the plate, Fig. 3. The first mention of *A. saratogensis* was by Walcott (3) in 1879 when he listed it as *Ptychoparia* (*A.*) *saratogensis*. In his next paper (5) he referred the species definitely to the genus *Agraulos*. A copy of his figure is shown on the accompanying plate in Fig. 2. Walcott, (7) in 1912, figures another specimen of the same species showing a strong circumglabellar furrow; glabellar furrows and ridge, as shown in Fig. 1. Both of the varieties above described occur at the same horizon at the Hoyt Quarry. Raymond, (8) in his "Revision of the Species which have been referred to the genus Bathyurus," took *Agraulos saratogensis* as his type of the new genus *Plethopeltis*, as has been previously stated.

The writer made a critical and comparative examination of the features of the four types referred to above and has recorded a summary of his observations in the accompanying plate, which is to a large extent self-explanatory. Figures 1 and 2, representing the two variations of *P.* (*A.*) *saratogensis* are drawn from specimens from the Hoyt Quarry. Figure 3 is drawn from a specimen of *Agraulos ceticephalus* Barrande. Figure 4 represents *Plethopeltis armatus* (Billings). On the right of the figures are arranged in order the chief characteristics

of the cephalons. On the left are placed the generic characteristics which connect *P. saratogensis* and *P. armatus*. In working out of the indices, the length of the cephalon was measured from the middle of the neck furrow to the anterior extremity, the length of the glabella being measured from the middle of the neck furrow to the anterior edge. The index in each case was derived by dividing the smaller by the larger measurement and multiplying the resultant by 1,000 to make it a whole number. It was hoped that by making careful measurements (within 0.25 of a mm.) that the indices would afford valuable criteria for the classification, but unfortunately the results do not appear to be decisive, probably because of the lack of sufficient working material. Nineteen specimens representing the total available material of *P. saratogensis*, were measured and their indices calculated. The average index proved to be 70 but a careful inspection of the individual indices showed this figure to be too low. Fourteen of the indices range between 75 and 80; only two fall below 70, while two others are as high as 85. The figures seem to show that further collecting would raise the average considerably. It is also important to note that measurements taken on *P. saratogensis* figured by Weller (6) as representative specimens from New Jersey show an index of 80. The writer has therefore made a conservative estimate of 75 as the index for *P. saratogensis*. So far as can be determined at present the index does not vary between the forms with smooth and those with furrowed glabella. Eleven specimens of *A. ceticephalus* were measured and their average index proves to be 63. This average was shown to be practically identical with that calculated from measurements made on Barrande's figures. The writer was forced to calculate the index for *P. armatus* from the original drawing by Billings. So far only one cranidium of this species is known, and its high index (88) may not be entirely indicative of the average for the species. All the evidence seems to show that the indices of *P. armatus* and *P. saratogensis* are very similar and dissimilar from that of *A. ceticephalus*. In addition, *P. saratogensis* and *P. armatus* have the following characteristics in common, which in turn are dissimilar from those of *A. ceticephalus:*

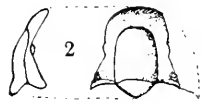
1. Greater convexity of the cephalon.
2. Eyes close to the glabella.
3. Cephalon never upturned at the anterior margin.
4. Facial sutures carried well forward.
5. Opposite portions of the circum-glabellar furrow nearly parallel and converging only slightly forward.

The writer therefore believes in the validity of Raymond's new genus.

Plethopeltis saratogensis

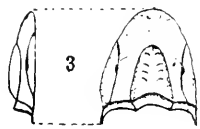
Index; 75.
Convexity; great.
Eyes; close to glabella.
Cephalon; unvariable, wider than long, never upturned at anterior margin. Posterior development into nucal spine.
Glabella; circum-glabellar furrow faint to strong, 2 pairs of faint glabellar furrows and median ridge.

Plethopeltis saratogensis



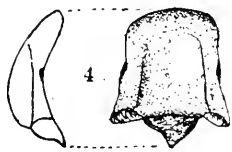
Index; 75.
Convexity; great.
Eyes; close to glabella.
Cephalon; unvariable, wider than long, never upturned at anterior margin. Posterior development into nucal spine.
Glabella; circum-glabellar furrow faint to strong, no glabellar furrows, no ridge.

Agraulos ceticephalus



Index; 63.
Convexity; low.
Eyes; farther apart than in preceding.
Cephalon; variable, from wider than long to longer than wide, anterior margin slightly upturned in some specimens. No nucal spine.
Glabella; no circum-glabellar furrow, 4 pairs of glabellar furrows, ridge, eye lines.

Plethopeltis armatus



Index; 88?
Convexity; great.
Eyes; close to glabella.
Cephalon; only one known. No signs of upturning of anterior margin. Nucal spine better developed than in 1 and 2.
Glabella; circum-glabellar furrow faint and dying out anteriorly. No glabellar furrows. No ridge.

Characteristics common to 1, 2 *and* 4.

1. Great convexity.
2. Eyes close to glabella.
3. Cephalon never upturned at anterior margin.
4. Facial sutures more nearly similar.
5. Circum-glabellar furrows similar in outline and roughly parallel.

DEVELOPMENT AND DISTRIBUTION.

The writer does not propose here to discuss the genus *Plethopeltis* but there are one or two points which are of interest regarding the morphological development and migration of the species, *P. saratogensis*. By glancing at the diagrams it will be seen that both 1 and 2 are referred to the same species, although certain morphological features are shown to be more strongly developed in one than in the other. As has been mentioned previously, the "smooth-glabella" forms predominate in the present collection and it is reasonable to suppose that this form is also the more stable, exhibiting more specialized development. Why the type possessing glabellar furrows and ridge should have persisted may be attributed to some inhibitor which is difficult to explain at present. At first the writer was led to believe that the differences of glabellar furrows and circum-glabellar furrow was one mainly of preservation, but a more careful inspection of the material has led to the conclusion that this is not the case and that we have in the specimens collected from the Hoyt Quarries two distinct types, showing stages of gradation from the smooth to the furrowed form. In the development of the species the glabellar furrows and ridges are the first to disappear while the circum-glabellar furrow often persists into the more specialized individual.

Cushing and Rudemann (9) describe the rocks in which the species occur as follows:

"———— the Hoyt is a local phase of the upper Theresa, *probably an off-shore phase*———. The waters were clearer, less subject to incursions of sand, *Cryptozoon* reefs flourished as they did not in the normal Theresa, and trilobites and gastropods lived on the surface of the reefs, where we find their fossil remains to-day."

When we consider the specimens of *A. saratogensis* described by Weller (6) from New Jersey we notice here that only the "smooth glabella" forms are represented. Weller stated that: "———— glabellar furrows————are wholly absent from the New Jersey specimens." The pygidia associated with the New Jersey specimens do not entirely agree with the description of that portion of the animal as it occurs at Saratoga, the transverse furrows being much less conspicuous. Notwithstanding these differences the specific indentity of the specimens from these two localities can hardly be questioned. Most of the specimens observed are smaller than the one illustrated, some of them being less than 5 m/m. in length. The writer also found a large number of small individuals amongst the specimens from the Hoyt Quarry, but these were not measured for obvious

reasons. It would seem as if Saratoga were the centre of distribution for this species and that only the fixed type was able to migrate.

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DEPARTMENT OF GEOLOGY,
HARVARD UNIVERSITY.

CORRESPONDENCE.

THE EDITOR, THE OTTAWA NATURALIST.

Mr. P. A. Taverner's "Suggestions for Ornithological Work in Canada," strike the right note. At present we Canadian bird lovers are more in touch with Washington, D.C., than with our own Ottawa. Only a few of us even know each other. By the formation of an Audubon Society in Winnipeg recently an attempt has been made to bring bird observers together. Hardly anyone in the West outside a limited circle is aware of the splendid original work of Norman Criddle and his brother Stuart. Probably none of your readers have the least idea that in A. G. Lawrence, of Winnipeg, and H. E. Pittman, of Wauchope, Sask., there are some rising lights in nature lore, especially in ornithology. I could name a few others, old and young, who might be linked together for the purposes suggested by Mr. Taverner. As a writer of sorts and as a lecturer on our birds I am impressed by the unused material lurking in Manitoba alone.

H. M. SPEECHLY, PILOT MOUND, MAN.

A CHEAP CASE FOR SMALL MUSEUMS.

BY HARLAN I. SMITH.

Geological Survey, Ottawa.

(Continued from page 36).

One form and size of this case is practically a simple box, three feet wide over all with a window sash screwed on as a cover. The sides of the case may be 7 feet high. The top and bottom of 1⅛ inch material, 1 foot wide, is set in about 2⅛ inches, more or less, from the ends of the sides. These four boards constitute the box frame without front or back. A piece 2½ inches wide and as thick as the window sash, usually 1⅜, or, better, 1¾ is nailed across from side to side at the top and bottom of both front and back to strengthen the frame and to cover the space above and below the top and bottom of the case; the lower one also serves as a support upon which the lower edge of the glass front and glass or wooden back frames may rest. This 2½-inch strip only partly covers the edge of the top and bottom, so that the screws holding the front and back may be inserted into the top and bottom, but also so that there may be no crack or space from the front or back into the space left at the outside of the top and bottom of the case. A kicking moulding may then be put across from side to side at the bottom of the case, both front and back, but it should not project beyond the sides of the case, as this would prevent several cases being placed close together, side by side. In short, the sides of the case should be flush. A board is next put over the top of the case to keep dust, etc., from gathering in the space outside of the case top, and to give the case finish. This board should project an inch or two in front and behind, but as in the case of the kickboard should not extend beyond the sides of the case except where a case is to stand alone. A moulding may be placed below this top in the corner between it and the 2½-inch strip across the top of the front of the case according to taste. The general label of the entire case may then be fastened on this moulding on the 2½ inch strip or from the cover of the case to the 2½ inch strip, by means of round headed screws through the middle of the end of the label board. In fact one purpose for having the case extend above the top of the exhibition space, that is above the top of the glass sash, is to provide this space for a case label. On the other hand a case label may be painted directly on the 2½ inch strip, or the sash.

The front of the case is made of a simple window sash, such as may be obtained in any town where a sash and door factory exists, or for that matter any place where houses are built. It is fastened with round headed screws engaging the edge of the sides and top of the case, the frame resting upon the 2½ inch strip across the lower part of the case. By screwing the frame on, it is not necessary to go to the expense of hinges and locks. The screw holes may be soaped, waxed, or metal screw sockets may be used if it seems desirable to go to that expense. A screwdriver serves as a key. Moreover, by drawing the screws tight, the case may be made as near dust-proof as is necessary in a small museum. In fact much more fuss is made about dust-proof cases and about getting fine cases than about using them, after fine dust-proof cases are obtained; that is, the curator's energy seems to be used up in getting building, cases, and specimens; then he rests on his oars as a rule, leaving the exhibits without understandable labels, and practically useless. A little attention given to wiping out cases, cleaning specimens and looking to the upkeep of the specimens in most cases would be cheaper and quicker than giving so much attention to dust and insect proof cases. Moreover, going over the specimens say once a year for such a purpose, the curator could hardly fail to note the lack of order and labels, and many things which he would then want to do to improve the usefulness of his exhibit. However, cotton tape or wicking set in a planed groove may be added to exclude dust if desired.

The frame should be cut down on the outer sides and ends as much as is consistent with sufficient strength to hold the glass, but of course it cannot be cut down to less than the ⅞ of an inch necessary to cover the edges of the sides and top of the exhibition case, to which it is screwed. The glass should be in the largest pieces obtainable, up to the full size of the frame, and where more than one piece of glass is required preference should be given to running the mullions horizontally so that they may the more often fall opposite a horizontal shelf edge instead of vertically across the line of vision. It is hardly necessary to say that the glass should be of the best quality which the museum can afford, and certainly should be free from blebs and other blemishes. If it is sufficiently heavy, there will be no need of disfiguring signs requesting visitors not to lean on the glass.

Shelves may be cut about ⅛ of an inch shorter than the top and bottom of the case, so that they may be moved easily and may rest upon round headed screws, or, still better, on screw eyes turned horizontally in the sides of the case, one at each corner of the shelf. When it is necessary to raise or lower the

shelf these screws are easily changed and the holes may be puttied up and touched with color, although if left they will no more disfigure the case than the ordinary ratchets used for holding shelves at various heights. The case may be stained or painted with a dull finish, certainly not a very glossy varnish, perhaps preferably with a thin wash, to give it a somewhat neutral color in harmony with that of the walls of the building in which it is to stand.

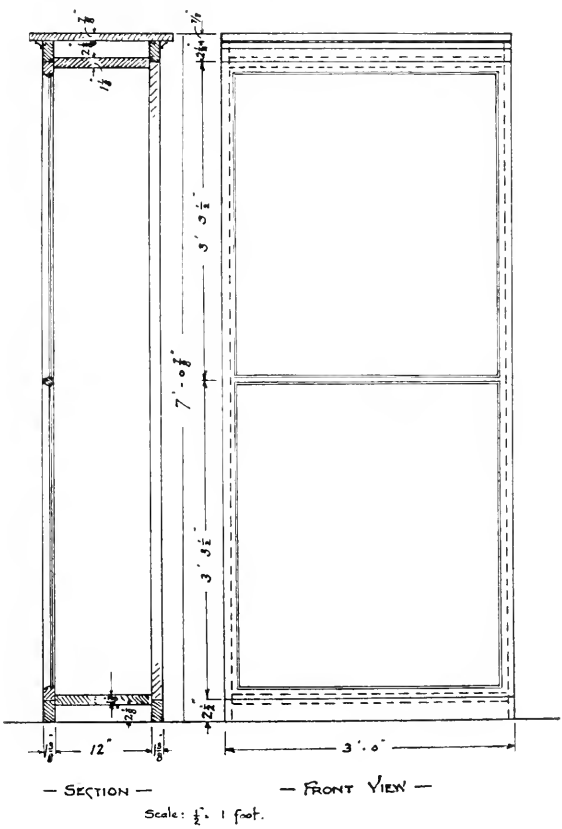
The back of the case, it seems, should certainly be put on in the same way as the front, so that if it is ever desirable to turn the case at right angles and have glass upon both front and back, the back may be removed and a glass frame similar to the one in front may be put on as easily as one would open and shut the case to put in or take out a specimen. If the back is to be solid woodwork, which is perhaps desirable where heavy things are to be hung from it, care should be taken that it is built so that the expansion and contraction due to changes in the weather or the heating of the building may not strain the rest of the case, and the boards should run up and down or crosswise rather than either diagonally or possibly even in panels, so that they may not be optically disagreeable in connection with the exhibit. Perhaps as good a way as any would be to let the back of the case be a frame with compo board instead of glass, as the compo board could be replaced at any time glass was desired, and meanwhile would serve very well as a background to exhibits or upon which to hang exhibits that were not too heavy. A diaphragm set back against the rear frame would serve for heavy objects and be desirably smooth or could be covered with burlap, paint, paper, or what not, as desired.

When the case has glass front and back, that is, when the exhibit is to be viewed from two sides, or when it is not desirable to use the full depth of the case for the exhibit on hand, a diaphragm about ⅛ of an inch shorter and narrower than the inside of the case may be inserted at any distance from the front of the case, and held in place either with round headed screws through the sides of the case or with small angle irons or ⅞-inch cove, in front and behind the diaphragm at the corners, or oftener according to taste and the amount of strength desired. This method of fastening the diaphragm allows it to be adjusted or removed in a very few minutes with practically no waste and no unsightly scars which could not be retouched with putty and colored, or which if not retouched would be no more unsightly than the complicated and expensive diaphragm holders usually used.

The cases should be made in uniform sizes or multiple sizes like sectional book cases, so that they may be moved about and

reassembled, for instance, by placing two 3-foot cases side by side to harmonize with a 6-foot case, and so on, or by placing two cases 6 inches deep back to back, to approximately harmonize with a case 1 foot deep. Cases should never be fastened to the walls of the room in such a way that when they are moved the room is disfigured, requiring replastering, repainting of the replastered part, and then, as so often happens, repainting of the entire room because it is discovered that the patch of new painting does not match the whole because of its freshness. A little forethought along these lines will save a large portion of the funds of museums which might be used for other purposes, instead of being thrown on the junk heap.

If it is desirable to let light in one or both sides of the case they may be made like the front and back, but then care must be taken that the frame is large enough to hold the screws necessary for supporting any shelves used. If a diaphragm is used, the screws to hold the rear corners of the shelves may be inserted in the diaphragm.



These general plans may be varied, the cases may be made of various heights, various widths, and various depths. They may be built with higher or lower bases and tops; or again shorter cases may be built and placed upon tables or pedestals; cases may be super-imposed or hung upon a wall. Very large cases might

be made on this same principle, by substituting frames with glass in place of the wooden sides of the cases, it being only necessary in such cases to carry the sides up and down from the top and bottom of the frame in the same manner that the front and back is carried up and down. If the case is so large, as for habitat groups, that it is necessary to have more than one frame, a mullion to which to screw the frames may be inserted between the top and bottom of the case where necessary, but this should not project sidewise beyond the wooden frame. By this means the amount of wood exposed to view is kept at a minimum, whereas in many cases such as we often see, the mullion is exposed to view and the frames are on each side of it, making three thicknesses of wood to obscure the exhibit instead of only two. If desired, a moulding can be screwed over the crack where the frames meet, and if fastened to one of the frames that frame may be taken off first in opening and closing the case, which will save the trouble of unscrewing the moulding.

In the simple cases the front and back sashes may all be made the same size; where the cases are not very deep and sashes are used in the sides, it will of course be necessary to have a smaller size of sash for the sides; but if the cases are very large this will not be necessary, although it will make any attempt at a square case as much longer than it is wide as twice the thickness of the sash, unless the frame at each corner laps the same direction.

One of the simple forms of these cases three feet wide by one foot by seven feet, was made, with the exception of the frame and glass, by two carpenters, during the time which they could take from other work in a single day while assisting in reorganizing the Rocky Mountains Park Museum. It was thought that the frame and glass could be put on later The case was wanted immediately and an exhibit was installed in it as soon as it had been given a coat of stain. This seemed a fair test of the cheapness, ease and speed with which such cases could be made available.

The specifications which have been made by Mr. P. A. Taverner to accompany this description are for a somewhat more complicated and slightly more expensive case, and consequently a number of the dimensions and methods of construction are slightly different.

SPECIFICATIONS.—By P. A. Taverner.

Material—Lumber.

All material in case to be of clear, white pine, whitewood or other material most readily obtainable in locality, in clear lengths free from large or unsound knots or shakes.

All exposed work may be in oak or other wood to match fittings already installed.

SASH.

To be 1 3/8 inch thick of common stock pattern—rails and styles 2 inch wide from glass to jamb, and of sizes as shown.

TOP AND SIDES.

May be of 7/8 stuff with 3/8 inch by 1 3/8 rebate along sash jamb or may be built up of two thicknesses of 1/2 inch stuff. The inner lining being of matched stuff well cramped together and blind nailed.

DIAPHRAGM TO BE SUPPLIED ONLY WHERE DESIRED.

To be of 7/8 inch stuff fastened together with flush end styles well nailed to prevent warping. All should be covered, both sides with burlap or other covering material, or paneled according to decoration or other scheme of museum. Diaphragm to be held upright and in place by 1 inch by 1 inch by 1/8 inch iron angles screwed to top and bottom of case on either side of diaphragm. For three-foot cases there should be two pairs of such angles, top and bottom, and for six-foot cases there should be three such pairs. Diaphragms may be moved to any situation in case by changing position of angles.

SHELVES.

Shelves for light specimens may be supported by screw eyes inserted in ends and diaphragm or mullions as indicated on drawings, turning them flatways and allowing them to project enough to engage shelves. For heavy specimens, iron brackets—stock sizes, or Shrosbree specimen hangers may be used whenever needed. If a coarse burlap is used over diaphragm, screws may be put in and removed as many times as necessary without causing disfiguring scars on the surface.

BASE OR MOPBOARD.

To be stock 6 inch base of whatever design may be desired and may be readily obtained at local lumber yard or mill.

SIDES.

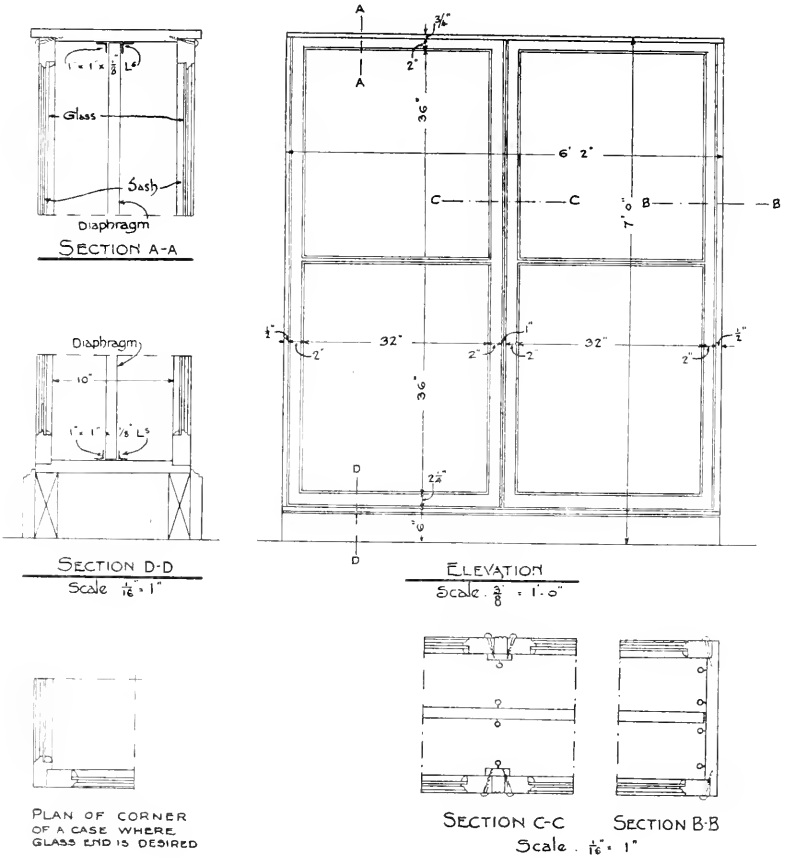
All sides of cases to present perfectly flush surface, so that two or more cases may be butted together to appear as one case without unsightly or dust catching spaces between.

Cases may be made in units of either 1 or 2 sash. A 1 sash case will then be just half the length of the 2 sash cases and will line up with them in series. The sashes are to be fastened in place by 2 1/2 inch brass, round headed screws, driven through the sash into the frame behind. With this method

neither locks or hinges are necessary, and all can be constructed by an ordinary carpenter without special joinery skill.

GLASS.

To be the sizes shown and of as good quality as procurable under the circumstances. The principal faults to be looked for being color, waves, bubbles or flaws.



A CHEAP CASE FOR MUSEUMS

DESIGNED BY HARLAN I. SMITH

WITH

PLAN AND SPECIFICATION BY P. A. TAVERNER

GEOLOGICAL SURVEY, CANADA

CONCHOLOGICAL NOTES.

But few mussels have been recorded from the Hudson Bay drainage area of Ontario, though many must occur.

Mr. J. B. Tyrrell, who explored the District of Patricia in 1913, found *Unio* (*Lampsilis*) *luteolus* in the Fawn and Severn about lat. 54° N. The species doubtless extends down to Hudson Bay as it does down the Mackenzie. The shells are smaller and lighter in color than these of the same species from the Rideau river and the Rideau canal. In the latter between Bank and Concession Streets, Ottawa, they are ordinarily of large size, green in color, and beautifully rayed. The Patricia shells resemble closely the *L. lutcola* found in Lake Nipissing at North Bay, and in Lake Talon, near Rutherglen, but are not as yellow on the same species from Lake Gauvreau in the Gatineau hills.

No mussel peculiar to America has a wider range than this. It is found from the Brazos of Texas to the Arctic Circle and from the Rocky Mountains to the St. Lawrence and the Hudson drainage areas. Throughout this vast extent, under conditions varying from crystal lakes and streams to muddy sloughs and pools, in polar cold and torrid heat, it preserves unvaried the peculiar undulations of the beaks which distinguish it from allied species. It thus affords a striking proof of the proposition of Quatrefages, that specific characteristics—properly so-called—are not permanently affected by environment.

An *Anodonta* found by Mr. Tyrrell in the Fawn river has the beaks so eroded that it cannot be identified. It is not improbably *A. kennicottii* Lea, which was described from Lake Winnipeg and Great Slave lake.

Another lot of mussels from Northern Ontario was collected in 1914 by Mr. J. K. Latchford in the Missinaibi, where on its way to Hudson Bay it flows under the National Transcontinental Railway, about twenty miles east of Hearst. They are mainly *L. luteola*, but include two Anodontæ which may be undescribed. Throughout Ontario, especially northward, the Anodontæ, or paper-shell mussels, abound. It is seldom, however, that any but mature specimens are collected. The beaks of old shells are nearly so always eroded that positive identification is extremely difficult, except in the case of a few species with prominent characteristics. The result outside of narrow limits is absolute confusion. It is safe to say the only thin-shelled mussels found near Ottawa which can be identified with any certainty are *A.* (*Strophitus*) *edentula* Say *A. cataracta* Say (= *fluviatilis* Dillw. of our lists) and *A. subcylindracea* Lea. Many

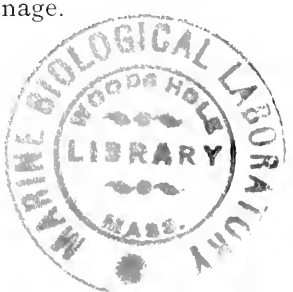
others undoubtedly occur. In the Rideau canal for instance, while it is impossible to distinguish two species among the large Anodontæ found there, a series of young shells, such as may easily be obtained in the little bay on the left side of the canal immediately above Hartwell's Locks, demonstrates the presence of two species—one certainly *cataracta* Say, and the other probably *implicata* Say. I used the word "probably" because I do not know what the young of *implicata* are like, and I know of no satisfactory description. Stimpson in his Descriptive Catalogue of the Naiades (Detroit, 1914) says "their sculpture consists of straight bars running parallel with the linge line, or they may be slightly curved and sometimes a little corrugated,"—which seems to me a confounding of two species. The beak sculpture of the Unionidæ is—I have observed—for any species invariable. *A. cataracta* in every stage of growth has been collected by the writer in at least fifty localities in Quebec and Ontario—from the lakes in the Laurentides to Toronto Bay, where it occurs with *A. grandis* Say—and the undulations of the beaks, when they could be made out, were in every case the same.

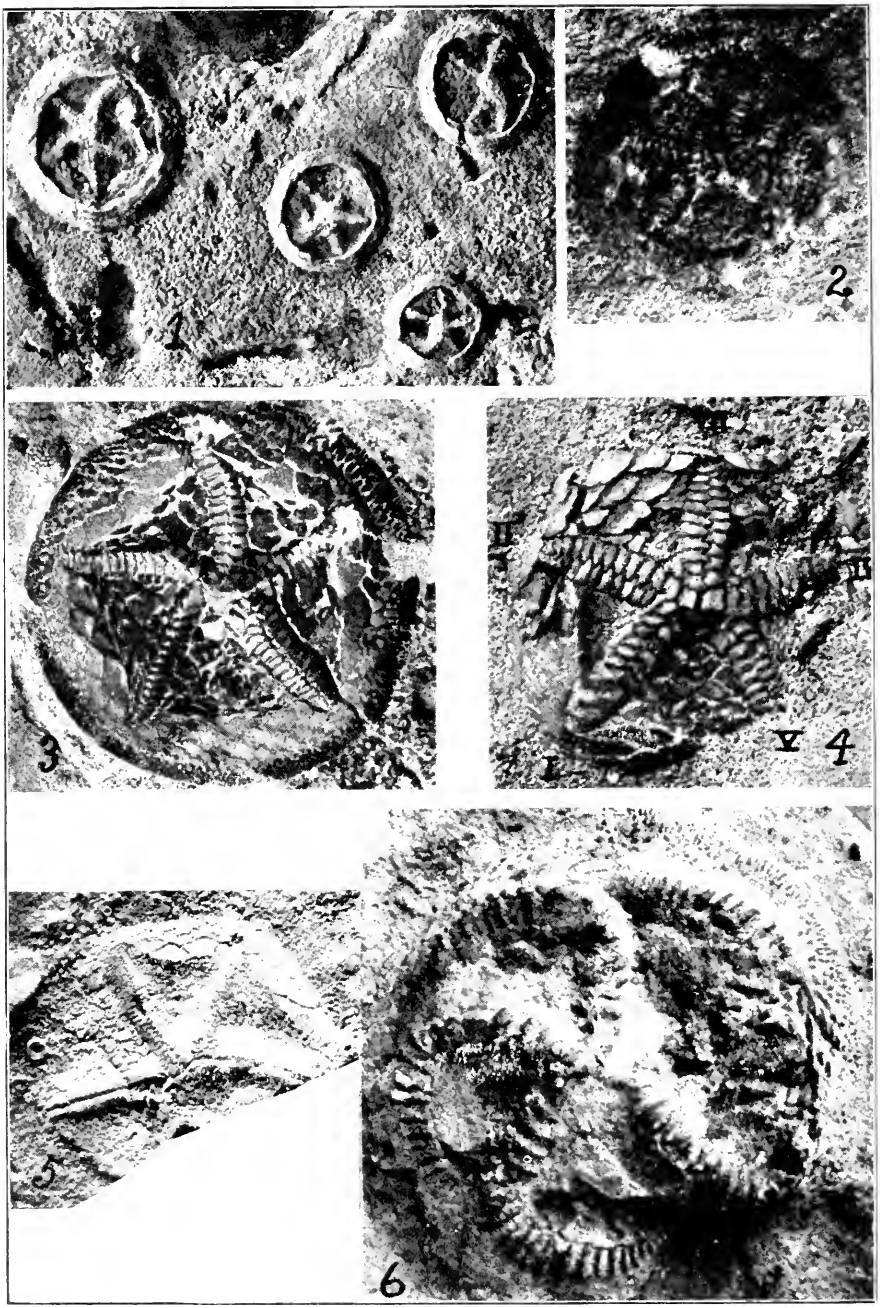
In addition to the three species named, many others occur in the Ottawa valley, but, until large series of shells are procured in every stage of growth, they cannot be determined, or, if new, described. It is really not more difficult to collect the young of mussels than to collect other small bivalves; that they cannot be seen should not prevent a search for them—nor the fact that they are often far less numerous than adults. A wire bowl strainer with a suitable handle will often produce the most astonishing returns from places that appear quite barren of molluscan life.

Till the Missinaibi is visited by an experienced collector, the Anodontæ from it can be regarded as only *probably* new.

Among the Missinaibi shells are two medium sized examples of *Unio pressus* Lea, now designated *Symphonota compressa* Lea. In addition of the localities mentioned in previous notes—the Rideau at Strathcona Park and Paquette's Rapids, near Pembroke and Moore's Creek on the Aylmer Road, and a brook crossing the Opeongo Road, near Foymount, in the County of Renfrew, afford this attractive little mussel. It has been recorded from as far north as the Montreal river near Sault Ste. Marie (Stimpson, Des. Cat. 483) but has not hitherto been known to exist in the Hudson Bay drainage.

L.





Illustrating Dr. Raymond's paper "Revision of the Canadian Species of 'Agelacrinites.'"

THE OTTAWA NATURALIST

VOL. XXIX. AUGUST-SEPTEMBER, 1915 Nos. 5 and 6

REVISION OF THE CANADIAN SPECIES OF "AGELACRINITES."

By Percy E. Raymond*

There are two famous regions for these pretty medallion-like little fossils, one in the Trenton formations of Ontario, and the second in the younger Cincinnatian and Richmond strata of southern Ohio and Indiana. The localities in Ontario have produced by far the more perfect specimens, but those found in the higher strata of the "Cincinnati dome" are generally larger. The specimens found in the latter region are almost always attached to a shell of some sort, most often a brachiopod, generally a *Rafinesquina*. In Ontario it is very unusual to find a specimen attached to any foreign object, though such specimens do occur.

It has been the custom to refer all the Canadian specimens to two species, *Agelacrinites billingsi* Chapman and *A. dicksoni* Billings, while a third name, *Agelacrinites chapmani*, has been current, and ascribed to Billings, though I cannot find that such a species was ever described. In the present paper several new species are described. More adequate illustrations will be given in a paper soon to be published in the Bulletin of the Victoria Memorial Museum.

Genus Lebetodiscus Bather.

Lebetodiscus, Bather, Geol. Mag. dec. 5, 5, 1908, p. 550. Type, *Agelacrinites dicksoni* Billings.

Dr. Foerste in his recent "Notes on Agelacrinidae"† remarks that a new name is required for the Ordovician species usually referred to *Agelacrinites* or *Lepidodiscus*. It seems, however, that a name proposed by Dr. Bather in the third of his Studies in Edrioasteroidea, entitled "Lebetodiscus, N.G. for Agelacrinites Dicksoni, Billings," may possibly supply the want.

Bather proposed the name after studying the incomplete specimen of *Agelacrinites dicksoni* collected by Bigsby and figured by Billings as figs. 4 and 4a of plate 8 of the third of the "Decades."

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†Bull, Denison Univ. 17, p. 400, 1914.

Specimens of this species are rare and the best one known is that figured by Dr. (now Sir James) Grant in the OTTAWA FIELD NATURALIST. During my incumbency as Invertebrate Paleontologist to the Geological Survey, this specimen was donated, among other valuable fossils, to the Victoria Memorial Museum, and after comparing it with Billings' and Bather's figures, I am convinced that it is a real *Agelacrinites dicksoni*. Bather states that *Lebetodiscus* differs from *Agelacrinites*, first, in the absence of a differentiated marginal zone; this I believe is due to the imperfection of the specimen he studied; second, he regarded it as having a less flattened and less sessile habit; this also proceeds from the study of an incomplete specimen; third, "It seems clear that the side plates, here called flooring plates, are homologous with the flooring plates of *Edrioaster*. Whether those plates have homologues in the Agelacrinidae is a matter for debate; at any rate, no genus of that family has similar plates with intervening depressions so like pores." I may have misunderstood the figures and descriptions of both writers, but as I understand it, the "flooring plates" of Bather in *Lebetodiscus* are the same as the "outer covering plates" of Foerste, and Bather's specimen was not so preserved as to enable him to get at the real flooring plates, which in a Canadian specimen, are concave and single, not double. (Compare Dr. Bather's fig. 1, p. 545, with Dr. Foerste's figs. 1, pl. 1, fig. 4, pl. 2, and fig. 4, pl. 3, or, for the genus *Thesherodiscus*, fig. 8, pl. 1). The small plates which Dr. Bather took for the real covering plates are the "median or intercolated covering plates" of Foerste. I see no real difference between the structure of the subvective system of *Lebetodiscus* and such a typical (Ordovician) *Agelacrinites* as *A. pileus*, except in the large pores between the lateral covering plates. These may, however, be of such importance as to justify the restriction of *Lebetodiscus* to the species *L. dicksoni* and *L. loriformis*, and the creation of two new genera for the reception of the other species here described.

LEBETODISCUS DICKSONI BILLINGS.

Billings, Rept. Progress, Geol. Sur. Canada, 1857, p. 294; Can. Org. Rem., dec. 3, 1858, p. 84, pl. 8, figs. 3, 3a, 4, 4a; Chapman, Expos. Min. Geol. Canada, 1864, p. 110; Grant, Trans. Ottawa Field-Nat. Club, 1, No. 2, 1881, fig. 9; Jaekel, Stamm. Pelmat. 1899, p. 50, pl. 2, fig. 2; Clarke, Bull. N. Y. State Mus. 49, 1901, p. 191, fig. 3; fig'd without name by Sowerby, Zool. Journal, 1825, 2, p. 318, pl. 11, fig. 5.

Of this rare species, the Museum of the Geological Survey contains the type, another poor specimen collected by Billings (No. 1415), a specimen collected by Mr. Fitzpatrick at Peter-

boro, Ontario, (No. 1412), and the beautiful specimen donated by Sir James Grant, and figured by him in 1881.

The type is a very poorly preserved specimen, as is also the one numbered 1415. This specimen has been cut so as to expose a section across arms II and III, and the section of the anterior arm shows that the structure is the same as in *Agelacrinites pileus*, there being a single concave flooring plate, and two roofing plates meeting above the groove thus formed.

Sir James Grant's specimen of *Agelacrinites dicksoni* is the finest one of this species which has been found, and it seems undeniable that it belongs to the same species as the specimen described by Dr. Bather. It has the same large pores along the sides of the rays, and the same large inter-ambulacral plates. The super-oral series is well shown, and is of the same type as in *Agelacrinites pileus*, *billingsi*, and others. There is a single plate behind the center opposite the anal inter-radius, and two in front, between rays II and III, and III and IV. On each side of the lower plate there are two narrow side plates, and two more small plates outside the upper plates. The breaking up of these plates and the introduction of some of the proximal ray plates into the disk probably accounts for the large number of supra-oral plates seen in the specimen figured by Dr. Bather.

The inter-ambulacral areas are beautifully preserved in this specimen, showing between the arms the very large plates which are so characteristic of the species, the smaller but still large plates just outside the arms, and the very small plates of the outer border.

Finally, there is the Bigsby specimen on which Dr. Bather based the genus *Lebetodiscus*. It agrees with other specimens of *A. dicksoni* in having five contra-solar rays, subequally spaced, in having the outer covering plates but slightly inter-locking over the rays, in having very large inter-radial plates and in the size and position of the anal structure. It differs in lacking the outer border, but after an inspection of Dr. Bather's photograph, one is easily persuaded that that is due entirely to an accident of preservation, as half the known specimens of *A. dicksoni* lack the border entirely or in greater part. There appears to be a difference between the supra-oral region of the Bigsby specimen and that of the other specimens known. In that specimen the arms seem to be more or less massed together to form a sort of supra-oral disk, somewhat as in *L. inconditus*. It is not possible to make out the orientation of these plates without seeing the specimen, but as stated above, it seems possible that the appearance of a large disk is due to the disturbed condition of the plates.

Horizon and locality:—All the specimens of this species

whose exact locality is known have been found in the Cystid beds of the Prasopora zone, and about 180 feet below the top of the Trenton. Beside Peterboro and Ottawa, a specimen has been listed by Dr. Ami from Pakenham, Ontario. The specimens from Kirkfield identified by Mr. Springer as this species are almost if not entirely all *L. multibrachiatus*.

LEBETODISCUS LORIFORMIS SP. NOV.

(Plate 1, fig. 6).

This specimen has long been known to the collectors about Ottawa as one of the prizes of Dr. Van Cortlandt's collection. (Now in the Museum of the Geological Survey, No. 1414). It has always been considered as an abnormal, long-rayed specimen of *Agelacrinites dicksoni*, and there can be no doubt that it is very closely related to that species, but since it forms one of the "connecting links" with the species of the later formations, I propose to give it a new name. It may be described briefly as a *Lebetodiscus* with rays so long that each one nearly touches its neighbor, all rays contra-solar, and equally spaced, the outer border of small plates narrow, supra-oral structure apparently as in *L. dicksoni*. This species is believed to be ancestral to the very long rayed forms for which Hall erected the genus *Streptaster*.

The holotype is 23 mm. in greatest diameter, and is from the Trenton at Ottawa, Ontario. Probably from the "Cystid beds," about 180 feet below the top of the formation. It is No. 1414 in the Victoria Memorial Museum.

LEBETODISCUS BILLINGSI (CHAPMAN).

Agelacrinus billingsi Chapman, Canadian Journal, 5, 1860, pp. 358, 204.

Hemicystites (*Agelacrinites*) *billingsi* Sladen, Quart. Jour. Geol. Soc. London, 35, 1879, p. 750.

Agelacrinites billingsi Chapman, Ann. Mag. Nat. Hist. third ser. 6, 1860, p. 157, fig. ; Billings, Canadian Journal, n. s. 6, 1861, p. 516, fig. 86; Chapman, ibid., n. s. 8, 1863, p. 199, fig. 180; Expos. Min. Geol. Canada, 1864, p. 110, fig. 86, p. 171, fig. 180.

Hemicystites billingsi Jaekel, Stammes. Pelmat. 1, 1899, p. 49.

Local collectors have for a long time recognized two forms of *Agelacrinites billingsi* in Ontario, one with straight, and one with curved rays.

Chapman's original specimen, collected at Peterboro, was of the straight-rayed variety. The species has never been properly described or figured, though fairly common. I am

now restricting Chapman's name to the form with straight rays and the plate ornamentation described below.

DESCRIPTION.

Specimens small, circular in outline, not ordinarily resting upon any foreign object. Rays five in number, narrow, straight, and tapering but little toward the distal end, the two rays enclosing the anal inter-radius a little further apart than the others. Each ray has about thirteen pairs of alternately placed lateral covering plates, which are truncated at the ends, so that they interlock along the median line. The points of these plates are curved, so that when the ray is slightly sagged apart, alternating pores are seen between the covering plates. Over the central area, presumably covering the mouth, there are three principal plates, a large one next to the anal inter-radius and two smaller ones anterior to it.

For convenience in speaking of these fossils, the anal inter-radius is called posterior, the ray opposite to it anterior, and the rays numbered in clock-wise (solar) order, beginning with the one at the left of the anal inter-radius.

The single large plate of the supra-oral series is then, between rays I and V, and its great width is due to the enlargement of the posterior inter-radius by the anal opening. The other two plates are inter-radial in position, one being between rays II and III, and the other between III and IV. There are also two other narrow, five-sided plates accessory to the supra-oral system, one between rays I and II, and the other between IV and V. These plates at their proximal edges abut against the anterior supra-oral plates. Numbering these plates according to the inter-radial areas which they oppose, we have the broad posterior one as 5, the next one to the left 1, the first anterior lateral 2, second anterior lateral 3, and the right posterior lateral 4.

There can be no reasonable doubt that Chapman's specimen had this structure. In his principal description, in the Ann. Mag. Nat. Hist. he says: "These rays, at their origin, leave a small central space covered by larger and somewhat rhombic plates. The latter appear to be five in number, and to constitute the first ray plates, one being common to two adjacent rays."

None of the covering plates, either of the rays or of the supra-oral system, seem to be in any way joined together, but were probably all movable. The three principal supra-oral plates, Nos. 2, 3, and 5, are of such form and strength as to suggest that they could have functioned as jaws.

The inter-radial spaces are covered with small imbricating

plates. The anal opening is surrounded by a small pyramid of six triangular plates.

Just outside the tips of the rays there is a ring of large, thick plates ornamented with pits and rather large granules. There are two or three of these plates opposite each inter-radius except the posterior one, which has four. These plates are much thicker and less scale-like than is usual in this group of fossils, and such ornamentation of the plates is unique in the family.

Chapman says that his specimen was ½ inch in diameter. Specimen 1413 is 12 mm. in diameter, while another, 1408E, is only 10 mm.

The plate structure as here described seems to be common to several species of *Agelacrinites* and *Cytaster*.

Horizon and locality: This species, as now restricted, is fairly common, but only at the type-locality. The original specimen was found at Peterboro, Ontario. At this city, specimens of *Agelacrinites* have been found in some numbers in an old quarry near the entrance to Jackson Park, and it is presumed that the original specimen came from that locality. If so, it was from the "Cystid" beds of the "Prasopora zone."

LEBETODISCUS YOUNGI SP. NOV.

(Plate 1, fig. 4).

This species is very like *L. billingsi*, having straight rays, the same supra-oral structure, and about the same size. It differs in lacking the thick, ornamented plates of the outer ring and the rays are broader. The inter-ambulacral areas are covered with large transversely elongated, scale-like, imbricating plates, about fifteen to each of the lateral and anterior areas, while in the posterior inter-radius the plates are somewhat smaller and more numerous. The anal opening is surrounded by two circles of small plates, five or six of which are in the inner circle. Outside the area to which the rays extend is a narrow margin of smaller imbricating plates.

The holotype (No. 3234, Vict. Mem. Mus.) is from lot 12, Con. I, Eldon, Ontario, where it was collected from strata belonging to the upper part of the "Prasopora zone" of the Trenton by Mr. W. A. Johnston. The name is in honor of Dr. G. A. Young, of the Geological Survey.

LEBETODISCUS CHAPMANI SP. NOV.

(Plate 1, fig. 3).

This species may be described briefly by saying that it differs from *L. youngi* in having longer and more slender rays, all of which show a slight curvature in the contra-solar direction,

and also in having a wider border of small plates. The plate arrangement is the same at in *L. youngi*, but the lateral covering plates are not so narrowly pointed on their inner ends. No median covering plates have been seen.

The specimen selected as the holotype is 18 mm. in diameter.

This is one of the forms which have been identified usually as *A. billingsi*, but as it persistently differs from it, as well as from *L. youngi*, in the points mentioned, and through them is intermediate in characteristics between *L. billingsi* and *L. pileus* of the Upper Ordovician, it seems to be worthy of a specific name.

Ray I of this species is almost straight, the only curvature being just at the point where it joins the peristomal plates. At the outer end there is no curvature.

Ray IV is the most curved of any on the type, and all show the greatest curvature at about half way between center and margin.

Horizon and locality:—The holotype (No. 3235, Vict. Mem. Mus.) is from an abandoned quarry near the entrance to Jackson Park, Peterboro, Ontario, and was collected by Mr. W. A. Johnston. The horizon is the "Cystid beds" in the "Prasopora zone" of the Trenton. The same form has been found in the "Prasopora zone" at Fenelon Falls and Brechin, Ontario, and in the "Cystid beds" at Ottawa and Hull.

LEBETODISCUS PLATYS SP. NOV.

(Plate 1, fig. 5).

This species is based upon a single specimen which has long been in the Museum of the Geological Survey. It is imperfect, having been cut off by a joint along the anal side, thus losing the distal ends of rays I and V. The specimen is otherwise quite well preserved. The outline is rounded pentagonal and the rays are long, reaching nearly to the margin. The rays are nearly straight, though the anal rays probably curved toward each other somewhat, partially enclosing the anal structures. Such a curvature is suggested by such parts as remain. The anal structure is entirely missing, but it would appear to have been small and far from the mouth. The inter-radial spaces are covered with small, thin, imbricating plates, those near the margins being much larger and stronger than the others. The plates along the rays alternate in position, there being about twenty-four to twenty-six pairs. The inner ends are diagonally truncated and pointed, so that, where undisturbed, they fit together very closely. Where they have been displaced, as is the case with most of the arms, they are somewhat drawn apart, and thus leave alternating openings.

The plates above the mouth are like those in *L. billingsi*,

the anterior pair between rays II and III, and III and IV, being clearly seen, and the posterior one less distinctly. At the end of each ray is a small, central terminal plate, suggesting the ocular of a starfish.

The greatest diameter is 24 mm.

This species is quite like *L. chapmani* but differs from it in its larger size, longer and more slender arms, less circular outline, and the curvature of rays I and IV.

Horizon and locality:—The type and only known specimen (No. 7941, Vict. Mem. Mus.) was collected at Ottawa by the late T. C. Weston in 1881. It is presumed to be from the "Cystid beds," probably from the foot of Parliament Hill or Queen's Wharf.

LEBETODISCUS MULTIBRACHIATUS SP. NOV.

(Plate 1, fig. 2).

This is a small *Lebetodiscus*, and remarkable for the possession of eight rays, instead of the usual five. Rays I and V are far apart and curve somewhat toward each other, thus partially embracing the anal area. All the other rays are approximately straight. Rays I, II and IV, are all bifurcated, I and II near the center, while IV bifurcates half way between the center and the margin. The disc is not symmetrical, ray III being crowded to the right of its normal position, and rays I and II taking up as much space as rays III, IV, and V. All the rays are short and the border outside them is wide, with rather large imbricating plates opposite the inter-ambulacral areas, and a margin of small plates outside. The supra-oral plates are of the simple type of *L. billingsi*, *chapmani*, *youngi* and *pileus*, No. 5 being a large wide plate, and the two plates anterior to it small. The inter-ambulacral areas are small, and are covered with small plates. Unfortunately the anal area is not well preserved. The type is 10 mm. in diameter.

This form, since it has numerous arms, naturally suggests the recently described *Thresherodiscus ramosus* Foerste, but is really not allied to that species, which has three primary rays, all of which bifurcate at least twice. The present species is much more closely allied to *L. chapmani* and to *L. billingsi*, and when first noted several years ago, was supposed to be an abnormal specimen of one of these species. It is of interest to note that this form is found at the same horizon, the "Crinoid layers" (Hull or Curdsville formation) in the lower part of the Trenton, as *Thresherodiscus ramosus*, these being the oldest of the *Agelacrinitidae*. Unfortunately the specimens found at Kirkfield are usually very badly preserved, so that it is not known how many of the specimens so far found are to be referred to this

species. A second specimen seems to have only six rays, and the normal number may prove to be seven.

The holotype is No. 7789 in the Victoria Memorial Museum, and is from the Crinoid beds (Hull formation) at the Kirkfield Lift Lock, Ontario.

LEBETODISCUS INCONDITUS SP. NOV.

(Plate 1, fig. 1).

This is the form which is so common in the "Cystid bed" below Parliament Hill and at Queen's Wharf, Ottawa, and which has always been identified as *Agelacrinites billingsi*. It differs in several respects from that species.

DESCRIPTION.

Specimens circular in outline with a broad border of small plates. Rays five in number, rather stout, broad at the proximal end and tapering rapidly. They are almost straight in small specimens while in large ones they are slightly curved, four of the rays having a contra-solar turn, and the fifth curved a little in the opposite direction, so as to embrace the posterior inter-radius. In some specimens, rays I, II, and III, are contra-solar, and IV and V solar, while in the one selected as the holotype, IV is almost straight. The rays bear short interlocking lateral covering plates, about twelve to fifteen pairs to a ray. Median covering plates have not been seen. An appearance of unusual width is given to the rays by the fact that the plates of the inter-radii which abut against the rays are somewhat higher than the remainder of the plates of the inter-radial spaces.

The supra-oral area is large, and covered by numerous small plates. Their arrangement is difficult to make out, because of the way the inter-ambulacral plates are mixed in with ray and supra-oral series. In the center of the disc there appears to be a central plate dove-tailing with two plates which are between rays I and V, and abut on the posterior inter-radius. At the sides and in front of the central plate are five more small plates, one on each side and three in front of the central plate. Two of the plates are inter-radial in position, one between rays II and III, and one between III and IV. This is on the type. On the small specimen next to it in the figure, there seem to be only five plates which really belong to the supra-oral series, the central, two posteriors, and two anterior laterals, between rays II and III and III and V.

The inter-radial areas are covered with small imbricating plates, the plates of the inner part of the outer marginal band being somewhat larger and wider than the plates between the rays. The posterior inter-radius is wider than the others, and

the anal pyramid is large and distinct. It is situated a little more than half way from the center to the margin, and is composed of a ring of seven or eight long triangular plates. In some specimens it is situated half way between rays I and V, while in others it is eccentric, and nearer V than I, as in the type.

The holotype is a large specimen, 15.5 mm. in diameter. Other specimens on the same slab with it (all figured) are 11.5, 10, and 9 mm. respectively.

This species differs from *L. dicksoni* in having shorter rays, one or two of which are solar, and in having much smaller interradial plates. It is most like *L. platys*, but has more numerous supra-oral plates. While small specimens of *L. inconditus* have straight, broad arms, they may readily be distinguished from *L. billingsi* or *L. youngi* by the more numerous supra-oral plates.

Horizon and locality:—This species is common in the "Cystid bed" in the "Prasopora zone" on both the Ottawa and Hull sides of the Ottawa River. It occurs at Peterboro also.

The holotype is No. 1409 in the Geological Survey Museum and was collected by Mr. T. C. Weston. It is undoubtedly from the "Cystid zone" at Queen's Wharf, Ottawa, Ont.

EXPLANATION OF PLATE.

1. *Lebetodiscus inconditus* Raymond. Four specimens in natural position, resting on the sea bottom, showing that they were not attached to shells or other objects. With the decay of the animal the central portion sinks in, leaving an elevated ring of marginal plates. The largest specimen is the holotype. x 1.5.

2. *Lebetodiscus multibrachiatus* Raymond. The holotype, showing the branching arms. The specimen does not lend itself readily to photography. x 3.8.

3. *Lebetodiscus chapmani* Raymond. The holotype. x 3.

4. *Lebetodiscus youngi* Raymond. The holotype. x 3.8.

5. *Lebetodiscus platys* Raymond. The holotype. x 1.5.

6. *Lebetodiscus loriformis* Raymond. The holotype, a large part of the surface of which is concealed by shale. x 2.8.

Figs. 1 and 5 were made at the Geological Survey photographic laboratories. Figs. 2, 3, 4, and 6 were made by Mr. Nelson at the Museum of Comparative Zoology, through the kindness of Director Samuel Henshaw.

MINERALS FROM BAFFIN LAND.

BY T. L. WALKER, UNIVERSITY OF TORONTO.

The Royal Ontario Museum of Mineralogy has recently received from R. J. Flaherty, Esq., M.E., of the North Lands Exploration, Limited, a fine series of minerals collected by him on his recent visit to Baffin Land. Most of the material came from near the shore to the south of Amadjuak Lake.

The geological character of this region is indicated in the following passages from the reports of Dr. Robert Bell*;—

> "The distinguishing feature in the geology of the southern part of Baffin Land is the great abundance, thickness and regularity of the limestones associated with the gneisses. At least ten immense bands, as shown on the accompanying may, were recognized, and it is probable that the two others, discovered in North Bay, are distinct from any of these. There would, therefore, appear to be twelve principal bands as far as known, to say nothing of numerous minor ones, between Icy Cape and Chorkback Inlet. The limestones are for the most part, nearly white, coarsely crystalline and mixed with whitish felspars. The individual crystals in some parts of the limestone masses would measure two or three inches in diameter and the crystallization of the felspar is occasionally equally coarse."
>
> "The limestones usually contain scattered grains of graphite and among the other minerals which commonly occur in the various bands are mica, garnet, magnetite, pyrite, and hornblende. Serpentine of a dark colour was abundantly disseminated as grains and small irregular masses in a band which crosses the head of Canon Inlet. Disseminated specks of bright green and blue serpentine were found in another band at White Bluff Harbour and similar specks of both colours occur in the eastern band at the head of North Bay. The late Mr. Ashe gave me a crystal of sphene, an inch and a half in diameter, which had been brought to him by an Eskimo from North Bay—probably obtained from the limestone there."

The series of minerals contained in Mr. Flaherty's collection is such as might be expected from an archaean region where cyrstalline limestones alternate with gneiss in a great complex. In many respects the collection suggests the mineral association found in Ottawa County to the north of the Capital.

* Report Geol. Survey of Canada, New Series, Vol. XI., p. 24M.

SCAPOLITE, Macdonald Island.

This mineral occurs in crystals some of which are five inches in diameter. The only forms observed are the prisms (100) and (110) and the unit pyramid of the first order (111). The mineral is white in colour and possesses a vitreous lustre.

ROSE QUARTZ, Amadjuak Bay.

The specimens of this mineral consist of a large number of fragments devoid of crystal form and varying in colour from deep rose to colourless. It is worthy of note that those fragments spotted by lichens and evidently from the very surface are either very pale rose or colourless, while the deeper tinted specimens are usually free from lichens. This contrast seems to give support to the view commonly held as to the gradual bleaching of rose quartz when exposed to bright sunlight.

GRAPHITE, Amadjuak Bay, North side; Fair Ness.

This mineral has been reported from this region by several explorers. The graphite from Amadjuak Bay consists of large, flat cleavage plates sometimes two inches in diameter. That from Fair Ness is very pure and more or less coarsely fibrous. The quality of the graphite from both localities suggests the possibility of commercial development in case the deposits are of sufficient dimensions.

GARNET, Garnet Island (about Long 72° 30′, Lat. 63° 45′).

The rock in which the garnet occurs is somewhat schistose, fine grained and consists almost entirely of small scales of dark biotite and felspar which the microscope shows to be microperthite. The felspar constitutes at least nine tenths of the rock. The garnet is found only in the form of large, more or less rounded crystal masses sometimes four inches in diameter. It possesses a fine, deep blood red color and is so free from cracks that some at least could be used for gemstones.'

OPHICALCITE.

Pure white calcite is mixed with about an equal amount of very beautiful sulphur yellow serpentine which is remarkable for the uniformity and delicacy of its colour. Unfortunately, the exact locality of this exceedingly beautiful ornamental stone is not available.

SERPENTINE.

This material is greyish, greenish or yellowish in colour, fine grained and massive as a rule but sometimes intersected by veinlets of chrysotile.

PHLOGOPITE.

The colour of this mineral varies from amber brown to a almost white. The largest crystals are about four inches across but are too imperfect to be of economic value.

DIOPSIDE, Macdonald Island.

Crystals of diopside sometimes three inches in length occur in calcite. They are olive green in colour with very fresh, brilliant surfaces in the prism zone while the terminal faces are often rounded and even corroded. The habit of the crystals is peculiar in that the most prominent end face is the positive orthodome (I01). Basal cleavage or parting is so well developed that most of the crystals have been broken across showing very smooth cleavage surfaces. The material is much brighter and fresher than the diopside found to the north of the city of Ottawa. Owing to the unusual crystal habit and the degree of corrosion this mineral merits further study.

SPINEL, Locality unknown.

The mineral occurs in the form of octahedra whose edges are sometimes truncated by the rhombic dedecahedron. The largest crystals are about half an inch in diameter. The crystals are lilac in colour but too much fractured to be of value for gem purposes.

CORDIERITE, Garnet Island (Long 72° 30′, Lat. 63° 45′).

The specimens of cordierite consist of irregular fragments of vitreous lustre which are sometimes two inches in diameter. It is associated with white felspar rock and probably occurs as lenses in gneiss. The mineral is deep blue in colour and some of the fragments are sufficiently free from flaws to suggest its use as a gem mineral. Cordierite has up to the present been a very rare mineral in Canada so that its discovery in Baffin Land has considerable mineralogical interest.

In thin sections under the microscope the mineral is seen to be polysynthetically twinned so that it is difficult to believe that the section is not composed of plagioclase. A subordinate part of the cordierite consists of an intimate intergrowth of twinned mineral in which the two portions present a vermicular intergrowth.* It is also characteristic that though the cordierite as seen in thin sections there are distributed many small inclusions of rutile or zircon, each of which is surrounded by a deep pleochroic aureole, orange in colour.

* Walker and Collins., Rec. Geol. Survey of India, Vol. XXXVI., p. 1.

ACTINOLITE, West side of Ottawa Island, Hudson's Bay.
This mineral approaches the variety asbestus but it is too splintery to be of commercial value. It is greenish grey in colour. The fibrous masses are sometimes six inches in length. It will be noted that this mineral is found in quite a different region from the others referred to in this paper.

The chief points of interest connected with this series of minerals are:

1. The remarkable agreement between the variety of minerals found in south Baffin Land and those found in other regions where crystalline limestones form a prominent part of the gneiss complex.
2. The presence of cordierite, spinel, garnet, rose quartz and ophicalcite suggests that in the future Baffin Land may produce minerals valued for ornamental purposes.
3. Mica, graphite, serpentine and actinolite are minerals frequently mined economically.

UNIVERSITY OF TORONTO,
JUNE 15th, 1915.

QUEBEC DRAGON-FLIES.

BY REV. T. W. FYLES.

A few weeks ago I had the pleasure of a visit from Prof. E. M. Walker, editor of the "Canadian Entomologist." Dr. Walker is an authority on the Odonata, and he kindly examined some of the dragon-flies taken by me in Quebec Province. He identified several of them, and verified the names of the rest. The following is a list of the insects, giving the locality in which each was taken. It should be regarded as an appendix to my paper on the *Dragon-flies of the Province of Quebec*, which appeared in the 31st Annual Report of the Entomological Society of Ontario.

LIST.

Names.	Localities.
AGRIONIDÆ.	
Calopteryx maculata Beauv.	"The Beaver Meadow," Hull.
" *æquabilis* Say.	Cowansville.
" *amata* Hagen.	St. David's, near Levis.

LIST—continued

Names.	Localities.
Lestes unguiculatus Hagen.	"The Beaver Meadow," Hull.
" *disjunctus* Selys.	"
Amphiagrion saucium Burm.	"
Ennallagma hageni Walsh.	"
" *calverti* Morse.	"
" *exsulans* Selys.	"
ÆSHNIDÆ	
Ophiogomphus rupinsulensis Walsh.	"The Gomin," Bergerville.
Gomphus brevis Hagen.	"The Beaver Meadow," Hull.
" *vastus* Walsh.	Levis Heights.
" *notatus* Ramb.	Hull.
Cordulegaster diastatops Selys.	"
Boyeria vinosa Say.	River St. Charles, Quebec.
Æshna sitchensis Hagen.	Island of Orleans.
" *eremita* Scudder.	"The Beaver Meadow," Hull.
" *canadensis* E. Walker.	"
" *umbrosa* E. Walker.	"
" *constricta* Say.	Island of Orleans.
Anax junius Drury.	"Mer de Papon," Levis.
LIBELLULIDÆ.	
Didymops transversa Say.	Levis Heights.
Macromia illinoiensis Walsh.	"
Tetragoneuria cynosura simulans Muttkowsky.	"The Gomin."
Tetragoneuria canis Maclachlan.	"The Beaver Meadow."
Libellula quadrimaculata Linneus.	"The Gomin."
Libellula pulchella Drury.	"Mer de Papon," Levis.
" *lydia* Drury.	"The Beaver Meadow."
Leucorrhinia intacta Hagen.	Bergerville.
" *proxima* Calvert.	"
" *hudsonica* Selys.	"The Beaver Meadow."
Sympetrum costiferum Hagen.	"
" *obtrusum* Hagen.	"
" *vicinum* Hagen.	"
" *scoticum* Donovan.	"The Gomin."

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To be continued.

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THE DANGERS OF OUR WILDS.

By Charles Macnamara, Arnprior, Ont.

The French traveller, lately returned from Algeria, was frankly joking when he told an enquirer that the most dangerous animal in North Africa was not the lion, as generally supposed, but the gazelle. "The lion," he said, "it never molests you. But the gazelle, when you are riding across the plain, suddenly springs up at your horse's nose; your horse shies, and throws you off and you break your neck." While this was admittedly a pleasantry on the part of the traveller, a consideration of the dangers of our native woods leads to a conclusion almost as surprising.

In the first place, the only real menace to human life comes, not from the animals of our forests, but from the plants. Our woods and fields harbour a far larger number of poisonous plants than is commonly suspected. Everyone knows of poison ivy and the painful and annoying skin eruption it causes; but its effects, however unpleasant while they last, very rarely result in any serious or permanent injury. Much more grave are the consequences of the internal poisonings by plants which attract by their succulent roots or bright-coloured berries. To mention only a very few of the commonest of these, the sweet roots of the hemlocks, *Conium maculatum* and *Circuta maculata*, are most deadly, and the rash partaker seldom recovers. Another plant with a bad record is Indian tobacco, *Lobelia inflata*, which grows plentifully in dry fields. Although it has a strong and disagreeable taste, children, misled by the common name, sometimes chew this weed with fatal results. The bright red pulp enclosing the seeds of the yew, *Taxus bacata*, found all through our woods, is probably harmless enough in itself, but the seeds are very poisonous. The vivid colour of the "berries" makes them attractive to children, and a good many young lives have been sacrificed to them.

But the fungi of the genus *Amanita* have more deaths against them than all the rest of our flora put together. Never a season passes without one or more records of persons fatally

poisoned by these pleasant-tasted but deadly mushrooms. In this connection it may be worth while mentioning that the popular tests of the edibility of mushrooms, such as the blackening of silver during cooking, the change of colour of the flesh when broken, easy peeling of the skin, and a host of others, are all perfectly worthless, and the mushroom eater who relies on them is in mortal peril of his life.

When we turn to the animal life of our wilds we find no such deadly enemies as these. Although our fauna includes a number of large mammals and about a dozen species of snakes, it can be stated with the utmost confidence that, with the single exception mentioned later on, no animal of Eastern Canada ever makes an unprovoked attack on man, and very few of them indeed show any fight even when brought to bay.

Considering first some of the lower forms, it may be remarked that in many countries, insects are to be counted among the worst foes of mankind. The pestiferous mosquitoes of the tropics and sub-tropics, the tse-tse fly of Africa, and the flea that spreads the bubonic plague are best known examples. We have our share of biters and blood-suckers,—deer flies, black flies, sand flies and mosquitoes,—and it is hard to think of anything kind to say about them. They make life in the woods miserable during the finest season of the year; but annoying as their attacks are, at least we must admit that they do not inoculate us with yellow fever or malaria, sleeping sickness or the plague.

Our ophidia comprise about a dozen species. The only venomous one of these, the rattle snake, once common in Western Ontario, is now practically extinct there, and as far as I know, never lived in the Ottawa district at all. Without exception, the other species are perfectly harmless. Some of them, such as the milk snake, live almost exclusively on rats and mice. Others are largely insectivorous, and all of them serve a very useful purpose in helping to maintain that balance of wild life that man sometimes disturbs with such dire consequences to himself. One must then deplore the wanton cruelty and gross superstition that prompt so many people to kill these harmless and beautiful creatures at sight.

The catalogue of mammals of Eastern Canada recites such formidable names as the cougar, the wild cat, the lynx, the bear, the wolf. But it is not among these that our "dangerous" animals are to be found. The cougar, which reached the extreme northern limit of its range in Southern Ontario, has long been extinct in these regions, and while a powerful animal and very destructive of deer and domestic live stock, was never

known to attack man. The wild cat, *Lynx rufus*, is also extinct and was never more to be feared than the harmless necessary domestic variety. The lynx, *Lynx canadensis*, is still fairly common in our northern woods, and despite the blood-curdling stories of some of our nature fakirs, it is a most innocuous creature, living largely on hares and as averse to fighting as the Hon. W. J. Bryan. The bear, *Ursus americanus*, would doubtless defend itself if cornered, but when it meets a man its first impulse is instant flight. A she-bear with cubs generally waits to cover the retreat of her young, but I never heard of one taking the offensive.

And what of the ravening wolves that,—in newspaper stories,—hunt in fierce packs, and devour hapless hunters and trappers? There are certainly plenty of wolves in the back woods, and they destroy large numbers of deer and in some districts kill the young cattle of the settlers. But the cold truth, well known to every woodsman, is that the Canadian timber wolf, large and powerful animal as it is, never attacks anyone. The ordinary farm dog is a far more formidable animal. The wolf is exceedingly wary and has an overwhelming distrust and fear of man and all his works. Anything that man has touched or handled inspires dread in the wolf. Consequently it is very hard to trap or poison him, and even harder to get a shot at him. Although always apparently half famished, he will prowl for days around a dead horse before he dares to feed on it, his exceedingly keen scent warning him that his dread enemy, man, has had something to do with it. Every hunter knows that it is quite safe to leave the carcass of a deer hung from a low branch anywhere in the woods. If there is snow on the ground, the tracks of wolves will be seen all around the suspended game, but not one of them will venture to touch the meat tainted for them by the contact of man. Much less likely are they to attack man himself, and all the stories of their treeing or devouring woodsmen should be catagorized with the German statements as to the causes of the war.

The moose is not at all pugnacious, but it is much more respected in the wilds than the wolf. It is not a particularly timid animal, and impelled by curiosity, it sometimes approaches the woods traveller quite fearlessly, its imposing bulk making it appear decidedly formidable. As far as I know, there is no record of anyone ever having been hurt by a moose, but occasionally its threatening attitude causes an unarmed man, perhaps unduly alarmed, to take to a tree. A friend told me recently of a curious display of woodcraft in connection with an obstinate moose. My friend, who was without a weapon of any kind, was crossing a portage in the Kipawa district last summer

with his Indian carrying the canoe on his head as usual, when they suddenly came on a large moose standing in the narrow pathway. The animal showed a determined front and apparently intended to dispute the right of way. It was hard to see how he could be driven off without running the risk of a savage kick, but the Indian, wise in forest lore, knew a safe and easy way. He slipped one end of the canoe to the ground and still supporting the other end on his head, drew his pipe and a match from his pocket. Quickly lighting the pipe, he blew a cloud of tobacco smoke down the wind towards the moose. One whiff of the "tabac canadien" was enough for the King of the Forest and he dashed off into the woods.

Then if our snakes, bears and wolves are all perfectly harmless, what are our "dangerous" animals? Well, as already stated, none of our fauna ever really menace human life; but there are two denizens of the Canadian woods that, though they do not ordinarily command any respect, I am inclined to treat with considerable circumspection. These are the skunk and the horned owl.

The skunk when undisturbed is really a well-disposed and unoffensive little animal. It is never the aggressor as far as mankind is concerned; but it has justifiably great confidence in its peculiar means of defence, and so it stands firmly on its rights and is very loath to make way for anyone. When it thinks it is being imposed on, it takes the literal offensive in a most effective manner, and an incautious approach always results in the loss of a suit of clothes to say nothing of one's dignity.

The horned owl is a much more dangerous enemy than this. It is, indeed, the only creature in our woods that ever makes an unprovoked attack on man. True, it has nothing against man personally, and its assaults are always the results of a misapprehension, but nevertheless it sometimes inflicts painful wounds. Like all its race, it is nocturnal in its habits, and its usual mode of attack is to swoop down in the dusk on the head of the passerby, its long claws causing severe lacerations. It is evident that the bird from its elevated outlook sees the moving figure of the man beneath it very much foreshortened, and mistaking a shock of hair or a fur cap for one of the small animals on which it usually preys, it pounces on its victim. In his most interesting book "Sport and Life on the North Shore" Napoleon Comeau records a number of instances of such onslaughts by the horned owl. I know a man who bears a large scar on his forehead as a consequence of such an encounter, and there are many well authenticated stories of shantymen having been attacked. At one camp it is said that the owls were so plenti-

ful and aggressive that the teamsters had to wear half a pork barrel over their heads when going out to the stables in the dark, but I do not vouch for the terminological exactitude of that story!

But after all, such adventures are very rare, and it may safely be said that the benighted traveller can lay his head anywhere in the woods of Eastern Canada in perfect security from venomous reptile or predacious beast; and with the exception of annoying insects at certain seasons of the year, he need "fear no enemy but winter and rough weather."

BIRD NOTES FROM MULVERHILL, MAN.

THE BLUEBIRD, *Sialia sialis*. In this district, during last summer, I did not meet a single one until fall. One day in the autumn, a flock of some twenty birds (mostly young ones) appeared near my home. They remained about half a day and then disappeared. I came to the conclusion that they had been breeding further north, and were on their way south.

CANADA JAY, *Perisorcus canadensis*. During last summer several pairs stayed with us all the summer. This season I have not seen a single one.

NORTHERN PILEATED WOODPECKER, *Phaeotomus pileatus pileatus*. During last summer at least two pairs stayed in our poplar bush all the season. This summer not a single one has been seen.

GREATER YELLOW LEGS, *Totanus melanoleucus*, and LESSER YELLOW LEGS, *Totanus flavipes*. Contrary to the general rule of both, these sister waders have been here in large flocks all this spring. Saw several of them on June 9. Last year I did not see a single one of either variety until late in the fall, when the migrants came down in flocks from the north. I found the nest of a Yellow Legs on June 24, less than a mile from my house.

CANADA GOOSE, *Branta canadensis*. Last year they all passed by both spring and fall; this year at least two pairs are staying in the big marsh in the middle of Birch Lake, evidently breeding.

ERNEST NORMAN.

August, 1915.

MIMICRY—SOME OF NATURE'S STRATEGEMS.

BY B. C. TILLET, HAMILTON, ONT.

Nature teems with instances of what are called mimetic resemblances, instances of organisms closely imitating their neighbours for the sake of some advantage to be gained thereby. Thus is instituted a sort of system of false pretences, an elaborate series of confidence tricks which in their most interesting examples have the merit at least of being defensive rather than aggressive. It is rather curious that while protective colouration in the general sense has certainly been elaborated, not only for defence but for attack also, that manifestation of it, technically termed mimicry, seems to have been developed solely for the purposes of defence and escape.

The gradation between ordinary protective colouration and the most highly specialised form of mimicry is practically complete. Our green caterpillars, our butterflies with brown undersides to their wings, the colouring of certain birds, and the markings of certain birds' eggs, are all instances of ordinary coloured organisms. They do not resemble anything in particular. Their colours are such that in most of their daily circumstances they harmonise in a general sense with their surroundings, thus ceasing to be specially noticeable, at any rate so long as they are at rest. A further step is illustrated by the caterpillars of those geometers usually called stick-caterpillars. These caterpillars are of such form and colouring that when stretched out stiffly, they have a strong resemblance to short dead twigs, sometimes even with buds and leaf-scars complete; while, to render the illusion quite perfect, they have also acquired the habit of resting in just the very poses that twigs might themselves take up. No better example of this can be found than the caterpillar of *Ennomos magnarius*, which when poised by the hind feet on a twig, with the body thrown backwards into space, may well escape detection by all except the keenest observer. Perhaps one of the most remarkable examples of special protective resemblance is seen in the leaf butterfly of Malay, *Kallima paralecta*. The wings of this insect so exactly resemble a leaf when closed, that it may pass altogether unnoticed. We find an elaboration here again of the protective instinct. These insects have a rapid flight, but they will drop suddenly and closing their wings as they alight, take on all the appearance of a leaf. Thus, they seem to completely vanish. The protective instinct may be observed in many insects. A butterfly which has been captured, fearing destruc-

tion, will lie prone on its side; moths, too, will mimic death by lying on their backs. Beetles will feign death in the same way.

Battle within battle must, Darwin says, throughout nature, be continually recurring with varying success. The weak suffer at the hands of the stronger, and they, having no other means of protection against a stronger enemy, have recourse to various strategies. If the caterpillar does not exhibit the protective resemblance, it may be it is unnecessary, that there are other means of protection existing. There are, for instance, many caterpillars that may be said to be quite conspicuous by their brilliant colouring. But no bird will touch them. Their safeguard, no doubt, is that they taste nasty, and their bright colours thus serve to protect them. Other forms of insect life escape elimination through the development of offensive weapons, such as the sting of wasps and bees. Animals which prey upon these forms learn to avoid them, and thus it becomes an advantage to other insects not possessing such means of protection to mimic them. And so we have that venomous-looking insect the great *Sirex gigas*, and the clear-wing hornet moth, *Sphecia apiformis*, with its abdomen arrayed in the bright colours of the hornet, and its sting-like projection and ovipositor. Yet this is a quite inoffensive and harmless insect.

As in the case of protective resemblance, so too, in its aggressive correlative, the resemblance may be general or special, or may reach the climax of mimicry. Hence, what may serve as a protective resemblance, may also enable the prey to steal upon its enemy. The cuckoo bee *Psithyrus rupestris*, an idle queen, who collects no pollen, and has no pollen baskets, steals into the nest of the bumble bee and there lays her eggs. So great is the resemblance here, that not only is the mother bee able to enter the nest unchallenged, but the young bees when hatched are by the same means enabled to escape. Our various bumble bees, no doubt, find great advantage in so closely resembling one another. Many other insects, too, find equally great advantage in so closely resembling the bumble bees. Many common flies mimic them, and each colour type of bumble bee has its appropriate mimic. Certain bees, called Apathi, are parasitic in the nests of the bumble bees. They are indeed very much like real bumble bees, from which they may be distinguished by the thinness of their fur and the consequent shining appearance of their bodies. These very large bees have precisely the colouring of the true bumble bees. Some are parasitic in the nests of those bees which they resemble in colour, and it may be that this resemblance assists them in entering the nests. Hence, it would seem that the mimicry is not so much an aid to the imposition upon the bumble bees, as a means of protecting the Apathi from the general

enemy. The honey bee has, of course, many mimics, of which the common drone fly is a familiar instance.

Nor is protective resemblance confined to invertebrates. We find it in animals, birds, fish and various reptiles. The wild rabbit is a common example of it. Not so common, but a more striking instance of it, may be found in the zebra. Travellers in Africa have found themselves at night in the presence of zebras, and only been aware of the fact by their breathing. Had the zebras been black, or had they been white, they would have been easily visible, but in the starlight night, the combination of black and white stripes blend exactly with the twilight, and so render them invisible.

Some animals, moreover, possess a variable protective resemblance. We have an example of this in the chameleon, which adapts its colours according to its surroundings, an adaptation which is brought about by the expansion and contraction of certain pigment cells. The same phenomena may be observed in the Arctic hare, and the Arctic fox, animals which change their colour according to the season, brown in summer, and snowy white in winter. Among birds numerous instances of protective resemblance may be noticed; and so too with the eggs of many of our wild birds, which so closely resemble the shingle in which they are laid as to be unnoticeable.

Thus we find that there are two kinds of mimicry. In the one the mimic is really weak and defenceless, but by assuming the appearance of some better armed and perhaps savage species, acquires also the latter's evil reputation. This is called Batesian mimicry. In the other we have the real hard cases, creatures which are as well protected by unamiable qualities as they well can be; and which imitate equally disagreeable beings merely for the sake of the additional free advertisement of their ill qualities which the latter afford. This is called Mullerian mimicry.

Mimicry depends for its effective expression upon the power that all the higher animals have of memorizing their experiences. The puppy which captures the bee and is stung learns to avoid such dangerous playthings. In this way the death of one or two individuals frees the whole species from danger of attack by that particular puppy. Moreover, any other kinds of bees, or of other insects resembling in appearance the first one, would also be looked upon with suspicion and avoided. So that the deaths of these one or two individuals would have the effect of protecting every kind of insect that resembled them in appearance.

BOOK NOTICE.

The Dominion Parks Branch of the Department of Interior, Ottawa, has recently issued three publications which are noteworthy on account of the attractive form in which they are printed, and the interesting matter they contain. They are: "Classified Guide to Fish and Their Habitat, Rocky Mountains Park"; "The Nakimu Caves"; and "Glaciers of the Rockies and Selkirks."

The Fish Guide is written for the sportsman and naturalist rather than the scientist. It is a compilatiou of first-hand information for anglers by one who has fished in all the principal waters of the park. It takes up each locality, describes the best means of reaching it, the different varieties of fish which can be secured, and the best bait to use. The game fish of the Rockies include five species of trout, one of which—the Lake Minnowanka trout—has been known to run as high as 50 pounds. The Grayling, the Dolly Varden, and the Cut Throat trout are found in many of the lakes and streams of the park, and a fish hatchery has recently been established at Banff for the purpose of restocking those which have become depleted.

The second pamphlet gives an interesting account of the formation, character and discovery of the famous Nakimu Caves near Glacier, B.C. These interesting natural curiosities are supposed to be about 40,000 years old, and consist of a series of underground chambers, some of them fifty feet high and more than two hundred feet long, hollowed out partly by erosion and partly by volcanic action, and opening into each other at different levels. The walls of the caves are covered with strange florescent limestone formation, and they reverberate to the roar of underground torrents. The different chambers have been given names suggestive of their character: "The Pit," "The Marble Way," "The Ballroom," "The Art Gallery," "The Judgment Hall," "The White Grotto," "The Bridal Chamber," etc., and when they are lit with electricity, and proper guards and handrails have been placed on the stairs and platforms, they should be among the most interesting sights in the Rockies for tourists.

"Glaciers of the Rockies and Selkirks" is by Dr. A. P. Coleman, Professor of Geology in the University of Toronto, and bears on the cover an attractive reproduction in color of a sketch of Mt. Ball, one of the picturesque peaks near the Divide. Dr. Coleman is a scientist with the imagination of a poet, and he has written the story of the formation and work of the Canadian glaciers with all his well known literary charm. The pamphlet

should prove not only a great help to the student of glacial phenomena who visits the parks, but it should inspire many Canadians with a desire to see the wonderful mountain scenery of their own country for themselves, "to put on," as Dr. Coleman says, "warm, strong clothes and hob-nailed shoes, and to fill one's lungs with mountain air in a scramble up to the snow fields to see how the glacial machinery works."

The pamphlets may be obtained free on application to the Dominion Parks Branch, Ottawa.

A HYBRID ROSE.

ROSA GYMNOCARPA NUTT. x R. NUTKANA PRESL.

Stems rather slender, 1.3—2 m. high; prickles below densely soft-prickly, slightly retrorse, above slender but stiff; leaflets simply serrate, 1—2.7 cm., broad, oval, rounded at both ends, glabrous beneath; stipules broad; flowers mostly in clusters of 2—4 or solitary, bright pink with pink stigmas 4—4.5 cm. broad; calyx more or less glandular, persistent, the appendages 5—15 mm. long; receptacle at flowering 3—6 mm. in diameter; pollen scanty and abortive; fruit mostly not developing, the few seen 7—8 mm. in diameter, producing few nutlets.

Several clumps of this rose occur near Crescent Beach, B.C., at the base of a bluff facing Boundary Bay. The bushes, with their rather slender flourishing stems, rising somewhat above the surrounding *R. nutkana*, look much like *R. pisocarpa*, especially as the flowers are mostly in small clusters, and smaller than those of *R. nutkana*. *R. pisocarpa*, however, does not occur in the immediate vicinity, and does not flower till late in June. The plant just described flowers with *R. nutkana* and *R. gymnocarpa*, all three being in full bloom May 20, 1915.

The clustered flowers, the prickles and the glabrous leaflets, suggest *R. gymnocarpa*; the large leaves and the glandular persistent sepals, *R. nutkana*. With its long, rather slender, very floriferous stems and bright flowers, this is a most attractive rose. It is readily, even at some distance, distinguished from *R. nutkana*, by which it is surrounded, by the brighter pink petals.

J. K. HENRY.

NOTE.

In Mr. P. A. Taverner's article, "Geological Survey Museum Work on Point Pelee, Ont.," published in the November, 1914, issue of THE OTTAWA NATURALIST, the year in which the observations recorded therein were made is not mentioned. This was 1913. Ornithologists please note.

PARTIAL LIST OF LITERATURE IN THE LIBRARY OF THE OTTAWA FIELD-NATURALISTS' CLUB.

(*Continued from page 68.*)

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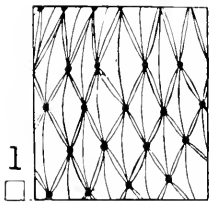
THE ENTOMOLOGICAL SOCIETY OF ONTARIO.

The fifty-second annual meeting of the above society will be held in Ottawa, on November 4th and 5th, 1915. The day sessions will be held in the large laboratory of the Entomological Branch, Department of Agriculture, Birks' Building, Sparks street, and the evening meeting on November 4th in the Assembly Hall of the Normal School. At this latter meeting Dr. H. T. Fernald, State Entomologist of Massachusetts, will deliver the popular lecture, the subject of which will be "Life Zones in Entomology and their relation to Crops."

A very full programme has been arranged for the day sessions. Many of the papers to be presented will be of an economic nature, on subjects of extreme interest to the agriculturist, horticulturist, etc. Entomologists from every province in Canada will be present, in addition to which prominent authorities from the United States will also be in attendance. Members of the Ottawa Field-Naturalists Club interested in insect life will be welcomed at the meetings.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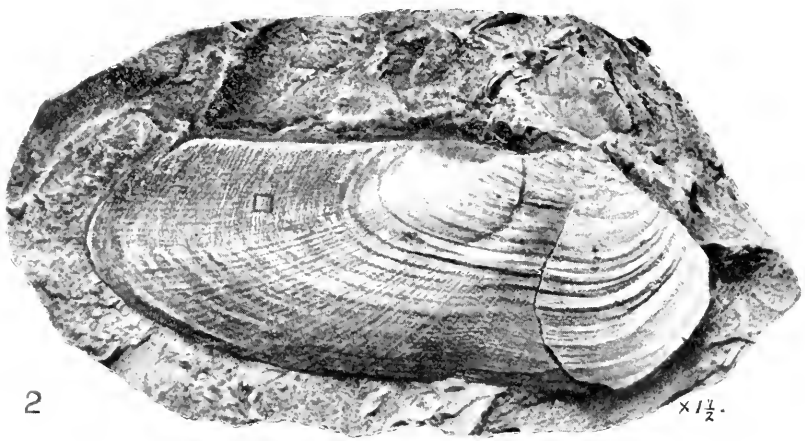
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THE OTTAWA NATURALIST

VOL. XXIX. NOVEMBER, 1915 No. 8

A NEW ORDOVICIAN PELECYPOD FROM THE OTTAWA DISTRICT.*

By Alice E. Wilson.

The shell is of medium size and subelliptical in outline, length and height about as 2:5. The valves are very slightly convex. The cardinal margin is straight posterior to the beaks for about two-thirds the length of the shell, making an angle of 45° with the anterior margin, which continues as a straight line nearly to the median transverse axis of the shell, thence curving into the anterior and basal margins. The latter margin bends slightly upward opposite the broad weakly-defined sinus. The posterior end is slightly truncated obliquely, but joins the basal margin with a moderately narrow curve. The anterior margin and the straight cardinal margin form a more obtuse angle than that of the posterior end, and the curve with which it joins the ventral margin is less narrow. There is a slight constriction beneath the very moderately raised umbones. The lunule, which is evidently very narrow, is partially destroyed on the specimen examined. The sinus is very shallow, moderately broad and less oblique than most other species of this genus. The umbonal ridges are not prominent, and become imperceptible in the posterior portion of the shell, which is almost flat. Anterior to the sinus there is a slight inflatation. The concentric growth lines are very fine, but anteriorly they are gathered into about a dozen strong ridges, which end abruptly in the oblique cardinal margin. Posteriorly the ridges of growth lines almost disappear.

The most striking characteristic of the species, however, is the unique marking. A series of fine granules crosses the concentric growth lines, radiating from the umbonal region. Near the beak they are very fine, hardly visible to the naked eye, but they become much stronger away from it, so that in the ventral half of the shell they have almost obliterated the concentric growth lines, except anteriorly where the strong ridges of concentric growth lines are still prominent. On the dorsal half of the posterior portion of the shell there is a still more complex marking. In addition to the very fine concentric growth lines crossed by the radiating series of granules, which here are very minute, there is a very fine double network of lines running obliquely from granule to granule, forming a regular mesh, with

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one granule at each intersection of the lines. The lines of growth, with a gentle curve towards the posterior margin, pass from apex to apex across the longest diameter of the mesh. Some of this very fine network is worn, and in places the granules appear to be shoved up together, but there is much of it that is remarkably well preserved.

The length of the right valve, which is the only specimen found, is 53 mm., height 21 mm.

This species closely resembles *Rhytimya ochana* Ulrich, but differs from it in the straight anterior cardinal margin in the narrower and less oblique sinus, with its consequent less sinuate ventral margin, in its narrow and more rounded posterior portion.

It differs from *Rhytimya compressa* Ulrich, in the more abrupt downward slope of the anterior portion of the dorsal margin, in the somewhat more distinct mesial sinus, and the corresponding slight upward flexure of the ventral margin. *Rhytimya granulosa* is larger, the posterior portion is more prolonged, and the mesial sinus is less oblique.

Compared with *Rhytimya convexa* Ulrich, this species is less convex on the whole, although slightly more inflated anterior to the mesial sinus. The folds of concentric growth lines are less prominent posteriorly and the cardinal margin is straighter.

For this species I would propose the name *Rhytimya granulosa*.

The Museum is indebted to Mr. G. S. Blake, geologist of the Standard Oil Company of Canada, for the shell.

Formation: Lorraine, in the Proetus zone, several hundred feet below the *Strophomena fluctuosa* horizon, which is regarded as near the base of the Waynesville division of the Richmond, by Aug. F. Foerste.

Locality: Twelve miles east of Ottawa, near Vars, on the Grand Trunk railroad. Immediately west of the intersection of the roads between concessions VII and VIII, between lots 20 and 21, nearly two miles west of Vars.

EXPLANATION OF PLATE II.

RHYTIMYA GRANULOSA, N. SP.

1. Portion of network on the upper posterior portion of *Rhytimya granulosa* x ten diameters. The lines of nodes from right to left are the radiating lines shown on the specimen. The single long lines through the long axis of the mesh are the lines of growth.
2. *Rhytimya granulosa*, photograph of type x 1½. Number 4319 in the Geological Survey Museum.

SHALLOW WATER DEPOSITION IN THE CAMBRIAN OF THE CANADIAN CORDILLERA.*

BY LANCASTER D. BURLING.

During the field season of 1915, the writer was engaged in a stratigraphic study of the Cambrian rocks along the Canadian Pacific and Grand Trunk Pacific railways in British Columbia and Alberta. One of the most striking features observed was the very considerable evidence of shallow water conditions of deposition in the limestones of the region.

The Stephen formation (*a*) occupies a central position in the Middle Cambrian and forms a two or three hundred foot shelf between cliffs of massive limestone each a thousand feet or more in thickness. In the vicinity of Mounts Stephen and Field, on the Canadian Pacific Railway, it includes those striking Middle Cambrian faunal horizons to which the terms Ogygopsis shale and Burgess shale have been applied. Here the limestones and shales of which it is composed betray no evidence of shallow water conditions of deposition; in fact it is hard to see how the jelly fish, sea cucumber, sponge, worm, crab, and pteropod fauna of the Burgess shale (*b*) could have been preserved in strata deposited outside of the most sheltered of habitats. In Castle Mountain, 30 miles southeast of the locality to which these faunas appear to be confined, however, the limestones of the Stephen formation, which are both coarse and fine grained and apparently purely calcareous, are very largely mud-cracked and ripple-marked. The areas outlined by these mud-cracks vary from one inch to three or four feet in diameter, and the distance between crests of the ripple-marks varies from one inch to two or more feet, some of the larger ripple-marks being impressed upon layers carrying limestone conglomerate pebbles two inches or more in diameter. Nearly all of these limestones carry an abundant trilobite and brachiopod fauna. Pure limestones carrying what we have been accustomed to regard as marine faunas thus bear unimpeachable evidence that they have not only been deposited under shallow water conditions, but that in many cases they have suffered prolonged exposure to the air. *Glottidia*, *Kraussina*, *Terebratulina*, *Lingula* and *Discina*, among recent brachiopods, are known (*c*) to live at or above low tide, and there is no reason

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(*a*) Walcott, 1908, Smithsonian Misc. Coll., vol. 53, No. 5, pp. 209-212.
(*b*) Walcott, Smithsonian Misc. Coll., vol. 57, 1910-1912.
(*c*) Davidson, British Fossil Brachiopoda, vol. 5, 1883, p. 337.

why the extinct trilobite should have needed a deep water habitat. In fact, specimens in our collections show this form to be present upon the surface of interformational conglomerate layers—those curious bands which owe their origin to the edgewise packing and cementing of broken bits of sun-dried crust upon a tidal flat—a characteristically shallow water phenomenon exhibited by limestone strata scores and hundreds of feet in thickness throughout large areas of the Cambrian in Wyoming, British Columbia, Alberta, and Yukon. It may be of interest to record here also the fact that brachiopods and trilobites have been discovered in a massive Cambrian limestone composed almost entirely of Cryptozoon-like algal masses approximating a foot in diameter and six to eight feet in length. The gradually accumulating weight of evidence is thus strongly in favour of the conclusion that neither marine faunas nor limestones are, either of themselves or jointly, a criterion of deep water deposition, and that for much of the Cambrian the postulation of deep sea basins is unnecessary. Moreover, we have shown this to be true for at least part of a horizon whose faunas preserve their individuality through the one thousand or more miles separating the Nevada localities from those in British Columbia and Alberta.(*d*)

Evidence of shallow water conditions in the Cambrian is most striking, however, nearly 3,000 feet above the Stephen formation at the line separating the Middle from the Upper Cambrian. The base of the Bosworth formation (*e*) in the Canadian Pacific Railway section and the base of the Lynx formation (*f*) in the Grand Trunk Pacific section comprise several hundred feet of red and yellow shales which are covered with mud-cracks, ripple-marks, and casts of salt crystals two inches or more in diameter. The emergence of the sea bottom indicated by these occurences must have been prolonged, but the quiet limestone forming conditions which immediately preceded them soon followed. The occurence is of special interest, because the correctness of the division of geologic time into major units is believed to be confirmed when those units are discovered to represent periods of deposition separated by emergences of the sea bottom.

(*d*) Geol. Survey Canada, Museum Bull. No. 2, 1914, p. 113.
(*e*) Walcott, Smithsonian Misc. Coll., vol. 53, No. 5, 1908, pp. 205-208.
(*f*) Idem, vol. 57, No. 12, 1913, p. 337.

NOTES ON THE HERRING GULL (LARUS ARGENTATUS).

BY M. Y. WILLIAMS, OTTAWA.

Between June 8th and October 26th the writer cruised by launch from Wiarton to Sault Ste. Marie, visiting nearly all the islands included in the Manitoulin group. Throughout the season herring gulls were very numerous. On and after July 21st the immature birds, in brown-gray plumage, began to appear.

These gulls are reported to nest freely on Half Moon Island, where the fishermen obtain plenty of eggs for eating. On July 21st, when we visited Wall Island, I saw old nests, and also a dead, half-grown gull. What appeared to be the remains of a nest was also observed on James Island, and many gulls made it a resting place. This species is also reported to nest on some of the islands in the north channel.

A number of well-informed fishermen and hunters report that the herring gull destroys whole families of young wild ducks. Following the flock as it swims in open water, they hover over the little ducks, which try to escape by diving, and swallow them as soon as they come to the surface.

On September 27th the writer saw a small flock of what appeared to be hooded merganzers off the west end of Barrie Island. Several herring gulls hovered near and dropped to the surface of the water alongside the ducks as soon as they rose to the surface, swam up and appeared to take something away from them. On October 1st a large flock of American merganzers were fishing along the Lake Woolsey side of Indian Point. In spite of a fresh wind blowing on shore, they fished close to shore in the shallow water, following up the innumerable minnows which were to be found at this locality. A number of herring gulls mingled with the ducks, and paid close attention to them as they rose from beneath the water. I shot two of the ducks, and found their mouths overflowing with minnows.

Mr. J. Merrylees, of Gore Bay, hunter and taxidermist, says that the gulls regularly rob the ducks of their fish when they rise to swallow their catch. This appears to be the only conclusion to be drawn from the above observations. It was further stated by Mr. E. Gaulin, of Meldrum Bay, that the gulls rob the loons as well as the ducks.

From evidences seen this summer, the herring gull has at least one dangerous natural enemy. On July 10th the writer discovered four duck hawks along the cliffs of the north side of

Echo Island, which lies but three or four miles north of the Bruce peninsula. The two young birds, which were fully developed, were secured. One was shot from a dead stub at the top of the cliff, which was a much frequented roosting place. Just below were the feathers of blue-jays and the wing primaries of a herring gull. Yeo Island, which was visited July 13th, was also frequented by duck hawks, and numerous wings of crows, gulls and blue-jays lay scattered along the top of the cliffs.

THE EVOLUTION OF THE SHEEP.

BY B. C. TILLETT, HAMILTON, ONT.

To the curious and enquiring mind which first strikes the question, viz: "What are the origins of the domesticated animals and plants of mankind?" there opens out a world of interesting investigation. How did man come to subdue the wild animals of the earth to his uses for labour, for hunting, and for food, and even for fancy and amusement? How came he to discover and cultivate the leaves, roots, seeds, and even the flowers of the vegetable world for food, as well as for ornament and artistic gratification? And, what is more wonderful, how did he multiply and develop from single common stocks all their innumerable and diverse varities? The last question has become, in its biological aspects, a problem so profound and interesting as to develop a new school of inquirers in Europe—the Mendelians.

THE IMPERMANENCE OF FORM.

Charles Darwin threw a powerful and important light upon these problems when he demonstrated and developed the simple yet remarkable fact of life, that all living forms existing around us have in reality no fixed permanence. They have all inherent in their nature a vital flexibility of tissue, of anatomy, and of function. And it is this which causes them to fluctuate and vary from those qualities which, in their sum total, go to the make-up of that distinctive type of life we term the species. When the world was young, and reptilian monsters dominated the tropical forests and swamps of the earth, the birds of that period showed their affinities with these creatures in the possession of teeth. The teeth have disappeared, but the population of the air remains. While no living bird now possesses true teeth, within the jaws of an unhatched parrot there are certain

microscopic points capped with enamel, which indicate its ancestral connections. They are absorbed before the bird is many days old. In the unborn parrot is the vanishing point of a "missing link" with its primeval progenitors.

With the disappearance of the primeval swamp has also disappeared the five-toed ancestor of the horse. Transferred to the plains, he now races free upon a single digit, developed into a hardened hoof, leaving the vanishing remains of other digits within his pastern to mark the transition of slow development, through æons of time, from one form of life to another. These are instances of a plastic power within the living organism which enables it to fit itself in, and adapt itself to, the exigencies of its environments. The very urgencies of subsistence, and the necessities of survival at Nature's table, demand this constitutional tendency to impermanence of form or function.

VARIABILITY OF NATURE AND LIFE.

For in all her physical aspects, Nature is herself changeable and inconstant. The rigors of her chequered and ever-changeable conditions have aided in eliciting and fixing the quality of mutability in her life forms. There is thus an element of mutability and reciprocation between the internal organism and its external surroundings. And the instability of the organism is a natural and a necessary part of the dual state of its existence. As Herbert Spencer has sententiously remarked in defining life itself, it is "a continuous adjustment of internal relations with external relations." Such, in brief, is the doctrine of variation, which is the starting point of Darwin's theory of the origin of species and the evolution of life.

Darwin at once seized hold of the enormous range of variation seen in domestic species, and its power of diversity and extension under the hand of the expert breeder and cultivator. And in utilising its multifarious phenomena in support of his thesis, he personally experimented with both animal and vegetable species. Here he showed that the key of man's power over species lies in the accumulation of his selections of varying and variable points of structure and character. Nature provides variations, and their succession in heredity. Man adds them up in directions useful to him. In this way he has built up great and serviceable breeds. He can not merely modify the character of his types, but he can change them altogether. It does not require a great effort of the imagination to determine the motives of man in his selection and improvements of breeds to serve his ends. It is known that sheep skins were used for tents, as well as for clothing and foot-wear, from the

earliest nomadic times. Size would, therefore, be a desideratum. Warmth and comfort would be desired. Length and fineness of fleece would, therefore, be sought for. Purity of colour would be appreciated. White, and its pure and uniform tints, would be desired. Principles of economy would dictate considerations as to weight, strength, and healthiness of skin and so forth.

THE FIRST EXPERIMENT.

Early in the history of the world it can be well imagined that wealth was measured by sheep. And the dignity of shepherding and the peace of pastoral pursuits bulk largely in ancient literature. The flocks of Abraham and Lot, as the measure of their prosperity, are said to have been more than the land could support. They were the chief resources as well as the spoils of the whole history and the wars of the Israelites. Solomon dedicated 120,000 sheep to the purposes of religion and the temple. Pliny remarks that sheep were used as sacrifices to the gods, as well as for food and clothing. The enormous superfluity of the flocks of ancient times must have been the product of careful selection; and it will be remembered that the first successful experiment for the production of a new colour was made by Jacob, as recorded in the Scriptures. He peeled rods of poplar, hazel and chestnut, so as to give them a "ring-streaked" or dark and white appearance. These he placed in the water troughs of the flocks. In this he supposed according to the world-old tradition that the speckled appearance would be reproduced in the young lambs through the impressionable character of the ewes carrying young. White troughs have since been used, and even white cloths have been hung up in the fields for the same purpose.

WILD AND DOMESTIC ANIMALS.

The original stock of domestic sheep is represented by, and more or less obscurely traceable to, less than a dozen wild species. These vary in outward appearance and character, considerably from the goat-like, furry rather than fleecy, blue sheep of Tibet, to the Moufflon or Armenian wild sheep of Europe. The latter is said to be the original progenitor of our domestic varieties. They formerly existed in the islands of Sardinia and Corsica in large numbers, and were the object of large organized hunts, as many as 500 being shot in a single drive. To-day they are not so numerous, and the captured are much less. Their affinity with domestic sheep is seen in the fact that now and then the wild Moufflon will forsake the wilds and mix with the homestead sheep, while it is also known that orphan lambs of the home-

stead have found a dam amongst the wild species. The variability of the domestic sheep of the world is more marked. The Africander fat-tailed sheep carries a tail which is frequently found to weigh 50 pounds, trails on the ground, and is supported by the breeder with a contrivance on little wheels. It is regarded as a delicacy, and is an important item in the mutton. On the other hand, there is a breed of sheep in Central Asia with a mere rudimentary tail, the fat natural to this part having accumulated on each side of the haunches in large protuberances as if like the camel's hump they were nature's store against future famine, which man takes advantage of and breeds out. Darwin notices the Angola variety of the long-tailed race which has similarly curious growths of humpy fat in the region of the head. The multiplicity of varieties of the sheep and their extremes of peculiarity render the veriest reference to specially interesting features out of the question in these notes. There are in the museums of the world collections of mediaeval, modern, and wild stocks, and in some of the European zoological collections a few living specimens. In the museums may also be seen fossilized remains which carry us back to the very early geological times in the earth's history. Although the ancestry of the horse may be definitely traced to the most ancient primeval epochs, that of the sheep still remains in obscurity. But it is known that this important domestic animal appeared wild in the tertiary epoch in company with the horse, camel, ox, hog and elephant. This takes us back to about 2,500,000 years ago. And according to authorities on the subject, there is ample evidence that in the quartermary epoch of the earth's geological age man had acquired some of the arts of agriculture. He had domesticated the docile sheep, and afterwards the ox, the cat, the dog, and the fowl. He had learned to dress hides, and had accomplished primitive methods of weaving. And this period is fixed as variously approximating 500,000 years ago.

BEQUEST TO O.F.N.C.

The Ottawa Field-Naturalists' Club is pleased to acknowledge a bequest of $100 by the will of the late John Charles Kearns. The late Mr. Kearns was a member of the Club for many years, and always took a very keen interest in its work.

The Council, at a recent meeting, decided to set this bequest aside as an endowment fund, the interest from which could be offered as an annual prize bearing the name of the donor.

G. LEL.

SOME HABITS OF SWAINSON'S HAWK IN MANITOBA.

BY NORMAN CRIDDLE, TREESBANK, MAN.

Swainson's Hawk (*Buteo Swainsoni*), is essentially a bird of open woodlands or hilly country. It prefers a mixture of the two for nesting purposes, and the open gopher-infested plains for a hunting ground. Reaching us rather later in the spring than most of our other hawks, it almost immedietaly sets about selecting a nesting site, the place chosen being usually either a scrub oak or an isolated aspen poplar. Occasionally, however, the birds abandon their usual practice and select a hill instead of a tree for nesting purposes, even when trees are available. On the plains farther west they do not have so much choice in the matter, and in consequence they are obliged, if they nest at all in such places, to be contented with a hill or river bank.

As I have previously pointed out, on several occasions, there are few more useful hawks, in our Canadian west, than this species. Years ago, in his "Birds of Manitoba," Thompson Seton suggested the name gopher hawk for this bird, and I know of no more fitting title. This does not suggest, however, that these birds live only on such animals. Those of us who know them well are aware that they are by no means partial in this choice. Young grouse, meadowlarks and other birds certainly form a portion of their diet, as do also, occasionally, young poultry. But observation also teaches us that at least 80 per cent of the food is made up of noxious rodents, and that is surely an excellent showing, well entitling the bird to protection.

In former times these handsome dashing hawks frequented the plains in considerable numbers, seeking and obtaining an easy living among the gopher population. As time went on, however, the persecution they were subjected to by farmers and others greatly thinned their ranks, so that to-day they are restricted to a few isolated or unsettled districts, where they are permitted to rear their young in comparative safety. I am pleased to say that one such district occurs in the neighbourhood of my home, it being situated on one of the Dominion timber reserves. It is there that I have been privileged to watch the birds for a number of years past, and have gleaned some interesting information relating to their habits and life history. Some of this information I have already related in a previous volume of THE OTTAWA NATURALIST. I shall here, therefore, chiefly confine myself to some observations made last summer, while I was out on some of my usual Sunday afternoon rambles.

My first excursion into the "Sand Hills," where the hawks reside, was in early June, when in company with two of my brothers, I was fortunate enough to run across three nests. The first of these, which I shall call No. 1, was situated in a dwarf oak (*Quercus macrocarpa*), the tree being some 14 feet in height, and the nest about 8 feet from the ground in its bushy limbs. In the nest were five eggs of the usual blotched type, and sitting upon them was a bird which was very loath to leave. It, however, rose on our close approach and rapidly soared skywards. When well out of reach it was joined by a companion and uttered shrill shrieks of defiance. The second nest was located about three miles from the first, and some five miles from home. This, unlike the first, was situated upon the point of a hill which rose some 20 feet above the surrounding level. This hill, however, was by no means isolated, there being numerous others round about, some of them actually higher, its only advantage in comparison being that it reached more of a point at one end where the nest was placed. The nest itself was of a decidedly bulky nature, being built of large sticks, with smaller ones and some bark as a lining. In this were seven eggs, the greatest number I have ever observed in one nest, the usual number being four, and not infrequently one finds only three. The third nest, like No. 1, was situated in a dwarf oak growing this time at the bottom of a hill. It contained no eggs, though a few green leafy boughs in it showed that its builders had recently been at work. This nest was about two and a half miles from No. 2, and on account of its distance from home was not again visited.

On June 27th I visited the first two nests for the second time. No. 1 now had some downy young in it, two striped gophers (*Cetellus tridecemlineata*) and one gray gopher (*C. Richardsonii*). No. 2 harboured five young and one egg, the young being half grown, though of different ages as usual. They were curious fluffy fellows, having a mixture of down and feathers, the latter being chiefly confined to the wings. They all opened their beaks as I approached, and the largest, as if guardian over the rest, did his best to defend them and frighten me away. In this nest half a gray gopher was the only available food.

On July 4th I was again in the vicinity, and found No. 1 nest with the young still present, and that their hunger had been recently appeased was evident from the presence of two untouched striped gophers in the nest. In nest No. 2 the young were still unable to fly, though three had made their way some distance along the hill. I returned these for the sake of a photograph, and they made very little effort to prevent my handling them. Curiously enough, there was still but one of a pugnacious nature, and he, as previously, seemed to consider himself

in charge of the remainder, and in that capacity resented in a ferocious manner my handling of the rest. One of the parents also made a half-hearted effort to frighten me by diving towards me. It took good care, however, to remain well out of reach. In the nest at the time were two gray gophers, one of them partly eaten, showing in spite of five almost fully grown young that the parents were able to keep the larder well supplied. I would like to draw attention here to the habit these birds have of going far afield for their hunting. In the case of nest No. 2 the nearest gray gopher colony was fully two miles away, while to secure them in numbers entailed a journey of four or five miles, and there is reason to believe that the hawks went even further than this. That they usually flew directly to their hunting grounds was also evident from the fact that in no instance were striped gophers found in the nest, though those rodents were met with more than once in its vicinity. While the hawks keep the nest and its immediate surroundings free from refuse, I was, nevertheless, able to secure a few pellets, which, as is well known, all birds of this kind disgorge. An examination of these revealed much gopher hair, a few feet of those animals, and two feet of a meadowlark, both in the same pellet, showing that they doubtless belonged to one bird.

As I left the nest its defender still stood erect on its edge watching my every movement, like a sentry on duty, and thus he remained until distance hid him from my sight.

On July 5th, a parent hawk which was flying very high, suddenly made one of those dives for which the birds are remarkable. In a moment it was among a brood of young turkeys, and but for their remarkable instinct in hiding, and my presence soon after, would have undoubtedly carried off one of them. As it was, the hawk continued on its journey southward to the usual hunting grounds.

On July 17th I visited nest No. 1 for the last time. I found it inhabited by four almost fully-fledged young. I had, in fact, just taken a photograph, and was searching for pellets beneath the nest, when the strongest bird flew out, but finding its weight still too great for its wings, it came to earth rather suddenly some 40 yards away, not, however, with sufficient force to be injured, as was indicated by the vicious manner in which it met me as I approached. Its onslaught was most determined, and I was obliged to defend myself with a spade, which the hawk struck repeatedly with its claws, but never with the beak. When exhausted with its efforts at jumping, it threw itself upon its back and struck out with both feet. Having finished my observations I retired, the hawk actually making after me, evidently considering that I was being driven from the field. The

other birds remained in the nest in company with two striped gophers, one being partly devoured. Pellets around the tree showed much gopher hair and some broken bones, but no indication of birds. It seems strange that this pair of hawks fed their young mostly upon striped gophers, while those of No. 2 preferred gray ones; doubtless situation had something to do with this, though both kinds of gophers were within reach. Another nest I had not previously visited was located in an aspen poplar, in an opening among the lower trees. There was a single hawk in the nest which immediately flew on my approach and disappeared in the distance. In this case the parent birds, as is customary, had been shrieking overhead while I was yet more than a mile away, and had even attacked me in the usual timid manner. As a matter of fact it was their own stupidity that led me to the nest, which but for their efforts I should never have found. Pellets in this instance were absent, consequently I could learn nothing of the birds' food habits.

To those unacquainted with the fauna of Manitoba the question might arise, how do these hawks manage to defend themselves while nesting on the ground, particularly upon a hill which is so frequently used as a vantage spot by coyotes. Is it that hawks make but poor eating, or do the coyotes, badgers, etc., fear those formidable claws? I do not know, but suspect the latter is more probably correct.

It is a very great pity that lack of knowledge regarding the usefulness of these hawks has caused them to be so severely persecuted. We are all of us aware in the west what a large toll gophers take of our crops, yet strange to relate, we seem to have done our best to propagate them by destroying the hawks and weasels, which are their natural enemies.

FIFTY-SECOND ANNUAL MEETING OF THE ENTOMOLOGICAL SOCIETY OF ONTARIO.

This meeting will long be remembered by those present as an extremely successful gathering, at which members convened from both ends of the Dominion, to meet their fellow workers at the Capital. The meetings of this Society have long been known for their successful programmes, but if we are to believe those competent to judge, the gatherings on the 4th and 5th of November last excelled in this respect any previous conventions, and in point of value to agriculture, were to Canada equally as profitable as the meetings of the Association of Economic Entomologists are to the United States.

The meeting was held in the large laboratory of the Entomological Branch, Department of Agriculture, Ottawa, thus not only providing ample accommodation, but also enabling visitors to inspect the large collections of insects housed there. While the Society had to deplore the unavoidable absence of Dr. Howard, Chief of the United States Bureau of Entomology, who was to have delivered the popular lecture, we were fortunate in securing instead another distinguished American in the person of Dr. H. T. Fernald, of Amherst, Mass., who delivered, on Thursday evening, November 4th, a most interesting and instructive lecture, the title of which was "Life Zones in Entomology in relation to Crops."

It is unnecessary to mention the names of all those present; sufficient to relate that the meetings were very largely attended. There were, however, a few visitors who cannot well be passed over, namely: Prof. C. P. Lounsbury, Chief of the Division of Entomology, Department of Agriculture, Pretoria, Union of South Africa; Mr. A. F. Burgess, who has charge of the United States gipsy and brown-tail moth work, and Dr. Hugh Glasgow, of Geneva, N.Y. In addition to many prominent members of the Society, there were in attendance all the scientific staff of the Dominion Entomological service, as well as the following well known Canadian visitors: Sir James Grant, Dr. F. S. Torrance, Veterinary-Director General; Dr. F. T. Shutt, Dominion Chemist; Mr. W. T. Macoun, Dominion Horticulturist; Dr. C. H. Higgins, Pathologist, Dominion Department of Agriculture; Mr. H. T. Gusrow, Dominion Botanist; Mr. R. H. Campbell, Director of Forestry; Mr. W. Ide, private secretary to the Minister of Agriculture; and Mr. D. Johnson, Dominion Fruit Commissioner.

The papers read, while usually of a scientific nature, and therefore of interest to a limited audience, provided, nevertheless, some noteworthy exceptions, which must have appealed to any lover of wild life. In this connection we would mention the paper of the Rev. Dr. Fyles, of Ottawa, on "Observations upon some of the Predaceous and Parasitic Hymenoptera,"; "The Home of Gortyna stramentosa," by Mr. A. F. Winn, of Montreal; "The Founding of the Science of Cecidology," by Dr. A. Cosens, of Toronto; and "Fresh Woods and Pastures New," by Mr. F. J. A. Morris, of Peterboro, Ont.

Of truly scientific papers, of which there were many notable contributions, we will mention but one: Dr. Seymore Hadwin's, of Agassiz, B.C., "Further Notes on the Warble Fly (*Hypoderma bovis*)," a valuable contribution, in which the writer produces conclusive evidence as to how the larvæ enter the bodies of cattle, the method being quite at variance with ideas previously held. All the papers presented at the meetings will

ultimately appear in the Annual Report of the Society, and should be in the hands of all interested in either agriculture or entomology.

The meetings were presided over by the President, Dr. C. Gordon Hewitt, until the last afternoon, when setting a new and appropriate precedent he vacated the chair in favour of the newly elected president, Mr. A. F. Winn. The other officers elected were: Vice-President, Prof. L. Cæsar, Guelph; Secretary-Treasurer, Mr. A. W. Baker, Agricultural College, Guelph; Curator, Mr. G. J. Spencer, O. A. College, Guelph; Librarian, Rev. Prof. C. J. S. Bethune, Guelph. Directors: Division No. 1, Mr. Arthur Gibson, Ottawa; No. 2, Mr. C. E. Grant, Orillia; No. 3, Dr. A. Cosens, Toronto; No. 4, Mr. C. W. Nash, East Toronto; No. 5, Mr. F. J. A. Morris, Peterboro; No. 6, Mr. J. W. Noble, London, and No. 7, Mr. W. A. Ross, Vineland Station.

On Friday evening, November 5th, a smoker was held in honour of the Society, the hosts being the entomological section of the Ottawa Field-Naturalists' Club, the president, Mr. Arthur Gibson, welcoming the members in a short speech. The proceedings that followed were presided over by Dr. Hewitt, and were greatly enjoyed. They ended, as was to be expected, in the height of good fellowship.

N. C.

THE CANADIAN FISHERIES MUSEUM.

Members of the Ottawa Field-Naturalists' Club will be interested to learn that the above-mentioned museum has been recently entirely remodelled by Mr. Andrew Halkett, the well known naturalist of the Dominion Fisheries. The object of this museum is to display in an educational manner all forms of aquatic life, and chiefly to illustrate the value of our vast fishery resources. The fishes proper, which for the most part are mounted specimens of the fishes themselves, are beautifully arranged and classified, according to Mr. Halkett's recently published "Check-List of the Fishes of the Dominion of Canada and Newfoundland," in cases around the walls on the ground floor of the museum. In view of much additional material, most of which has been recently acquired and mounted, the large room up stairs, formerly used as an Art Gallery, will in the near future be devoted for the display of this material, and will, therefore, soon be open to the general public. A conspicuous object which will be on view in this room will be a mounted skeleton of a Fin-back Whale, 51½ feet long, from the Seven Islands Whaling Station, Gulf of St. Lawrence.

Whilst the direct object of the Fisheries Museum is to point out the value of the Canadian fishery resources, yet incidental to the collection there are also on view a variety of natural objects, embracing fishes, corals, sponges, mollusk shells, etc., from the Bahama Islands, and such form an ornamental feature of the museum.

Models of vessels, weirs, traps, etc., to illustrate the fishing industry, are also on exhibition.

Recently two specimens of octopus or devil fish have been installed, and are to be seen in glass cases, preserved in a solution of formalin. These specimens are from the coast of British Columbia.

OTTAWA FIELD NATURALISTS' CLUB.

PROGRAMME OF WINTER LECTURES.

December 7th, 1915 (Tuesday).—"Wheat Improvement in Canada." Dr. Charles E. Saunders, Dominion Cerealist, Ottawa.

January 11th, 1916 (Tuesday).—"Canadian Folk-tales and Oral Traditions." Mr. C. M. Barbeau, Division of Anthropology, Geological Survey, Ottawa.

January 25th, 1916 (Tuesday).—"The Use of Ornamental Trees and Shrubs." (Illustrated with lantern views). Mr. W. T. Macoun, Dominion Horticulturist, Ottawa.

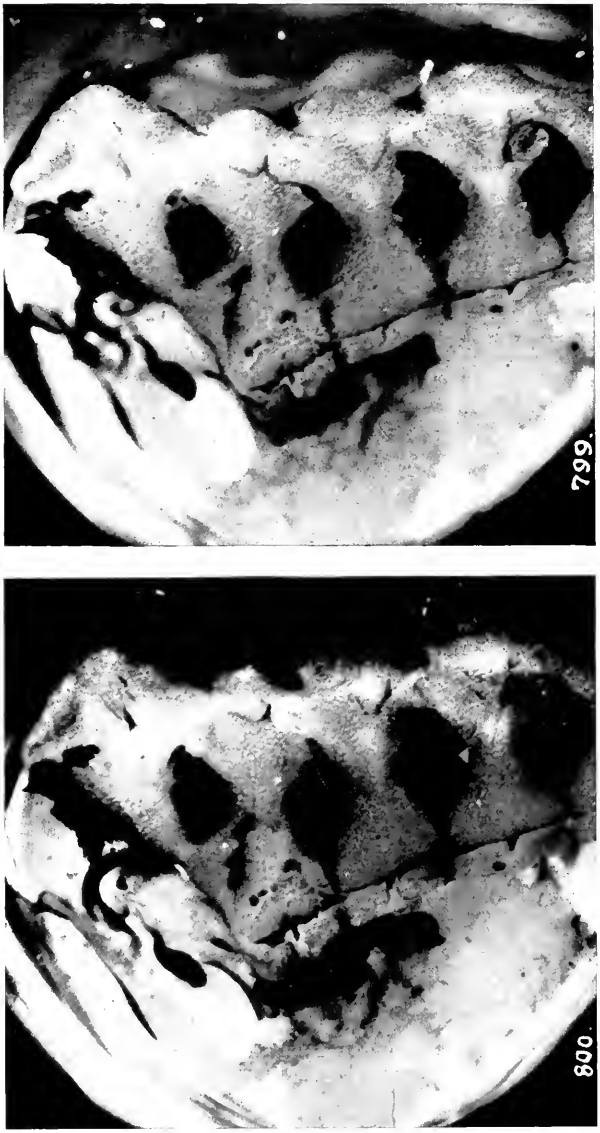
February 8th, 1916 (Tuesday).—"The Formation of the Great Plains." (Illustrated with lantern views.) Mr. D. B. Dowling, Geological Survey, Ottawa.

February 22nd, 1916 (Tuesday).—"The Evolution of Army Sanitation." R. Lorme Gardner, M.D.

March 7th, 1916 (Tuesday).—"The Identification and Nesting Habits of Some of our Common Birds." (Illustrated with specimens and lantern views.) Mr. W. E. Saunders, London, Ontario.

March 21st, 1916 (Tuesday).—Annual Meeting, Exhibits and Brief Addresses by Members.

All the above meetings will be held in the auditorium of the Victoria Memorial Museum.



Benthopecten simplex Perrier, inner portion of arm viewed from the side (marginal removed) x 20 dia. mounted under gum. West Indies 1323 fathoms. Specimen from Museum of Comparative Zoology, Cambridge, Mass. To be viewed through a stereoscope.

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THE USE OF GUM DAMAR IN PALEOHISTOLOGY.

(With Notes on the Genus Benthopecten.)

By George H. Hudson, Plattsburgh, N.Y.

In the study of the detail of opaque objects with the simple or compound microscope, there are some very decided advantages to be obtained through covering the object with some transparent medium that may be used to hold a cover glass in position. The writer has long used a solution of gum damar in benzol for this purpose, and whether the mounting was for temporary observation, for drawing under camera lucida or for photomicrographic work, the results were often of surprising value. For instance, he was enabled by this method to obtain a microphotograph which without retouching was used for the production of a figure (1911, plate VI, fig. 1) showing clearly the sutures surrounding the radianal of *Palaeocrinus striatus*, Bill. Billings stated that he could not make out the sutures in this region, and so left it blank in his published analysis. Bather, in Lancaster's "A Treatise on Zoology," Part III, p. 172, gives an analysis that for this region is in error. How great a help this process is in revealing sutures may also be seen by comparing (1911) figures 27 and 28 on page 252. The writer will here give reasons for the character of the results obtained, present other advantages of the method, and give briefly a description of the process as he uses it.

Suppose that we make the attempt to photograph a printed page through a sheet of ground glass placed directly over it. Much of the incident light will be reflected and scattered. Such of these rays as enter the lens will tend to produce a uniform fog over the whole negative. They are from the ground glass surface and not from the covered paper. That portion of the light which reaches the printed surface cannot return without being subjected to both reflection and refraction on account of the many minute angles presented by the ground surface through which it must pass. This tends to give us numerous overlapping images. If now we will wet, oil or varnish the ground surface we shall cut down its reflecting power to a marked degree. The more nearly alike the indices of refraction of the two transparent media the greater will be the amount of light received by the lens from the covered object, and the sharper will be the negative secured.

In the making of photomicrographs of recent or fossil specimens we have to face conditions very similar to those just described. The innumerable elevated microscopic grains on an ordinarily rough surface catch light on their summits and scatter it as do motes in a sunbeam. This light caught on a photographic plate swamps the detail which lies just under these summits. If our specimen is of calcite a thin outer layer is practically transparent, and with the light scattering reduced, we should get some structural detail just under the surface itself. In this way we secured a view of the sutural canals of *Palaeocrinus striatus*, Bill., and their membranous linings in (1911), plate V, fig. 2, while only the canal coverings were visible where the gum was not used, as in fig. 1 of same plate. Compare also figs. 3 and 4 of this plate. In 1913 (*a*) plates 6 and 7, we illustrated the difference in effect secured when this process was used on very recent material. In same reference, in plates 3 and 4, we also showed the value of being able to penetrate thin sheets of calcite adhering to the surface of a mold. Its value in revealing features just underneath the surface was also shown in 1913 (*a*) plate 10. Sometimes we desire just the surface contours or topography,and we may then add to the reflecting points by using the Williams process (holding the specimen in the combining vapors of ammonia and hydrochloric acid). We may thus avoid all stains or detail in colour and get pure form. If, however, we are to do something more than simple species-making, we should desire the detail due to difference in tone or hue. For instance, in the author's work on Blastoidocrinus and Paleocrinus (1911), he found internal organs outlined with black and partially filled, by respiratory and alimentary processes, with mud now yellow with limonite. The contrast between ossicle and decayed soft tissue could have been reproduced almost as pure white and black, or very like the results obtained in 1913 (*a*), plates 7 and 8.

The better to compare these two methods we may suppose that a dweller on the moon desires to photograph the earth. If he could but find the illuminated hemisphere covered with cloud he could eliminate surface stain and get pure but very general form. On the other hand, could he find a hemisphere free from cloud he could get general form plus many differences due to hue and tone. He would have the deeper, truer surface, the detail of mountain and valley, and a very significant difference between sea, mountain top, Sahara and valley of the Amazon.

The ability by means of this process to reduce the amount of reflection from the microscopic facets of granular surfaces

also allows one to quickly view detail on a surface one is grinding down in order to reveal internal structure.

The paleobotanist is well aware that soft parts may be preserved in fossil forms, for he not only recognises different tissues but sometimes individual cells. For him there is a true paleohistology. The paleozoologist, on the other hand, has hitherto been skeptical as to preservation of soft parts in fossil forms. The marvellous finds of Wolcott, his beautifully preserved annelida and delicate medusa-like holthurians—his reproductions of inner organs and discovery of fossil crustacean livers which still show their characteristic microscopic structure on cross section—these things now compel the paleozoologist to also become a believer. Traces of such soft parts should then be looked for, and the gum mounting is peculiarly adapted to reveal them. By this process the author has been enabled (1913 (*b*) plate IX, fig. 1) to show the remains of muscle fibres still adhering to a well-defined muscle field lying between the right hand fifth and sixth marginals of an arm of *Protopaloeaster narrawayi*.

METHOD.

Portions of the crude gum are selected for their clearness and lack of colour, and dissolved in benzol, to form a liquid that will filter easily. The stock solution should be kept in a glass-stoppered bottle, and a very fine bit of wire, or an insect pin, kept between the stopper and neck of bottle. Portions for use should be allowed to evaporate to such a consistency that the fluid will slowly drop from a glass rod. A regular dropping bottle will be found to be a convenient receptacle for the thicker gum.

The specimen to be treated may be attached to a glass slide by means of a few pellets of beeswax. Care should be taken to have the specimen so oriented that when placed on the stage of the microscope it will receive light at the angle which will best emphasize the features to be observed.

A cover glass of appropriate size and shape is then selected and cleaned, the specimen freed from dust, and a drop of benzol placed on it to free the pores or crevices from air. A few drops of gum solution are now added, and a drop also placed on the cover glass, which is then inverted and placed on the specimen. Additional gum may be easily run under the cover glass, and if bubbles are present a slightly inclined position will allow them to pass to one side and escape. Twenty-four hours or more is usually required to so fix the cover glass that it will not creep when placed on a vertical stage.

In case the specimen has a small or convex surface, the cover glass is first placed on a smaller support, such as the screw

cap of a small vial, and the specimen attached to a slide is inverted over it. This slide is supported by a block or bunch of slides at one end, and a weight placed upon it to hold it in position. After making the proper adjustments the slide is removed, specimen and cover glass treated as before, and the specimen then returned to its inverted position. Gum may now be added from time to time until the gummed area is sufficiently large.

Porous specimens, such as colonies of bryozoa, are best treated by slowly lowering them into a very small volume of the thinner gum solution, thus driving out most of the air.

If it is desired subsequently to shift the position or angle of the cover glass, it is only necessary to add a little fresh gum at the edges and slowly push the cover to the new position. Deep Petrie or covered cylindrical glass dishes will be found useful in housing the mounted specimens and keeping them from dust.

To clean: place in benzol until the gum is dissolved. Rinse with a little clear benzol and let dry. The benzol used for dissolving and rinsing may be saved for subsequent operations.

The plate accompanying this article is introduced to show the value of the process where penetration of recent organic material is desired. The remains of muscle fibers here shown are, in appearance, practically as they appear in many fossil forms, when revealed by the gum process. Note that the first (upper) ambulacral (jaw piece) is supported by a process arising from the second. The oral end of each ambulacral is firmly attached to the adambulacral in advance of it. Between the lowest adambulacral in the figure and the ambulacral at the left of it, there is a dark spot revealing a bit of the buried ambulacro-adambulacral muscle. A contraction of this muscle served to draw the following ambulacral orad. The aborad wings on the oral ends of the ambulacra are so shaped as to allow this motion. While the ambulacra themselves are not truly imbricated, the pairs (adambulacral and following ambulacral) are distinctly so placed. The numbers on the lower edge of stereogram are those of the original negatives.

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1911.—Hudson, G. H. Studies of some early Siluric Pelmatozoa. New York State Museum, Bulletin 149.

1913 (*a*).—Hudson, G. H. The use of the Stereogram in Paleobiology. New York State Museum, Bulletin 164.

1913 (*b*).—Hudson, G. H. Does the type of Protopalaeaster narrawayi present an Oral or Aboral Aspect? The OTTAWA NATURALIST, Vol. XXVII (Oct. 1913) plates VIII-IX.

"GLEANINGS IN FERNLAND."

BY FRANK MORRIS, PETERBOROUGH COLLEGIATE.

Readers of the OTTAWA NATURALIST in 1910 who went "Fern-hunting in Ontario" with me, may remember that our treasure-trove amounted to 37 species. In the course of our wanderings, as I seem to remember, we had good store of pleasure, and surprises not a few; the charm of surroundings possessed by the ferns forming a spell of peculiar potency, our sheaf of fronds, in the getting and the gathering, gave us communion with Nature in some of her most enchanting haunts; while in tedding and garnering, these peaceful trophies of ours were still redolent of the woods, and even to-day keep green and fragrant with glad memories of summer days and rambles.

Manifold sights, unseen or unheeded before, taught us to keep eyes open and wits a-stretch for all the observations and reflections we could make. Some of the inferences that we drew might perhaps provoke inquiry; some of our questions never found an answer: moot points, one or two of which have since cleared themselves up; but nothing had happened till quite lately to justify rushing into print. Since last July, however, it has been my good fortune to add no less than six species to our list, and I believe it would be possible for a careful fern-hunter to extend the record to a grand total of 50, without stepping over the border of old Ontario. All, then, who love these most beautiful forms of living foliage, especially in their native haunts of woodland dell and rocky height, are now invited to "follow the gleam" once more, and dream themselves back into summer this Christmas-tide.

One of my first trips for ferns in the neighbourhood of Peterborough was two or three miles south east into Otonabee, my objective being Burnham's wood. The net result of two days' roaming was 15 species of fern: the Oak and the Bracken, the Silvery Spleenwort and the Lady Fern, the Christmas and the Marsh, the Marginal, Crested and Prickly Shield Ferns, the two Bladder Ferns, the two Onocleas, the Adder's Tongue, and the Virginia Grape Fern. A series of tramps west of the city added 10 more to my local check-list of the fern-flora, viz.: Maidenhair, Narrow-leaved Spleenwort and Goldie's Shield Fern, the New York and the Hay-scented, the three Osmundas, and two more Grape-ferns—the Little and the Ternate. This June, in the intervals of a day's trout fishing south of Bethany, I found another station for the Narrow-leaved Spleenwort and its "*fides Achates*," the Goldie's, besides having the exquisite pleasure of

discovering five or six fine clumps (in full bloom) of the Macrae's or Striped Coral Root orchid.

Just before the month ended I paid a flying visit to my old home, 30 miles south of Peterborough. In the few days available I had to choose which of my ancient cronies to gladden my eyes with, and after a tramp north to the ridges, known locally as the "Rocky Mountains," I determined on one long day near Newtonville, in the tamarack swamp with its surrounding fringe of cedars, where ten years ago I made my first rare find among ferns. In order to give some spice of variety to the coming banquet, I chose the new C.P.R. route, which landed me further west by two miles than I had ever been before. Tramping steadily north for a mile, I found myself in full view of the village, and with a very inviting swamp to the east. Shaking the dust of the road from my feet, I swung myself over to the happier side of the fence, and crossing a couple of pastures soon gained the edge of the swamp; distance often lends enchantment, no doubt, but, fortunately, nearness by no means always brings disillusionment; the stretch of swamp had looked promising even from the road, and when I got a nearer view of it, I felt sure the promise spelled fulfilment. Do you know the delightful sense on a field day of being on the verge of mystery, the edge of some discovery, a sense of expectancy like a hush, that sometimes in the shadow of the woods deepens into awe? That feeling came over me now, and I paused a few moments for it to thrill me through, before advancing into the unknown.

All the details of a long eventful morning are fresh in my memory as I write, but space and time forbid more than a summary. I found, in my very incomplete survey of the swamp, hundreds of plants of the Adder's Tongue, and besides the Virginia and Ternate Grape-ferns, I discovered some six stations for the Little Grape-fern and the Matricary; and also (to my huge delight) two colonies of the Narrow-leaved Beech Fern. In the autumn I found another station for this last, north of Colborne, but except for these two finds, I have never seen the plant so near Lake Ontario. In the afternoon I hurried on to the tamarack swamp, intending to make a round of calls and hob-nob an hour or so, but while in the heart of a huckleberry marsh, gathering a posy of *Arethusa* and *Pogonia*, I was overtaken by drenching rain, which threw a wet blanket on all my plans. To get out of the swamp I had to wade over 100 yards through shrubbery almost waist high, and by the time I gained a corduroy road, flanked with Royal Osmunda, and serving (among other things) to cleave in two a most wonderful colony of *Botrychium simplex* —thousands of plants—I was like a drowned rat. Had it been fine, my plan was to go north to the C.N.R. station of Starkville,

for this would have brought me past at least two of my favorite haunts in Fernland: a roadside colony of the Hay-scented Fern, and a series of grassy slopes and low knolls in a willow swamp, on which in the short turf are scores of enormous plants of *Botrychium ramosum* (Matricary Grape-fern). But it was not to be, and this, one of the earliest of my all-day fern-hunts, proved curiously typical of the whole season: a promise of sunshine that ended in rain.

In the first week of July I had to report for duty in Toronto, and mark matriculation papers in the arid waste of a Varsity lecture room, while ever and anon the wizard's wand of imagination transformed the bare space into a leafy grove with ferns and orchids unfurling their crosiers and gay bannerets about my desk. On July 25th, a drudge no more, I hurried down to the Yonge Street wharf, and got the fresh lake breeze from the upper deck of a Niagara boat to blow the dust and grime of city haunts away, clear my head of cobwebs, and sweeten my heart for the reception once more of the fair works of nature.

From headquarters at Queenston village next day, before 5 a.m., I went up to the Heights on foot, and then along the electric railway track towards Niagara Glen. This meant 16 hours—an all-day revel—among woods and thickets near the stupendous gorge, or down in the moist, shady glen, within sight and sound of the rushing cataract. It was a glorious day, and on the New Jersey Tea blossoms by my path I found, among scores of insect visitors, several strange beetles of the *Leptura* and *Strangalia* genera, besides many little chrysomelians busy at their various food plants. The Glen itself is famous for its flora, and I wandered for hours among the giant growth of Goldie's Shield-fern and Narrow-leaved Spleenwort, past huge boulders wreathed with Walking-leaf and crowned with Polypody, or under cliffs studded with the Purple Cliff-brake and Black Spleenwort. Soon after twelve o'clock I left the last fountain and followed the footpath upstream as far as it went; then I made my way on over loose stones and tangled undergrowth to a grove of hemlock and cedar, where I sat down in silent communion with my favorite denizen of this silvan retreat: a tiny colony of the Ebony Spleenwort. This beautiful fern is far from common, the only other colony of my acquaintance being on the north shore of the Upper Rideau, nearly opposite Sand Island.

It was far on in the afternoon when at last I climbed reluctantly out of this fern paradise by the steep flight of wooden stairs. Having absorbed all the beauties of the wayside on my morning's tramp, I had myself flashed back to Brock's Monu-

ment in the electric trolley car, and thus stole a march of over an hour on fleet-foot Time.

From the Monument I walked along a wooded lane on the edge of the Heights till I reached a fine rich open wood, characteristic of the peninsula in the number of chestnut trees among its larger timber,—not *Aesculus*, the Horse Chestnut, but *Castanea*, what in England we term the Spanish Chestnut—characteristic, too, in its rich clumps of Beard Tongue and Oak-leaved Gerardia, both blooming luxuriantly at this latter end of July. The wood was much dryer than our woods further east, and quite open—compact of sunny glades rather than shady groves. Here, to my great delight, I found five or six colonies of a fern till then new to me, the Broad-leaved Beech fern. The living frond is quite distinct in appearance, especially when still young, from that of the Narrow-leaved; exactly where the difference lies is a little difficult to say; sometimes the two are in shape and proportions identical, but as a rule in the Broad-leaved species, the frond is light yellow-green, and smoother, less hirsute. In writing of it five years ago, I was in error when I said it was common near Owen Sound. The Narrow-leaved species is common near Barrie, but the true home of the Broad-leaved is further south, and in south-western Ontario, Welland, Niagara and other districts, it seems to take the place of the Narrow-leaved form. It is recorded from woods near Campbellford, and evidently prefers limestone. In the Algonquin Park, where Huronian and Laurentian granite abound, the Narrow-leaved Beech-fern luxuriates in every moist woodland hollow, and even subsists in dwarfed form on bare crags and the sides of railway cuttings.

The close of July found me established in lodgings at Owen Sound, with a fern press and piles of blotting paper. I had long wanted to visit this famous fern-centre, but till now had never realized my wishes. It is a beautiful neighbourhood, and (to a fern lover) unique in the Province for some of its plants. The city lies in a great hollow delta, flanked on either side by high limestone cliffs that start from Sydenham Falls, a few miles back of the town, and rapidly diverge in the direction of the Sound. The ferns are almost entirely those peculiar to limestone, but within these limitations it is one of the richest localities in North America.

I got there at 1 p.m., and as soon as I had found my quarters and lunched, I hurried out to explore. Making my way west to the nearest flank of limestone, I followed a steep road to the top of the cliff, and looked about. South of me ran another diverging cliff, with signs of an active lime and cement quarry not far off. Making a slight detour round this to a more sequestered part of the cliff, I got my first surprise. In a stony, half-

wooded pasture near the cliff, where limestone strata cropped out of the grass, were several large plants of the Holly Fern! And some of them actually showing signs of having been chewed by that omnivorous ruminant, the domestic cow. You may well imagine what a rude disillusionment and shock it was to me, when I tell you that the only other time I had seen this fern was 3,000 feet up the steep side of lone Ben Lui, in the Perthshire Grampians. It is abundant in the Rockies, and all through this limestone district, from Collingwood west to Tobermory, at the head of the Bruce Peninsula, it fairly runs riot. While slowly moving along at the foot of the cliff, I found in the course of a few hundred yards, plants of Purple Cliff-brake, Slender Cliff-brake, Black Spleenwort, and finally, to grace the triumph, a fine colony of Green Spleenwort. This fern is almost identical with the Black, except that the stalk is brown at the base, and then green from the upper part of the stipe to the tip of the frond. It is abundant on mountain heights in Wales, North England and Scotland, and I have seen it once in Ontario, growing on deeply shaded limestone ledges by the Speed, near Rockwood. Later, I found it growing abundantly on detached limestone boulders in the woods below Sydenham Falls, near the opposite cliff that flanks the east of the city. By this time it was late in the afternoon, and I returned to headquarters.

Next day I went out to Sydenham Falls, and rambled in the wood below, with its rich, swampy hollows filled with Narrow-leaved and Silvery Spleenworts, Goldie's Fern and Maidenhair, and found (along with more Holly Fern) the treasure for which the district is noted, the far-famed Hart's Tongue. This fern is very plentiful in the west of England, and in parts of Somerset and Devon fairly chokes the wayside ditches and hedgerows. But on the American continent it is extremely rare, Woodstock in New Brunswick, Central New York and Tennessee providing the only known stations for it outside of Ontario. It belongs to the talus at the foot of limestone cliffs, or to moist shady situations in limestone districts; at one time it was apparently more generally distributed, and specimens are recorded from Niagara, as well as many widely divergent points of Bruce and Grey counties. Among the ferns of temperate regions, the Hart's Tongue is almost unique in form, the frond being simple and entire—like a long, narrow dock leaf—but the surface, like that of the Holly Fern, is smooth and glossy. Near the Sydenham Falls this rarity proved very abundant, both below the cataract and above, the crevices of the limestone floor throughout the extensive woods being filled with plants of this and the Holly Fern. The growth of the fronds below the falls was very luxuriant, sometimes from 24 to 30 inches. Before

my stay ended I found many other stations for the Hart's Tongue, several miles west of Owen Sound, also on the Rocky Saugeen, near Durham and close to Wiarton. Had this ended my successes I should have been well satisfied. But a delightful surprise was still in store for me. Prof. Macoun's catalogue of 1890 mentions for many of the ferns the name of Mrs. Roy, of Roystone Park, Owen Sound. Among the late Mrs. Roy's recorded finds is the Male Fern, "at the foot of cliffs behind Roystone, and under the same line of cliffs some ten miles up the coast." Finding that Roystone Park was a farm, I called on the tenant, and was directed across hay fields, past the shooting butts, to the cliffs in question. Not five minutes' search—though the record is probably 30 years old—revealed the plant, its identity being all the less questionable because I had so often gathered its fronds in England, Wales and Scotland. But so rare is it in our part of Canada, that I had never seen it at all on this continent, and indeed there is no other station for it known in Ontario. Not only was it abundant at the back of Roystone, but two or three plants were found in sheltered crannies of talus on the adjoining lot. As soon as opportunity served, I made an expedition by buggy up the coast as far as Kemble, and back to the cliffs behind this village. Here the Male Fern was again discovered, both below the cliff and in the woods above, robust, luxuriant and plentiful, occasionally hybridising with its neighbour and congener, the Marginal Shield Fern. But how is one to account for such a limited range in the Province? Two stations about 10 miles apart, with a diameter, the one, of some 50 yards, the other, of perhaps half a mile, in the single county of Grey and nowhere else.

On August the 10th my wife and I had arranged to set up our usual summer tent on Cache Lake, in the Algonquin Park. Shortly before that date I made a trip from Owen Sound to Durham, in the hope of finding *Pellaea densa*, the extremely rare Cliff-brake discovered there by Dr. H. M. Ami some years ago. Unfortunately the date fixed for our trip proved the day of the great gale and rainstorm over Lake Ontario, and the west of the Province. It had already begun to rain when Durham was reached, and conditions grew rapidly worse for the rest of the stay. Bad weather and lack of time combined to make three proposed trips impossible, two from Owen Sound and the third from Utterson, on the way up to the Algonquin Park.

To be continued.

THE CURIOUS EGG OF THE HAGFISH (*MYXINE*).

BY PROFESSOR EDWARD E. PRINCE, DOMINION COMMISSIONER OF FISHERIES, OTTAWA.

In classifying fishes, scientific authorities have always placed lowest on the list the hagfishes and lampreys. Indeed, the well-known writer on fishes, William Swainson, in his excellent book, the "Classification of Fishes," London, 1838, goes so far as to claim, regarding the hagfish (*Myxine*), that "all authors agree in placing it near the worms." These fish are, of course, far removed from the worms; but with the exception of the Lancelet (*Branchiostoma* or *Amphioxus*), they are the lowest and most rudimentary of vertebrate animals. The late Dr. Theodore Gill and others concluded that they ought to be separated from the true fishes, and placed in a separate class, owing to their many rudimentary structural features. Thus, they have no paired fins, no scales, no segmented backbone, (the jelly-like notochord persists), no complete skull, no spleen, no pancreas, a very simple brain and nervous system, a peculiar series of gill-pockets instead of typical filamentous gills, and their whole form and structure are in contrast with the true fishes, and higher vertebrates generally. It is still a debated question whether or not, in this peculiar group, the features referred to are original and primitive or degraded and degenerate. In all, the mouth is round and adapted for sucking, not biting. The lamprey attacks fishes, adhering to the outside with its mouth, which it uses like a vacuum sucker, and removes flesh and blood with its rasp-like horny teeth. The hagfish bores its way into fishes, living or dead, and eats out the interior, leaving little more than the skin and bones of its victim. Fishermen find cod and haddock hanging to their hooks which have been destroyed in this way. Moreover, the hagfish has a remarkable device for protecting itself from enemies. The skin is provided with slime glands and pores, which enable it, at will, to pour out a great quantity of tenacious ropy slime, in which it envelops itself. I have seen a specimen, the size of a medium-size eel, fill a bucket with this gummy grey substance, exuded from the slime pores. There are not many species of hagfishes, and they are very local in their occurrence. Thus, *Myxine glutinosa* is well known to abound off St. Abb's Head on the Scottish coast, but is rather rare in other areas. Our Canadian hagfish so closely resembles the British form that both were included in the same species, though our western form is now known as *Myxine limosa*.

Many years ago, when I was the Naturalist at the Scottish Marine Station, St. Andrews, I paid special attention to *Myxine*, for the reason that no one had ever seen a male specimen, and very little was known about its eggs. One egg only was known to scientific men, so far as I am aware, viz., a single specimen in the Bergen Museum, Norway. No doubt it was the study of this unique and valuable specimen which enabled Professor Allen Thomson, of Glasgow, to describe and figure the hagfish's egg in his article "Ovum," in Todd and Bowman's Encyclopædia of Anatomy. I dissected many hundreds of specimens and found plenty of eggs, yellowish brown, very hard to the touch, and about the size of a small bean. Each egg was narrow at the two ends, as Professor Thomson had described, but I never found the bunch of hooks at both apices, which appeared in his description and figure. Carl Claus, in his "Zoology," says that "the deposited egg is recognisable by the filaments attached to both poles, and which probably serve to fix it to sea weeds," while Professor Arthur Thomson, of Aberdeen (Outlines of Zoology, 1892) states that "each has an oval horny case, with knobbed processes at each end. By these they become entangled together." In Dr. Lenn's "Synopsis der Thierkunde," Hanover, 1883, Bd. I., Professor Hubert Ludwig describes the "horny shell as provided at both ends with a long bunch of thread-like hooks." This bunch of threads or filaments is evidently pushed out after the eggs are deposited, for I saw no trace of them in the large number of eggs, many thousands, which I removed from ripe hagfish in Scotland. I may add that I found no males, and this was due to a fact, one of the most astonishing in the whole field of zoology, viz., that only the very small specimens are males, and, as they grow bigger, each changes its sex, and, later in life, produces not sperms but eggs. This sex-transformation, first discovered by Mr. J. T. Cunningham, and by the famous Dr. Nansen, is called "protandry."

It was with very great delight that I found in July last some of these exceedingly rare objects, the ripe eggs of *Myxine*, at the Biological Station, St. Andrews, N.B. Professor Philip Cox, of Fredericton, who was engaged in scientific researches at the station, had placed them in a sea-water tank, under a constant circulation of water, with the hope that they might hatch out. The larval hagfish has never been seen by any zoologist, and a description of it would be of the profoundest scientific interest. After several weeks the eggs died and began to show signs of decay, and before their condition was too advanced I made a study of their external features. In view of my work on *Myxine* in Scotland, I felt a special interest in ex-

amining the structure of these rare specimens. Like the Scottish examples, they were over half an inch in length, oval in shape, and of a whitish yellow colour. The colour is due to the creamy yoke inside the horny shell, for the shell is very transparent, and somewhat thickened at the apices. Each end or apex of the egg rose into a protruding mound, from which projected forty or fifty slender threads, about a fifth of an inch long. At its root each thread was enlarged and outspread, but diminished distally and became slender, until near the free tip, it enlarged again and expanded in the flattened form of a hooked head. They cannot be described simply as "thread-shaped hooks," to use Ludwig's phrase, or as "knobbed processes," according to Professor Thomson's description. They vary so much in shape that hardly two are alike. Most of them may be likened to a bent and half-closed hand, the wrist very slender and the fingers much flattened. Inside each finger tip, a cushion or pad studded with short but very sharp points occurs. Some of the expanded hands or heads possess two fingers only, others have three, but a great many have four, and a few seem to possess five. Usually the fingers are curved over as described, but many are bent in various ways, some turned up, or twisted sideways, just as the fingers of the hand may be variously contorted. The whole of the flattened edge of the "finger tip" may in some cases be studded with minute denticles or teeth; indeed these toothed surfaces are so variously turned that they grasp or cling to anything and everything which comes in contact with them. When once hooked to any object they are as difficult to detach as some of the familiar seeds which cling to one's clothing when walking through the bush. The eggs were entangled with each other when I first examined them, and they could be separated only at the risk of tearing off some of the hooked threads.

These rare and interesting specimens were procured by a Bay of Fundy fisherman, attached to each other, and to the rope or line of a baited trawl set for pollack, between Campbell's Island and the Wolves, New Brunswick, where the depth ranges from 40 to 50 and, in some places, 70 fathoms. The parent fish are said to burrow in the mud or sand at depths of 40 to 300 fathoms, and to protrude the snout only, so that they are rarely procured, excepting when they emerge and swim about in search of prey. As already stated, they bore into hooked cod and haddock, passing eel-like into the abdominal cavity of the fish, or at times they suck in the baited hook set for superior fish, and the hook is swallowed so far down the gullet that the fishermen usually cut off the head of the hagfish, to make them disgorge the hook being practically impossible.

A SUGGESTIVE NOTE AS TO WHAT MIGHT BE BROUGHT TO LIGHT ABOUT THE PADDLEFISH THROUGH DEEP LAKE DREDGING.*

BY ANDREW HALKETT.

One of the most remarkable things in modern biological research concerns what has been brought to light through deep sea dredging. Many new species of fishes, often grotesque in appearance, constructed so as to resist pressure, and many of them furnished with phosphorescent organs enabling them to see in the darkness of the abyss, have through such researches been added to the list. An instance of the kind from our own marine waters relates to the only specimen known of *Raja abyssicola*—a male obtained at a depth to 1,588 fathoms from off the coast of the Queen Charlotte Islands, British Columbia. Upon this fish, in my "Check List of the Fishes of the Dominion of Canada and Newfoundland," I bestowed the vernacular name of Deep Sea Ray; and in a foot note, here quoted from that work, I drew attention to that remarkable find:—

"No ray was ever found at any such a depth as this before. A ray from a depth of 565 fathoms is included in the list of deepsea fishes obtained by the dredgings of the 'Challenger' (Günther), and '*R. mamillidens*', a uniform jet-black species, has been obtained from a depth of 597 fathoms in the Bay of Bengal' (Bridge), but as far as available records show, none have been obtained at a greater depth than some 600 fathoms except this one."

Now, it has occurred to me, for reasons presently to be pointed out, that possibly something concerns the distribution of the Paddlefish (*Polyodon spathula*), which as yet is unknown. This singular fish still exists in plenty in the Mississippi Valley, and in waters of the southern United States, besides which, at exceedingly rare intervals, it has been found in waters of the Great Lakes system, its records, as again quoted from my "Check List," being these:—

"Exceedingly rare in Canada—the following appearing to be its records: Lake Huron, near Sarnia, Ontario (two specimens); Spanish River, District of Sudbury (one specimen); Lake Helen, Nipigon River (one specimen); Lake Erie (if from the Canadian side of the lake—one specimen): plentiful in the Mississippi valley and southern United States: also recorded from Ohio River (LeSueur, 1817, as *Platirostra eden-*

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tula; and Rafinesque, 1820, as *Acipenser lagenarius*); and from Lake Ontario (Rafinesque, 1820, as *Proceros vittatus*)."

Supplementing its records, a quotation from Dr. Prince, given as a foot note in the Check List, is introduced here:—

"Old fishermen near Point Edward, on the Lambton county shore, vaguely refer to other specimens occurring in Lake Huron."

The form and structure of the paddle-fish determine it to be a species whose habitat is at the bed of the rivers or lakes where ordinarily it occurs. The fusiform body is little compressed, and its long spatulate and somewhat flexible blade, preceding the rest of the head, enables it to scoop among the mud or ooze in the obtaining of its food. It is probably for this reason that it has seldom been found in lakes or rivers tributory to such deep lakes as Lakes Superior and Huron are, and the inference is that it normally remains in the depths; and whilst it is true that individuals of this fish have been found with ripe eggs in Kentucky, in the month of May, and that the paddle-fish was then swimming up stream, so that it has been supposed to spawn in bayous along the river, yet its spawning grounds do not appear to have been located; besides which the fry are entirely unknown, and the young of the paddle-fish, even where it occurs plentifully in the United States, has never been found of a length less than about six inches.

The idea that the paddle-fish normally remains in the depths, or even spawns there, is perhaps strengthened by what is known concerning the structure and habits of its only immediate ally, the fish known as *Psephurus gladius* of great rivers of China, such as the Hoangho and Yang-tse-Kiang. That fish, which is said to attain the great length of twenty feet, has a rostrum of conical shape instead of a spatulate blade like that of the paddle-fish, but this organ also serves the purpose of scooping in the mud; and it may therefore readily be seen how well it is equipped for living at the beds of those great rivers in China, which appear locally to vary in their character from clear and sparkling to turbid and muddy.

This suggestive note claims to be no more than a hypothesis, but the idea seemed to commend itself to Dr. Garman, the ichthyologist of the Cambridge, Mass., University, and to Dr. Hussakof, the palaeontologist of the American Museum of Natural History, New York, to whom I mentioned it; and these gentlemen seemed to share my opinion that there is no saying what deep lake dredging, carried on after the manner of deep sea dredging, which has been so prolific in what it has yielded, might bring to light concerning the paddle-fish which otherwise must remain unknown.

BOOK NOTICE.

A LIST OF CANADIAN MINERAL OCCURENCES. By R. A. A. JOHNSTON, OTTAWA, 1915, GEOLOGICAL SURVEY OF CANADA.

In view of the great advance of the mineral industry of Canada in recent years, a complete list of its minerals and their localities has been much desired. Such a list now appears among the publications of the Geological Survey, and the compiler, Mr. R. A. A. Johnston, mineralogist of the Geological Survey, is to be congratulated upon the thoroughness of the work.

As is usual in such lists, the work is divided into two parts, the first of which discusses the minerals and indicates the localities where each mineral is found, while the second part contains a list of localities and indicates the minerals to be found in each place.

In view of the rapid development of the country involving changes in the boundaries of districts, it was hardly to be expected that the mineral occurrences should always be listed under the districts as they exist to-day. This difficulty is illustrated by the District of Nipissing, which in recent years has been sub-divided so that portions of the original district are now contained in four districts. In a few instances Mr. Johnston has failed to make the necessary readjustments, particularly in regard to Algoma and Kenora districts. There are some errors as to the chemical composition of minerals, as illustrated by breithauptite, which is an antimonide of nickel rather than of iron.

Unfortunately the localities recorded by Dr. J. J. Bigsby and by Dr. Samuel Robinson have been largely ignored, though some of Bigsby's localities are mentioned. In some cases proper references are given, while in others this has not been done. In the case of beryl from Rainy Lake, the reference is to a Geological Survey Report, but in that publication Dr. Bigsby is given credit for the locality. Interesting omissions are the staurolite on La Croix or Namaycan River, the jasper on Gunflint Lake, celestite from Lake Simcoe, and selenite from Manitoulin Island, which were mentioned by Dr. Bigsby (American Journal of Science, vol. 8, p. 60 et seq.)

In spite of these minor defects, this book is of a character in press work, plan and contents to take its place besides such noted works as Robinson's American Mineral Localities and Dana's Catalogue of American Localities of Minerals.

T. L. WALKER.

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FOSSIL COLLECTING.*

By E. M. Kindle.

Introduction.

Away back in the mists of antiquity, so long ago that no record of him survives, "some pastoral savage, more reflective and less practical than his brethren," made the first collection of fossils and placed them in front of his tepee. From the time of this first unrecorded collector to the present, most thoughtful and reflective men have some time or other felt the spell of the past which the discovery of the fossil remains of extinct animals casts over the mind, and have become temporarily at least collectors of fossils. Even statesmen burdened with the affairs of nations have found time to collect fossils. It is related of Thomas Jefferson that when he journeyed on horseback from his Virginia home to Philadelphia to be inaugurated President of the United States, he carried with him in his saddle bags some fossils which he wished to submit to the Philadelphia savants.

From the rude mound of fossils so often met with in the farm-house front yard, or the mantlepiece collection in the mountain cabin, to the great collections of our large geological museums, is a long step, but the former may be regarded as the prototypes of the latter. The mantlepiece and front yard collections usually have slight value because no record of the exact locality of the several specimens has been preserved. The museum collection should show not only the geographical source of the fossils but their geological horizon as well. In other words the fossil exhibits of a properly arranged museum show the specimens in both their space and time relations. The fossil exhibits of large museums like the British Museum show the ancient life of the world in epitome. The educational value of the great museums of geology depends largely upon the extent to which the visitor has prepared himself to understand their message. There is no preparation for receiving the knowledge which museums and books on geology have

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to offer which will compare with the use of the hammer and chisel in collecting fossils from nature's own museum. It is the object of this paper to encourage the reader to collect fossils in such a way that their scientific value will not be impaired or destroyed, as often happens through the use of improper methods.

COLLECTING METHODS.*

In collecting fossils a rather heavy hammer is indispensible. Many palaeontologists prefer the ordinary bricklayer's hammer, with its long broad blade, which is very effective in splitting open blocks of rock and in digging in shales. A small chisel is frequently useful, and a note book should be carried. A tube of glue and a small vial of hydrochloric acid are valuable adjuncts to the collector's outfit. A bag or basket with a supply of old newspapers or tissue paper for wrapping specimens, together with a substantial lunch, complete the essential elements of the collector's outfit for a day in the field.

There is no royal road to finding fossils. But success usually comes to the collector who prostrates himself on the ledges and searches the beds foot by foot as he crawls over the surface. Beds which are nearly or quite barren of fossils are often separated by comparatively thin bands in which fossils abound. Much patience and close scrutiny are often required to detect these rich beds. In this work haste has no place, and keen eyesight plays the same role in finding fossil animals that it does in hunting living ones. Sometimes the fossils are composed of harder material than the enclosing rock, and stand out in strong relief on the surface of the ledge. In such cases they are easily found. But more frequently the only clue to the presence of fossils is the indistinct outline on the surface of the rock of the cross section of fossil shells, which have little resemblance to the specimens as they appear after removal from the matrix. Where the fossils occur in shales they are often found lying loose on the surface, having been set free by weathering.

If the collector wishes the fossils which he finds to have scientific value he must keep a systematic record of the exact geographic locality from which each lot comes. This is easily done by keeping a numbered record in a note book of the collecting stations, and attaching a corresponding number to each lot of fossils collected. It should be the practice of the collector or field geologist to prepare for each specimen or group of specimens a field label before leaving the collecting station, giving:

*No attempt is made here to discuss methods of collecting vertebrate fossils.

(*a*) the serial field number assigned to it, (*b*) a precise definition of the locality from which the specimen was taken, (*c*) name and formation, if known, (*d*) the relationship to each other of the beds from which different lots of fossils have been taken—best shown by reference to a section in the note book of the beds collected from—(*e*) name of collector, (*f*) date: day, month and year; (*g*) number and page of field note book in which the section or bed furnishing the collection is described. The serial field number placed on the label should appear in the note book in connection with the description of the part of the section or bed from which the specimen was obtained. All specimens taken from one bed in one locality, whether representing one or more species or individuals, should be given the same number and label. Fossils collected from different beds, even when only a few feet apart, should as a rule be given distinctive labels, and specimens taken from talus slopes or boulders should be kept separate from those found in place. As a rule, each individual fossil should be wrapped separately in newspaper or tissue paper at the locality where collected. Where the specimens are very fragile, like the shells of the post glacial clays of the Ottawa valley, for example, cotton batting and small vials or pasteboard boxes are required to protect the specimens from breaking. A single label will suffice for all the specimens from one collecting station if heavy manilla paper is used in making them into a secure package. This should be numbered on the outside in addition to having a label inside. Abundant material should be obtained wherever circumstances permit.

The preservation of both the moulds and casts of a fossil where the original material of the fossil has been removed is most important. All of the parts of a broken specimen should be carefully preserved and kept together. A tube of glue for repairing broken specimens should always be included in the collector's outfit. The collector should bear in mind the fact that his collection of fossils may be of much value in furnishing new data regarding the stratigraphic range and geographic distribution of species.

In collecting from a section where a considerable thickness of rock, with several fossiliferous beds, is exposed, the section should be measured as collecting proceeds. The section may be given a number, and each subdivision of it designated by a letter of the alphabet, the several lots of fossils from the different levels being marked with their respective letters. Detailed information concerning the physical and chemical characteristics of each subdivision of the section should be recorded. If the section studied is exposed along the sides of a gorge, a

simple method of measuring the beds collected from is to cut a light pole 10 or 15 feet in length and mark it with bands of peeled bark at intervals of 5 feet, one of the 5-foot subdivisions being marked off into 1-foot spaces. The section can then be measured by holding the pole at right angles to the bedding and using it yard-stick fashion. In the case of horizontal beds exposed along the slope of a hill or mountain-side, the aneroid barometer or a Locke's hand level is generally used. When the beds are inclined, neither of these instruments will suffice. The method used by Blackwelder for measuring sections of inclined strata is a modification of the Walcott method, and includes the use of a clinometer compass attached to a rod 5 feet 1 inch in length. Walcott describes this method as follows:—

"The strata, in section to be measured, were inclined to the east 40°. Placing the lower end of the rod at the base of the section, I inclined the rod towards the edges of, and at a right angle to, the line of the dip of the strata, which was indicated by the needle of the clinometer standing at 40°. Then, looking through the compass sights the point where the line of sight touched the ground was marked as the next station for the rod, and on this station the base of the rod was placed for the second sight, which was made exactly as in the first instance, and so on to the end of the section. Frequent trials were made, at the exposed outcrops, to determine the angle of dip of the strata, so that the rod might be held at a right angle to it."

The application of this method is clearly shown by Blackwelder's figure which is given below.

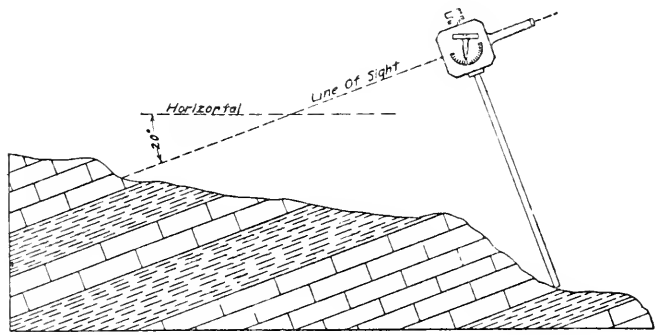

Fig. 1. Diagram illustrating the measurement of strata by means of a spirit level clinometer and sighting arm attached to a five-foot rod. (After Blackwelder.)

In case the collector is not provided with a clinometer compass, fairly accurate measurement of a section of inclined beds may be made with the aid of a roughly improvised T-

shaped square. The long arm should be of a known length. The T-shaped staff when used is held vertical to the surface of the inclined beds to be measured, while the eye sights along the short arm in a direction at right angles to the line of strike to a point on the ground which will be the next station base for the staff. Each station occupied will have an elevation above the preceding one in the section corresponding to the length of the staff.

OBJECTS SOUGHT.

Brief consideration of some of the purposes for which fossils are collected will indicate to what extent the methods outlined in the preceding pages are essential in different classes of work, and whether they may be expanded or shortened in connection with collecting which has different objects in view.

There is probably no other branch of natural history collecting which may lead to the solution of such a variety of problems as the collecting of fossils. The problems of the the palaeontologist include within their range those of structural geology, the restoration of ancient physical geographies, and the problem of evolution. Whatever the purpose of the collector may be, however, the precise location of the rocks furnishing the specimens and their relationship to other beds in the locality should always appear on the locality label.

During an earlier stage in the development of palaeontology the discovery of new species was the ultima thule of the collector. This is still an important and legitimate object of the collector's work, for many thousands of species as yet unknown to science doubtless remain to be discovered, described and systematically placed in the immense catalogue of the earth's extinct life. Many collectors and palaeontologists of an earlier generation were content to refer their new species to the Lower Carboniferous, the Upper Silurian, or to a major division of whatever system they were derived from. Our present ideal, though not always attained, is to indicate the place of a new species in the section where discovered with the utmost exactness. This kind of painstaking care on the part of the collector and the author of a new species will ultimately, if not at once, make possible its reference to its proper place in the general geological time scale with a precision comparable to that with which the railway engineer refers a particular station on his line to its exact position above sea level. This tendency toward greater refinement and precision in the methods of the palaeontologist is one of the factors which has lead to an extensive revision and expansion of formational nomenclature. The description of a new species, important as it is, can at present be

regarded as only one of several objects to be attained through the collection and study of fossils. The description of fossils is in fact only the first step in their use for the purpose of correlation in palaeogeography, attacking the far-reaching problems of evolution.

It is worth while recalling here that Wm. Smith, the father of stratigraphic palaeontology, made excellent use of certain fossils even before they were named in tracing the formations which they characterized over a great part of England. Smith's discovery of the value of fossils in correlation enabled him to prepare the first geological map of which we have any record. The fundamental importance of fossils to the geologist in enabling him to recognize or identify the same beds in different areas has been universally recognized since the days of Wm. Smith. It is for this purpose that the fossil collections of the field geologist are generally made. They necessarily often represent a great many localities, and frequently a small number of specimens from the individual localities which may or may not be as large as the conditions incident to the work will permit, and the preparation of stratigraphic sections in connection with them is most important.

Progress in stratigraphic palaeontology in recent years has been largely along the line of increasing our knowledge of the range and distribution of faunas, and of the individual species composing them. The important bearing of this class of knowledge upon questions concerning the evolution and dispersal of faunas is evident. Its interest to the general geologist lies chiefly in the fact that the accuracy with which fossils can be used in correlation is in direct proportion to the completeness of our knowledge of their range. The presence in certain areas of recurrent faunas or faunas which re-appear at higher levels after completely disappearing for a considerable interval from a series of beds, sometimes introduces for particular regions a new and difficult factor into the use of fossils in correlation until the inter-relations of the recurrent with the associated faunas has been worked out. Such areas require an amount of collecting and careful comparison of faunas and sections which would be unnecessary in ordinary regions. The recurrence in the Devonian section of southern New York of *Tropidoleptus carinatus* in the Chemung, 2,000 feet above its disappearance at the top of the Hamilton formation, is an example of this phenomenon.* (See fig. 2.) We learn from it and similar examples that the disappearance of a fossil from a section may not mean that it has become extinct, but that it has changed its habitat.

*E. M. Kindle, Jour. Geol., vol. XIX, pp. 346-347, 1911.

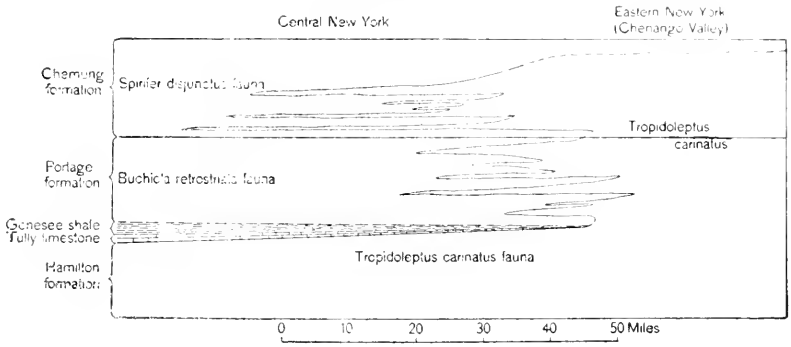

Fig. 2. A diagrammatic east-west cross-section of the Middle and Upper Devonian of southern New York, showing the relations of *Tropidoleptus carinatus* to the western faunas during Portage and Chemung time. Total thickness of the section is about 2,700 feet.

The presence of a recurrent Hamilton species like *Tropidoleptus carinatus* in the Chemung fauna of southern New York involves its withdrawal from at least the major part of the New York area at the end of Hamilton sedimentation to some part of the sea furnishing a more congenial environment than that which accompanied Genesee and Portage sedimentation. In the newly adopted habitat, or in a small portion of the old one, it found a haven where those conditions of the Hamilton sea which were essential to its life were maintained throughout Genesee and Portage time. With the initiation of Chemung sedimentation *T. carinatus* extended its habitat back again over a part of the area which it had previously occupied, as shown in fig. 2.

These recurrent faunas furnish convincing evidence of the existence during the Palaeozoic of distinct faunal provinces. It seems safe to conclude that the recurrence of a fauna has been due to the oscillation or migration of the factors which conditioned its geographic distribution.

Palaeogeography is a field of knowledge to the extension of which the collection of fossils contributes most important data. Collections which will contribute most to this subject are those concerning which the collector has supplied, in addition to the data already mentioned under methods of collecting, complete data regarding the physical features of the rocks in which they are found. This physical data should indicate very fully the nature of the sediments associated with individual faunules, as to composition, texture, hardness and colour. The collector should note the character of the lamination, whether in thin or thick sheets or variable, and whether uniform or alternating composition characterizes the beds. The presence or absence of cross bedding, ripple marks, current marks and

wave marks should be noted with care. The direction of these features when successive beds show a degree of uniformity should be noted. Particular attention should be given to observing the amplitude of ripple marks, and whether they are symmetrical or asymmetrical. A great predominance of one or the other type of ripple mark may, as I have elsewhere shown,* afford conclusive evidence regarding the continental or marine origin of a set of beds. Mud cracks, rain drop impressions, and other features characteristic of the intertidal zone, should be looked for with the greatest care by the collector.

It is true that the literature treating of fossils seldom gives much data of this kind. The palaeogeographer in making use of fossils in drawing the boundaries of ancient seas, has had but little data of this class to curb his imagination or stay his hand. Structural features of comparatively recent origin have too often assumed for him a significance which they did not possess, while the really significant features indicating proximity to a shore line were neglected because unrecorded by palaeontologists and geologists.

The observation and record of the physical characters which have just been enumerated are of the utmost importance in connection with the collection of certain classes of fossils, like the eurypterids and certain fishes whose normal habitat is still a subject of discussion. It is to the careful study of the physical features of the beds enclosing such fossils that we must look for the solution of the problems relating to the character of their habitat.

Zoology gave to the world the hypothesis of evolution, but its demonstration and its actual history is the province of palaeontology. It is the privilege of the collector of fossils to assist in discovering the actual course which the steady upward trend of life has followed through the geologic ages. For the study of problems relating to orthogenesis, saltation and other elements in evolution, fossils offer a great advantage over living animals and plants. The time element in the latter is an undetermined factor, while in the geological section its value may be determined. Zoologists are too little acquainted with the excellent results which have been attained in this field through the work of such men as Waagen on mutation, Hyatt on the cephalopods, and Beecher on the evolution of spines. Only very well preserved material can be utilized in studies of this class. The collector of perfectly preserved fossils derives an added pleasure from his work through knowing that it may be of value in contributing to the solution of some of the most fundamental problems of the organic world.

*Recent and Fossil Ripple Marks (in Press).

"GLEANINGS IN FERNLAND."

BY FRANK MORRIS, PETERBOROUGH CGLLEGIATE.

(*Continued from page* 110.)

From our summer schedule of trips, the first place to suffer a "washout" this wet season was the Bruce Peninsula between Wiarton and Tobermory; the next was Manitoulin Island, where the Parsley Fern has been recorded; and the third was the north margin of Twin Lake, near Port Sydney. Here grows a magnificent colony of the Virginia Chain Fern (and with it the handsome rein-orchid *Habenaria blephariglottis*). The Woodwardia I have never found except here, and, as you may remember from our "field day" in 1910, the sight of it in its ordered ranks made a profound impression. The fronds seemed all standing to attention, and facing one way out over the "mud lake" from their beds of sphagnum, buckbeans, cranberry, and plants of the heath family. I suggested that sunlight was the key to the mystery, for it certainly was mysterious to see those silent forms standing in the midst of an open space in the heart of forest and swamp, as though all endowed with one conscious purpose, and obeying some unseen power: "Eyes front!" and every member of every rank stood focused to the same point in space. This was one of the "moot questions" referred to before. The fern is peculiarly fond of moisture, often growing submerged in water, and spreading, by very long runners under the surface. Just as the fruiting pinnae of the Crested Fern are twisted into a new plane at right angles to the rhachis in order to protect the sporangia from the sun's rays, so where there are not shrubs enough to throw healing shadows for a colony of Virginia Chain Fern, every stalk will be found twisted on the underground runner so as to face due south to the sun at its zenith; by keeping "eyes front" to the foe, the fronds preserve the spore-cases from parching and evaporation. This was first observed by D. C. Eaton, author of "Ferns of North America."

A second moot point was the determination of one of the smaller species of *Botrychium*. This was a plant first found by me under cedars fringing the tamarack swamp near Newtonville. The first colony was discovered west of the corduroy road that leads to Starkville. Since then I have found the plant—in hundreds—at nearly a dozen points, over a space whose diameter is perhaps 1½ miles. I have also found it in the neighbourhood of the Rideau, of Stony Lake, of Peterborough, and of Garden Hill. Always under cedars in rich swamps, usually in thin moss, occasionally in sphagnum, often

in detritus of cedar and spruce. It has always been, to my mind, a form of *B. simplex* peculiar to moist, shady situations. The plant ranges from 2 or 3 to 6 or 8 inches in height. The barren frond consists of from one to four or five pairs of lunate sessile lobes, opposite to alternate, and terminates in a notched lobe. This barren leaf is decidedly fleshy; apparently the plant seldom lives more than three or four seasons, for though in a colony I have found hundreds of plants, the vast majority appear to have sprung recently from wind-blown spores, and to be not more than two years old. Very rarely large plants are found with four or five pairs of lobes on the barren frond, and, still more rarely, in such patriarchs of the colony the basal pair of lobes show a tendency to become compound by branching out into similar lobes. My first specimens were sent to the late Prof. Fletcher, in Ottawa. He inclined to think them *B. matricariae* (*ramosum*), but was not familiar with these smaller members of the genus, so handed them over to Prof. Macoun. He also thought them *B. matricariae*.

Next season I found the genuine *B. matricariae* by hundreds in the Algonquin Park, but remained convinced that my earlier find was *B. simplex*. Later on I found the strange fern in the Rideau district, and still never wavered, though I was unable to get more than a doubtful assent to my view from other collectors in the Province. Then I sent specimens of both ferns to W. N. Clute, of the Fern Bulletin, but to my chagrin he too pronounced the stranger a variety of the Matricary Fern; luck was against me, it seemed the wind simply *wouldn't* blow my way. At last (more than four years ago) I sent specimens to Prof. Robinson, of the Asa Gray Herbarium, and waited for nearly a year. Then I wrote again, and heard that my first consignment had gone astray or been lost. By this time I was desperate, but made my last venture with a parcel of specimens to Harvard, from five or six different localities. My Argosy came to port safely with its precious cargo, and I got word that every specimen forwarded in the half-dozen sheets of plants, was undoubtedly *B. simplex*.

If the last week in Owen Sound was wet, our three weeks under canvas on Birch Island were to prove little better. But we managed to snatch a few days and half days out of the deluge and salvage them to some profit. We gathered blackberries and raspberries galore; we caught lake trout and black bass, we made flapjacks and jam, and ate them too; and every now and then we paddled our own canoe (a new one) to various portages and explored the trails. Once I made my way to the back of "Skymount" and gathered in, from a certain trough of the hardwoods that I had found years before, specimens of

Botrychium ramosum and *Botrychium lanceolatum*, and on the return trip (for curiosity) *Botrychium Virginianum* and *Botrychium ternatum*. Another day, after gathering plants of *Aspidium fragrans* from a cliff overlooking the lumber slide on the Madawaska, I crossed the railway and explored the woods for shaded cliffs. Here I stumbled on a veritable El Dorado, for on three successive outcrops of rock in the depths of the forest, I found clump after clump of silvery green fronds—the Fragrant Shield Fern in all its aromatic loveliness. Passing out from the woods to the cliff exposed at the lake shore, I found dense masses of *Woodsia ilvensis*, but no more *Aspidium fragrans*.

These two or three trips sent my enthusiasm up to fever heat, and whenever I saw a piece of woodland, the botanist in me ettled to explore it, and as the woods were everywhere, I was forever diving into their recesses and carefully scanning the ground for some lilliputian treasure, or hurrying over to a line of cliffs in the background.

That will-o'-the-wisp of the unknown led me many a dance all to no purpose; but one day, while exploring a piece of cliff near one of the trails, I found a small fern growing in the rock seams that I could not reconcile with any familiar species. It was much like the Brittle Bladder-fern in frond, but the rootstock was different; it was very much like the Rusty Woodsia, but neither "rusty" nor jointed; it grew in loose, detached moss at the base of the cliff, up and down a vertical seam, along a horizontal ledge, and inside a crevice some 20 feet up; it extended over 30 or 40 yards of the cliff, and formed a colony of three or four score plants. It was closely tufted, the stipes were dark brown, and the rhachis and frond covered with white hairs and yellow resinous glands. I had no microscope, nor even a table, in camp, but I made the plant out to be *Woodsia scopulina*. A guest in our camp, who scorns to be initiated into the noble brotherhood of "men of grass" (to use the title given to Douglas by the Indians), went so far as to school his wife to greet me on my return to civilization with the magic password: "Woodsia Scopulina." I understand there were dress rehearsals of the scene, but the best laid schemes of mice and men gang aft agley, and when there fell on my ear words that sounded like "Woodulina Scopsia," I was only a little less bewildered than the old bishop who, wakened out of slumber at a country vicarage by a thunderous knock at his bedroom door, and asking in quavering tones "Who's there?" heard the appalling response: "The Lord, my boy."

Specimens of the new find were sent to the Asa Gray Herbarium at Harvard, and identified at first sight as *Woodsia obtusa*, but Mr. J. M. Macoun, at the Victoria Museum, Ottawa,

and (I believe) Prof. Fernald, of Harvard, both inclined to the view that it was *W. scopulina*. Accordingly I sent the plant to Prof. Maxon, of the Smithsonian Institution, and in due course heard from him that the plant was undoubtedly *Woodsia scopulina*, and this has now been corroborated at Harvard.

By way of summary. The list of our finds in 1910 amounted to 37, but since then two varieties have been given specific importance, viz., *Aspidium bootii* and *Botrychium o'liquum*; so our list was virtually 39. Add *Pellaea densa* from near Durham, and the Parsley Fern from Manitoulin, and you have 41. The six new species added to our list this season make a total of 47, and all these in *old* Ontario—I mean from Detroit in the west to Montreal in the east—and for northern marches, the French River, Lake Nipissing, and the Mattawan. In New Ontario, between the Lake of the Woods, James Bay and Lake Abitibi, some seven more species are known to occur, and of these, it seems to me quite likely that two or three at least may be discovered by some happy enthusiast nestling among the thousand-and-one yet unsearched nooks and crannies this side of North Bay. I will end our ramble by listing the fern-flora of the Province:—

I.	1.	Polypodium vulgare.
II.	2.	Phegopteris polypodioides.
"	3.	" hexagonoptera.
"	4.	" dryopteris.
III.	5.	Adiantum pedatum.
IV.	6.	Pteris aquilina.
V.	7.	Pellaea atropurpuria.
VI.	8.	Cryptogramma densa.
"	9.	" acrostichoides.
"	10.	" stelleri.
VII.	11.	Woodwardia virginica.
VIII.	12.	Asplenium viride.
"	13.	" trichomanes.
"	14.	" platyneuron.
"	15.	" angustifolium.
"	16.	" acrostichoides.
"	17.	" filix-femina.
IX.	18.	Scolopendrium vulgare.
X.	19.	Comptosorus rhizophyllus.
XI.	20.	Polystichum acrostichoides.
"	21.	" lonchitis.
XII.	22.	Aspidium thelypteris.
"	23.	" noveboracense.
"	24.	" fragrans.

XII.	25.	Aspidium marginale.
"	26.	" filix-mas.
"	27.	" goldianum.
"	28.	" bootii.
"	29.	" cristatum.
"	30.	" spinulosum.
XIII.	31.	Cystopteris bulbifera.
"	32.	" fragilis.
XIV.	33.	Woodsia ilvensis,.
"	34.	" scopulina.
XV.	35.	Dicksonia punctilobula.
XVI.	36.	Onoclea sensibilis.
"	37.	" struthiopteris.
XVII.	38.	Osmunda regalis.
"	39.	" claytoniana.
"	40.	" cinnamomea.
XVIII.	41.	Ophioglossum vulgatum.
XIX.	42.	Botrychium simplex.
"	43.	" lanceolatum.
"	44.	" ramosum.
"	45.	" obliquum.
"	46.	" ternatum.
"	47.	" virginianum.

ONTARIO, N. AND N.W.

II.	48.	Phegopteris robertiana.
VIII.	49.	Asplenium ruta-muraria (?).
XIII.	50.	Cystopteris montana.
XIV.	51.	Woodsia glabella.
"	52.	" hyperborea.
"	53.	" oregana.
XIX.	54.	Botrychium lunaria.

BUPRESTIDÆ KNOWN TO OCCUR IN THE OTTAWA DISTRICT.

BY BRO. GERMAIN, of the Christian Schools, Académie De La Salle, Trois-Rivières.

In 1909, Mr. G. Chagnon published an interesting monograph of the Buprestidæ of Quebec. Practically all of the species mentioned were recorded from Montreal, Rigaud, and a few from Hull. The following is a list of these interesting beetles which the writer has captured in the Ottawa district. I hope it will prove of value to Canadian coleopterists. The

asterisks indicate those species which are not included in the literature above mentioned. The numbers preceding each species are those given in Henshaw's List of Coleoptera of America, North of Mexico:—

CHALCOPHORA Sol.

4568—angulicollis Lec.
4569—virginiensis Drury.
4570—liberta Germ.
4572—fortis Lec.

DICERCA Esch.

4576—prolongata Lec.
4577—divaricata Say.
*4578—pugionata Germ.
caudata Lec.
4579—obscura Fab.
4583—tenebrosa Kirby.
4585—tuberculata Chev.

POECILONOTA Esch.

4594—cyanipes Say.

BUPRESTIS Linn.

*4598—rufipes Oliv.
4601—lineata Fab.
4602—consularis Gory.
4604—nuttalli Kirby.
4606—maculiventris Say.
4607—fasciata Fab.
*4608—sulcicollis Lec. (1 sp. det. by Schwarz).
4609—striata Fab.

MELANOPHILA Esch.

4619—logipes Say. (acuminnata DeG.)
4621—drummondi Kirby.
4622—fulvoguttata Lec.

ANTHAXIA Esch.

4630—viridifrons Lap.
*4631—viridicornis Say.
4633—quercata Fab.

CHRYSOBOTHRIS Esch.

4639—femorata Fab.
4640—floricola Gory.
4647—dentipes Germ.

Chrysobothris Esch. (continued).

4650—trinervia Kirby.
4651—scabripennis Lap.& Gory
*4652—pusilla Lap. & Gory. (Ent. Rec. 1901).
4657—sexsignata Say.
4658—chrysoela Ill.
*4660—azurea Lec.
4661—harrisii Hentz.

ACMÆODERA Esch.

4699—pulchella Hbst. (Ent. Rec. 1901.)
4707—culta Web. (Ent. Rec. 1901.)

EUPRISTOCERUS Deyr.

4718—cogitans Web.

AGRILUS Steph.

4721—ruficollis Fab.
4724—otiosus Say.
*4724*a*-pusillus Say.
4727—bilineatus Web.
4731—fallax Say.
4738—acutipennis Mann.
4739—anxius Gory.
4742—politus Say.
4746—egenus Gory.
10109—obsoletoguttatus Gory.
10112—masculinus Horn.
*10118—pensus Horn.
10119—blanchardi Horn.

TAPHROCERUS Sol.

4755—gracilis Say.

BRACHYS Sol.

4758—ovata Web.
4761—aerosa Melsh.
4762—aeruginosa Gory.

PACHYSCELUS Sol.

4766—laevigatus Say.

MUSEUMS AS AIDS TO FORESTRY.

BY HARLAN I. SMITH, GEOLOGICAL SURVEY, OTTAWA.

In gaining due recognition and support from the great mass of the people, museums may be great aids to forestry. Even the further application of museum methods in forestry, may be of valuable service. The extent of the possibilities in these lines of recruiting aid by means of museum methods of publicity, recreation, instruction and research can hardly be forecast. Such museums or methods, however, must be properly administered to be effective. The methods used, for intance, in the large and costly Botanical Museum in New York, would be of little or no avail to forestry. That museum may be of use to scientists, but is not of much human interest to me, and, therefore, I judge, not to the average citizen, lumberman or forester.

Vast expenditure of time and money is not necessarily needed to secure valuable aid by these means. Museum cases, if such are really required, may be made at a cost of less then four dollars per foot front, as I have pointed out in THE OTTAWA NATURALIST of May, 1915, and The Scientific American of May 29, 1915. A large collection of specimens, maps, photographs and labels is not needed to inoculate whole regions with the germs of the ideas of the practicability and economic importance, to say nothing of aesthetic values and the love of forestry. A small exhibit may teach the general and valuable principles of forestry, perhaps even better than a complete exhibit of all kinds of trees, such as is shown in the American Museum of Natural History in New York. Such a complete exhibit might confuse or burden. The persons to be influenced to give aid to forestry might be lost in the woods as it were.

In the Rocky Mountains Park Museum at Banff, Alberta, a beginning to a tree exhibit has been made. There are eleven species of trees in the Park. Five grow in the valley, but the other six are found only on the higher land. A complete collection of the trunks and leaves of the trees growing in the valley was made in two half days as a bi-product of other work, and without any expense except as for time in cutting the trunks to lengths for exhibition. At the same time two photographs were made of each of these five kinds of trees; one of a grove or group of each kind of tree from a distance, and one of the details of the trunk, bark, leaves and such flowers or fruits as were then in season. Later photographs are to be made of the

parts of the trees not yet taken, and of uses and abuses of each tree and its products. Tentative labels had previously been prepared at my request by the late Mr. Abraham Knechtel, Chief Forester of the Parks Branch of the Department of the Interior. These refer particularly to the Park, and consequently are to be revised, so as to serve as labels to the same trees in any other museums that may accept the labels. Supplementary labels describing the peculiarities of the same trees as to the Park are also in preparation. These labels were printed in the Handbook of the Rocky Mountains Park Museum, and from the same type the labels were printed for labelling the specimens in the museum. The museum labels were printed on card of a yellow colour to harmonize with the furniture of the museum, and with a brown ink for the same purpose. They were framed and securely screwed to the trunks of the specimens, so that they cannot easily be displaced. The glass covering them, which can be cleaned readily by any janitor, protects the label from dirt or breakage. When these labels are revised to include instruction and explanation of the most important of the forestry abuses and needs, and when specimens of uses of the lumber and other tree products, such as wood alcohol, charcoal and turpentine, are added with full labels, this exhibit will be the beginning of a suggestion for a museum aid to forestry. An example of such a fact as should go in a label is that the obnoxious pitch of the balsam is so largely in the bark that the wood, formerly not used at all for paper pulp, is exceptionally valuable for this purpose. The qualities of a great number of woods may be shown by the exhibition of the volumes of American Woods published by Hough, illustrated by cross radial and longitudinal sections of actual trees. But certainly to accomplish the best results expert foresters who know the scientific facts must co-operate with those who understand people well enough to translate forestry facts into terms that not only can be understood by those whom forestry seeks to convert to its aid, but into terms that will also attract those people to read the labels and study the specimens.

The same labels may serve as outlines for lectures, each label being illustrated by lantern slides made from the photographic negatives previously mentioned. It is part of the work of all progressive museums to give popular lecture interpretations of science, as well as scientific lectures and recreation based on instruction. Then, too, the museum may send out both travelling exhibits of forestry and lecture outlines made up of the labels together with loan sets of lantern slides.

The President of the Ohio Academy of Science, speaking at the 25th anniversary of the Academy, stated that the exist-

ence of the Academy was unknown to the great majority of the people of Ohio, and a "Pan-American Scientific Congress" was organized last month in Washington, under the chairmanship of the third assistant United States Secretary of State, with a program of nine sections, but ignoring Canada, and also mathematics, physics, pure chemistry, pure geology, zoology, psychology and botany, so it was really a Congress of American Republics, neither Pan-American nor scientific. The United States Secretary of the Navy, in selecting the societies to elect members of the Naval Advisory Board, ignored the National Academy of Science, which is by law the advisor of the Government, and also ignored the American Association for the Advancement of Science, which is the great democratic body of over 4,000 scientific men of the United States and Canada. He apparently never heard of either association. These striking examples seem sufficient to suggest that the forestry branch of science, as well as the whole tree, would do well to seek aid by every means of publicity, recreation, entertainment, education and research possible. Since all these means are included among museum methods and in the work of up-to-date museums, museums may become of great aid to forestry, while forestry may provide museums with many necessary scientific facts.

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THE GENERA OF THE ODONTOPLEURIDAE.

By Percy E. Raymond.

Odontopleura (*Acidaspis* auct.) is essentially a Bohemian genus, as may be seen if one contrasts the 40 species listed by Barrande with the 2 species of Esthonia, the 12 or 15 species of Scandinavia, and the same number in Great Britain.

Practically the only attempt at a subdivision of the Odontopleuridae is that of Dr. John M. Clarke.* He recognized six subgenera of the genus *Ceratocephala*, viz., *Ceratocephala* s. s., *Acidaspis*, *Odontopleura*, *Dicranurus*, *Selenopeltis* and *Ancyropyge*. I adopted this classification in the second edition of the Eastman-Zittel text book (1913), raising the subgenera to generic rank, and grouping them under Burmeister's family name Odontopleuridae. Recently I have had occasion to study the very large collection of trilobites of this family in the Museum of Comparative Zoology, and while I have been able to continue the use of the names listed above, I find that the definitions and limits of the genera *Odontopleura*, *Ceratocephala* and *Acidaspis* must be very considerably modified.

Dr. Clarke's definitions of the three genera were as follows: *Odontopleura*, occipital ring smooth or with a central tubercle; *Acidaspis*, occipital ring with a single straight median spine; *Ceratocephala*, occipital ring with two straight divergent spines. This scheme was, of course, simplicity itself, and, so long as applied to the American species alone, seemed to work very well. If, however, one turns to plate 38 of Barrande's "Système Silurien du Centre de la Bohême," and looks at the three figures (22, 25 and 30) at the bottom of the plate, he sees at once that this classification is not a natural one. The figures represent *Acidaspis dormitzeri* Hawle and Corda, *A. dufrenoyi* Barrande, both from the Silurian, and *A. hoernesi* Barrande, from the Lower Devonian of Bohemia. In glabella, free cheeks, thorax and pygidium, these species are exceedingly alike, yet the first has a neck tubercle, so would be called *Odontopleura*, the second

*Notes on the Genus Acidaspis. 10th Rept. N.Y. State Geologist, 1891, p. 61.

has two long neck spines, and would be a *Ceratocephala*, while the third has a single long neck spine, and would have to be called *Acidaspis*. Except for these spines, the species show no important differences, and it is evident that in any natural classification they would be congeneric. Compared with the type-species of *Ceratocephala* and *Acidaspis*, *Acidaspis dufrenoyi* and *A. hoernesi* show marked differences in all parts except in the spines on the occipital ring.

Ceratocephala, Warder, Am. Jour. Sci. 34, 1838, p. 377. Type, *C. goniata*, ibidem, p. 378, fig. The typical species was badly described and figured by Warder, but all parts are now known. Among the striking features of this trilobite one may note the coalescence of the free and fixed cheeks, accompanied by the obliteration of the facial suture, the almost complete obliteration of the dorsal furrows on the cephalon, and the position of the eyes, far from the glabella, and half way to the front of the cephalon. On the thorax the horizontal furrow on the pleural lobe of each segment is weak, and the two low ridges separated by this furrow are equal. The pygidium has long subequal barbed spines.

Acidaspis, Murchison. Silurian System, 1839, p. 658. Type, *A. brighti* Murchison, ibidem, pl. 14, fig. 15. The glabella of the typical species is roughly triangular in outline, tapering rapidly forward. The eyes are situated far back and close to the glabella, and the whole neck ring is prolonged backward into a long heavy spine. No more than the cephalon of the typical species is definitely known. In the American *A. anchoralis* and *A. onealli*, which have the same sort of a cephalon, the thoracic segments are narrow, and the linear horizontal furrow separates a high narrow posterior ridge from a low narrow anterior one on the pleural portion of each segment. In these same species, the pygidium has two long lateral spines, between which are short spines, and outside of which are small spines. A similar pygidium has been referred to *A. brighti*.

Odontopleura, Emmrich. De Trilobitis, 1839, p. 53. Type, *O. ovata* Emmrich, ibidem, pl. fig. 3. The type, an entire specimen, is characterized by its broad form, an oval glabella which does not taper much toward the front, and the central position of the elevated ridge on the pleural lobe of each thoracic segment. The pygidium is not unlike that ascribed to *Acidaspis*, except that the spines are more nearly equal in size.

As one looks over the various Odontopleuridae which have been described, it is seen that there are a few which agree with the type of *Ceratocephala* in having the fixed and free cheeks in symphysis, eyes well forward, and pleura of thoracic seg-

ments without a pronounced ridge; there are also a few which agree with the type of *Acidaspis* in having a triangular glabella and a broad stout nucal spine; a few others which have the characteristics of *Dicranurus*, *Selenopeltis*, or *Ancyropyge*, but the great majority have an oval glabella and a prominent median ridge on the pleural portion of each thoracic segment, as in *Odontopleura*. Hence, the name given to the family by Burmeister is not only the oldest, but is particularly appropriate.

It is quite possible that the species which I have grouped under *Odontopleura* can and will be arranged in other subgenera or genera. The type is a very broad form, and a row of tubercles on each of the thoracic segments is a prominent feature of the ornamentation. With it could be associated *O. prevosti* Barrande, and *O. hughsi* (Salter). Another group, with a narrower form, fewer tubercles on the thorax, and fewer and longer spines on the pygidium, is exemplified by *O. dufrenoyi*, *O. hoernesi*, *O. roemeri*, and other Bohemian species. A third group, with thick, subequal pygidial spines, would include *O. pectinifera* Barrande, and *O. cornuta* (Salter). Then there is the exceedingly spinose *O. mira* Barrande, with very numerous and small pygidial spines, barbed lateral thoracic spines, and very tall eyes. For the present, however, it seems useless to break up the genus into such small groups.

To replace my definitions in the Zittel-Eastman text book, I would suggest the outline of the family which follows:—

FAMILY ODONTOPLEURIDAE BURMEISTER.

Opisthoparia with large free cheeks and eyes (usually), far back and close to the glabella. Lateral lobes of the glabella reduced to two or one. Thorax of 8 to 11 segments. All parts of the test usually very spinose, the spines usually of the horizontal type.

Odontopleura, Emmrich. Glabella oval in outline. The pleural lobe of each segment of the thorax has a narrow, strongly elevated median ridge. Ordovician to Devonian. Cosmopolitan.

Acidaspis, Murchison. Glabella roughly triangular in outline, tapering towards the front. The pleural lobe of each segment is divided by a linear furrow into a low anterior and an elevated posterior ridge. Ordovician and Silurian. Europe and North America.

Ceratocephala, Warder. Free and fixed cheeks anchylosed, eyes far forward and far from the glabella. The pleural lobe of each thoracic segment is divided by a shallow median fur-

row into equally elevated portions. Silurian, Europe and North America.

Dicranurus, Conrad. Dorsal furrows weak on cephalon, but the free and fixed cheeks not anchylosed. Occipital ring with two very long spirally curved spines. Pygidium with only a single pair of spines. Lower Devonian, Europe and North America.

Ancyropyge, Clarke. Margin of pygidium with 12 very long slender curved spines. Devonian, North America.

Selenopeltis, Hawle and Corda. Eyes half way to the front of the cephalon. The pleural lobe of each thoracic segment is crossed diagonally by a ridge which is extended into a very long spine. Pygidium with only a single pair of spines. Ordovician, Bohemia.

Glaphurus, Raymond. Probably does not belong to the Odontopleuridae.

NOTE ON DICRANURUS.

The *Dicranurus monstrosus* (Barrande) of Bohemia is exceedingly like our *D. hamatus* Conrad, of New York. The collection in the Museum of Comparative Zoology contains many fine specimens of the Bohemian form, including the originals of figures 1-3, plate 15, of the supplement to volume 1 of the "Silurian System." The original of figure 3 is an indeterminable fragment, but certainly has nothing to do with the pygidium of this species. The pygidium was unknown to Barrande, but our collection contains an example from Lochkow, where the species seems to be rather common. It is of the same type as that described by Barrande as *Acidaspis spoliata* (Suppl. 1872, p. 82, pl. 14, fig. 46). The type of this latter species is from Mnienian, Bohemia, and it also is in the Museum of Comparative Zoology. The pygidium is short, triangular, and there are two strong spines which arise from the upper surface of the test, and not from the margin. The spines arise in the same way in *Selenopeltis*, the spines in that genus being of considerable length, but seldom preserved, even on excellent specimens. It is interesting that the oldest genus (*Selenopeltis*), and the youngest (*Dicranurus*), of the Odontopleuridae, should both have a pygidium with an aspinose margin, while the other members of the family all have numerous spines on the pygidium.

AMERICAN SPECIES.

In the following list I have attempted to arrange the American species in accordance with the above definitions. It is not

necessary to give references to the place of publication of the Ordovician and Silurian species, since they may readily be found in Bassler's recent and exceedingly valuable "Index of American Ordovician and Silurian Fossils."* In cases where I have had to change the name, I have added in brackets the name under which it is to be found in Bassler's catalogue: —

Ancyropyge romingeri (Hall), Pal., N.Y., vol. 7.
Acidaspis anchoralis Miller (*Ceratocephala*).
A. ceralepta (Anthony) (*Ceratocephala*).
A. cincinnatiensis Meek (*Ceratocephala*).
A. crosota (Locke) (*Odontopleura*).
A. obsoleta Van Ingen.
A. onealli Miller (*Odontopleura*).
A. parvula Walcott (*Odontopleura*).
A. quinquispinosa Lake.
A. trentonensis Hall (*Odontopleura*).
A. vanhorni Weller.
Ceratocephala depauperata Van Ingen.
C. goniata Warder.
Dicranurus hamatus Conrad. Pal., N.Y., vol. 3.
Odontopleura arkansana Van Ingen.
O. callicera (Hall).
O. coalescens (Van Ingen) (*Ceratocephala*).
O. halli (Shumard).
O. horani (Billings) (*Ceratocephala*).
O. illinoisensis Weller.
O. narrawayi Raymond (*Ceratocephala*).
O. nodulata (Van Ingen) (*Ceratocephala*).
O. ortoni (Foerste).
O. perarmata (Whiteaves) (*Acidaspis*).
O. robina (Clarke). Mem. N. Y. State Mus. Memoir 9.
O? brevispinosa (Foerste)† (*Acidaspis*).
O? fimbriata (Hall)† (*Ceratocephala*).

Museum of Comparative Zoology,
Cambridge, Mass.

*Bull. U.S. National Museum, 92, 1915.
†Not adequately described.

PRENANTHES MAINENSIS:

NOTES ON THE MORPHOLOGY, TAXONOMY AND DISTRIBUTION OF THIS HYBRID FORM.

By BRO. M. VICTORIN, Longueuil College, Longueuil, Que.

Up to the present time very little attention has been devoted in this country to the study of natural hybrids. The subject, however, is of the utmost importance, not only to students of Mendelism, but also to the average systematist. "In fact," says De Vries, "the majority of authors agree that systematic and sexual affinity are essentially parallel, as they are really no more than two manifestations of one and the same thing; but we have not yet succeeded in explaining the apparent exceptions to this parallel." (*) If some light is ever to be thrown on the subject, it will doubtless be through observations on natural hybrids, in widely separated groups of the plant kingdom.

We have in a previous paper (†) studied quite extensively a cross of two distant species of *Lysimachia* : *L. terrestris* (L.) B.S.P. x *L. thyrsiflora* L., and hinted that the recently proposed genus *Naumburgia*, created to account for *L. thyrsiflora*, was not founded in nature, since the plant hybridizes freely with other *Lysimachia* species. The writer knows such hybrid to occur constantly in Chateauguy, Que., and Professor M. L. Fernald, of the Gray Herbarium, states that he has collected it in Maine, and also in Prince Edward Island.

The present paper will deal with another interesting hybrid in the genus *Prenanthes* (Compositæ), which is of rare occurence and has never received close study.

In a detailed botanical survey conducted during the summers of 1913 and 1914 along the coastal portion of the county of Temiscouata, Que., our attention was called to various forms of *Prenanthes* growing intermingled in a salt marsh at Anse à Persi, near Rivière-du-Loup. Specimens were collected and a preliminary study showed the bulk of the crop to be typical

*Hugo de Vries, "Mutation Theory," II., 593-599 (English translation).

†Fr. Marie Victorin, "Notes sur Deux Cas d'Hybridisma Naturel," Nat. Can. XXXIX., 177-189.

but stunted *P. trifoliata* and *P. racemosa*, whilst the rest appeared somewhat puzzling and intermediate between the two. We determined to prepare a large series of specimens to facilitate a thorough study, but, alas! the next morning the marsh was found neatly mowed, and the *Prenanthes* were no more.

Later study and comparison with type in the Gray Herbarium have shown our doubtful forms to be equivalent to *P. mainensis* Gray. There can be hardly any doubt now that the so-called *P. mainensis* is a natural hybrid: *P. racemosa* x *P. trifoliata*. Gray's text reads as follows: "About two feet high, leafy up and into the panicle; leaves nearly those of *P. racemosa*, but thinner and less glaucous; the radical ovate, commonly with abrupt or rounded base; upper, subtending clusters of the interrupted narrow thrysus; heads all drooping both before and after anthesis, resembling those of the following species (*P. virgata* Michx). Shore of the St. John's River at St. Francis, North Maine, *Pringle*. Growing with or near *P. racemosa*. And a looser form of the latter, "very common on the St. John's River," (*Goodale*) is somewhat between the two; so that this may be a hybrid between *P. racemosa* and *P. serpentaria*." (*)

It should be borne in mind that when these lines were written (1886), *P. trifoliata* had not yet been separated from *P. serpentaria*. From the description of Gray it appears that the plant named by him *P. mainensis* was an extreme form of the hybrid, differing from the "looser form of *P. racemosa*" only quantitatively, and that both are but distant terms of a Mendelian series.

We will now give the result of our own study based on the comparison of 15 specimens of *P. racemosa*, 20 of *P. trifoliata*, and 8 of *P. mainensis*.

STEM.

An important reduction in size is first noticeable, which is doubtless a response to the semi-halophytic habitat. In normal conditions *P. racemosa* reaches fully 2m., whilst here its maximum is 30cm. *P. trifoliata* generally grows to a height of 1.50m., and exceptionally to 3m.; in this locality no specimen higher than 32cm. was found.

It is well known to breeders, as well as to students in hybridism, that crosses between nearly related forms are more vigorous than either parent. The following tabulation will emphasize the law as applied to the present case:—

*Gray, Asa, "Synoptical Flora," I., 433, 1886.

COMPARED SIZE OF
P. racemosa, P. trifoliata, P. mainensis.

Height in cm.	RACEMOSA		TRIFOLIATA		MAINENSIS	
	Number	Product	Number	Product	Number	Product
15	2	30	..	..	..	..
16	..	..	..	..	..	..
17	2	34	2	34	..	..
18	2	36	..	..	..	..
19	2	38	2	38	..	..
20	..	..	4	80	..	..
21	2	42	1	21	..	..
22	..	..	1	22	..	..
23	..	..	4	92	..	..
24	3	72	1	24	..	..
25	..	..	..	..	..	..
26	..	..	2	52	..	..
27	1	27	..	..	1	27
28	..	..	1	28	..	..
29	..	..	1	29	1	29
30	1	30	..	..	..	..
31	..	..	..	..	..	..
32	..	..	1	32	1	32
33	..	..	..	..	..	..
34	..	..	..	..	..	..
35	..	..	..	..	..	..
36	..	..	..	..	1	36
37	..	..	..	..	..	..
38	..	..	..	..	1	38
39	..	..	..	..	1	39
40	..	..	..	..	..	..
41	..	..	..	..	2	82
Total.....	15	309	20	452	8	283
Mean.....	20.6 cm.		22.6 cm.		35.3 cm.	

The series of specimens is not numerous enough to show very clearly a curve of Quetelet, but what stands prominently is the fact that *P. mainensis*, the hybrid, is taller by 63 per cent. than the parent species (figuring on the means). What are the causes of this increased luxuriance? They are yet a matter of research. Tischler and Jost (*) agree that it is probably due to a "poisoning" effect of one species on the other.

LEAVES.

We have not been able to see the radical leaves of *P. mainensis* of which Gray makes so much in the above-mentioned description, but we observe that the lowest stem leaves taper into a winged petiole which sometimes reaches 10 cm. Most re-

*"Arch. Zellsforchung," I., 33-151, 1908.

[Leaves and bracts of *Prenanthes trifoliata*, *P. racemosa* and their hybrid *P. mainensis*. Bracts much enlarged.

markable is the tendency some of the leaves exhibit to lobate after the manner of *P. trifoliata*. But this tendency is checked in some way in its action, as it succeeds in affecting only one-half of the leaf, thus showing that the elementary characters of *P. racemosa* are dominant over those of *P. trifoliata*.

In the three plants the leaves are bordered with glandular teeth.

FLOWER AND FRUIT.

The color of the ray-flowers of *P. mainensis* is evidently intermediate between the pale purple of *P. racemosa* and the straw yellow of *P. trifoliata*.

The inner bracts of the involucre are about the same in outline in the three plants, but they differ much in the amount of pubescence. In *P. trifoliata* these bracts are perfectly glabrous; in *P. racemosa* they are covered with very long ribbon-like flattened hair tipped with a spherical gland; *P. mainensis* shows a pubescence much like that of *P. racemosa*, but very scarce, the evident result of the fusing of opposed characters.

The bract of *P. mainensis* ends in a somewhat fimbriate obtuse point bearing septate hair, very different from those described above; they are much shorter, and consist in a single line of hyaline cells. The bracts of *P. trifoliata* and *P. racemosa* show the same peculiarity.

The bracts of *P. racemosa* and *P. mainensis* are covered with truncate conical papillae, inclined towards the point of the bract. Every cell being papilla-bearing, their number can be estimated in round figures to 10,000 per sq. mm. None of the twenty specimens of *P. trifoliata* from the halophytic habitat of Anse à Persi showed these papillae, but we found them in smaller numbers, and different in form, on a giant specimen collected on the quartzite rocks of the "Gros Pelerin," one of the islands off the Kamouraska coast.

The akene of *P. mainensis* is slightly longer than that of *P. racemosa*, and much longer than that of *P. trifoliata*, even when giant specimens of the latter are considered.

DISTRIBUTION.

We do not believe that *P. mainensis* has been before noted outside of the type station on the St. John's River, neither do we think it can be found frequently on account of the distribution of the parent species and their different habitat.

P. racemosa is very widely distributed in North America, from Eastern Quebec to Alberta, whilst *P. trifoliata* is distinctly eastern and boreal. In the Province of Quebec there is no sure record west of "Gros Pelerin" island, though some of Macoun's

localities under *P. serpentaria* may belong here. The distribution of *P. trifoliata* is therefore restrictive as regards the possible occurrence of *P. mainensis*.

Moreover, *P. racemosa* is a riverside and prairie species, and *P. trifoliata* a plant with xerophytic preferences, so that the two are rarely to be met together, except in such habitat as the halophytic, or more exactly the semi-halophytic, where water is to be found, but which at the same time is physiologically dry.

BIRDS OF ALGONQUIN PARK.*

By W. E. SAUNDERS, LONDON, ONT.

On August 11th, 1915, Mr. E. M. S. Dale and the writer started from Joe Lake on an investigation of the birds and mammals, chiefly the former, of Algonquin Park. It is probably unnecessary to give any description of the character of the country, in which spruce, pine, poplar and birch alternate, as is usual in the northern parts of Ontario.

The fauna of this region should be more northern than would be called for by latitude only, because of the altitude, which is nearly two thousand feet.

After packing our dunnage in bags and loading it into the canoe, we got away to a favorable start. During the first day we saw nothing of moment until we reached Island Lake, where our ears were assailed by the calling of two hawks, which proved to be Goshawks. Their calls were of rather a peculiar character. They were in descending thirds, as is the case with the Marsh Hawk, and more particularly the Sharpshin, but they had two different calls. In one the phrases were repeated about every second and a half, and in the other, which was about half an octave higher, they were repeated about four times each second. We paddled over near where they were sitting in some dead timber, and one of them flew over us with a scissor-tail effect, opening and shutting the tail.

The first night's trapping for mice yielded nothing but one *Sorex personatus* and several of the northern deer mice. While passing over the portage and through the Otter Slide lakes it rained so hard that we sought shelter at the point where the creek leaves for White Trout lake, and spent the night in a tumbledown lumberman's building. Next morning we had a call from an Olive-sided Flycatcher, of which we

*Read at the December meeting of the McIlwraith Ornithological Club.

met a good many on the trip. They were not using their whistling call but the *Ku-Ku-Ku* which some of them repeated endlessly; in fact there were two which we concluded must have made a bet as to which could say it the most times in a day, and one of them stuck to it almost all day. Being an exceedingly monotonous note, we both felt that we got very well acquainted with it indeed, and should not forget it in a hurry. At this point we saw the only solitary Sandpiper on the trip. It was rather a surprise not to see more of these birds, as a great deal of the country is well suited to them. The trip down the stream into White Trout lake provided rather more walking than we appreciated, as the portages were long and somewhat arduous, but we met here our first Ruffed Grouse, Black-backed Woodpecker, and Duck Hawk, the latter flying high overhead while we were on one of the portages right opposite a high cliff, which, however, did not look very suitable for nesting on account of recent devastation by fire.

On these portages we found numerous runs of field mice, and subsequent trapping succeeded in getting a couple of them. They seemed rather too reddish to be our southern form, but this has not yet been definitely determined. The creek is wide and well filled with stumps and grass for the last half mile before it enters into the lake, and the banks are covered with dead and dying timber, which made a very attractive spot for woodpeckers. Here we became very well acquainted with a good many notes of the Black-backed Woodpecker. Once or twice we heard some genuine Blackbird notes from a Rusty at this point, but all the rest of the notes of that character were from the woodpecker. Here, also, we met our first Canada Jay or Whiskey Jack, a pair of which came flying down to interview us at the end of one of the portages. We tried to make friends with them, but they were not to be cajoled, and the bread which we laid on top of a burnt stump remained there untouched. As usual they were very quiet, but later on we heard from them quite a variety of notes, mostly of a very liquid character, and for the writer, not very easily described. Their flight resembles that of the Blue Jay to a considerabe extent, but there were differences which would make them readily identifiable by one who was well acquainted.

Paddling around the left corner of the entrance into the White Trout lake we found the most beautiful camp of the trip in a sandy bay which made excellent bathing. The level of the woods was only about ten feet above the lake, and a beautiful location was all ready for our tent, with a sun parlor overlooking the bay. Here we stayed for two nights while we trapped on the last portage and explored the nearby islands,

which contained nothing of very great interest. Our next stop was at the northern end of White Trout lake, where we slept in the shelter hut on the portage into Longer lake. The traps were set on a small island which had been burnt over about ten years before, and now contains a beautiful stand of young red pine five to ten feet high. We were interested to investigate the mammal inhabitants of this little islet, and found, as we expected, that nothing was on it excepting deer mice, and very few of them, both the cover and the food having been burnt off by the fire, and replacement not having progressed to any great extent.

The ranger who was located at this portage had a boy who was somewhat interested in the trapping industry, and wanted not only to catch some mice for himself but to see how they were prepared, and we spent an evening in the house illustrating the operation. The boy had set a trap which we gave him, on top of a cupboard in the one room of the house, and twice during the evening the trap was sprung and each time caught a deer mouse, in spite of the fact that the room was lit and contained five people, who were making no effort to be quiet.

A short exploration of Longer lake and one of the beaver streams leading into it completed this end of our trip. From the middle of the lake we saw a fine nest of the Osprey, located some four or five hundred yards back from the shore. It was exceedingly conspicuous, being placed, as usual, high up in a dead tree. Retracing our steps to White Trout lake we spent another evening in the shelter hut, and in the early morning, while preparing breakfast, the writer had a call from a beautiful large skunk which was not at all aggressive, but rather timid, and immediately retreated on being discovered. These animals are said to be very common in the park.

Launching again on White Trout lake, we turned our bow towards the north-west corner, and paddling through the narrows, went down through Grassy bay to the mouth of the Petewawa river.

Here there is a good deal of shallow water and some grass showing through it. There was an attractive point which overlooked the bay from quite a nice elevation. Here we landed and stayed some time, the most interesting part of which was spent in admiring the antics of three otters which came to the surface about a hundred yards away, and were at first taken for beaver, but the style of swimming with the head elevated, as is the habit of a mink, not held level on the water as is the habit of the beaver and muskrat, at once identified them. As this animal was a new acquaintance for both of us we watched

with great interest their movements. When swimming underneath the water they had a most interesting habit of following each other on every little deviation. When one would come to the surface, breathe and go down, the one immediately after did the same thing at the same place, and then the third following; they soon went into the grasses where they were not clearly visible, but they began working towards a little opening near us in which sat a Pied Bill Grebe. She kept a watchful eye on the motions of the otters, and when they were within twenty or thirty yards, disappeared and re-appeared some thirty yards to one side, and it happened that they did not go any nearer to her. They soon caught some fish and, fortunately for us, there were some stranded stumps and roots on which they climbed out and ate their catch. They also played with each other, and quarreled in a friendly way, which led us to suppose that they were young, or at most a mother and two young, though we could see no difference in their size.

This was perhaps the rarest sight of our trip, and we were exceedingly gratified that it lasted nearly an hour.

We then proceeded up McIntosh creek as far as the first portage, where we decided to retrace our steps. We followed the portage trail up through the woods, and had the pleasure of seeing there our only pair of the Pileated woodpecker. They were not very tame, and gave us little opportunity for observation, but it was a joy to see these big birds again. They are said to be quite common in some parts of the park. Two boys from Toronto camping on Lake LaMuir told us that they were frequently seen near their camp. A ranger with whom we talked told us that they inhabited the big timber only, which means the districts where the pine has not been cut off, and it was in a region of large trees that these two birds were seen.

Next morning we began our return trip through White Trout lake.

After paddling two or three miles we came to the high bluff facing the lumber camp on the north side of the lake, where we had climbed on the preceding day hunting for ferns. This time we found something much better than the ferns, in the person of a Duck Hawk, which gave us one of the most beautiful illustrations of sailing with motionless wings that either of us had ever seen. Evidently he was keeping watch over something, and as the location was entirely suited to their needs as a nesting place, we thought it not improbable that the young were nearby. After we had passed the cliff we heard him scream, and looking back found that he had been joined by his mate, but we gathered no more information regarding their habits or location.

When lunch time arrived we landed on an island separated by a narrow stretch of water from the shore, and while we were busily engaged, a large, black, hawk-like bird came sailing up the narrow channel, and was promptly identified as a Raven. He rose over the banks on the other side, and while passing gave out two or three of his characteristic notes. He was followed by two others, which did not come quite as far before turning, but still gave us a fair view of their flight.

There are times when a Raven and a Crow might puzzle an observer, but when flying they can be easily identified; the flight of the larger bird is very hawk-like and entirely different from that of the crow.

No other rarity was noted until we had passed up the five portages to Otter Slide lake again, where we camped at the entrance of the stream. Here we were in great luck in choosing the very spot used by the local troop of warblers as one of their promenades.

While setting traps across the stream that evening we heard, but failed to find, a Hudsonian Chickadee. Next morning he passed with the Warblers, Chickadees, Nuthatches, etc., over the route right around our camp, but succeeded in getting by without giving us a chance to see him; but before we left that camp the warblers passed us again, and this time the Hudsonian came out in the open and settled in the top of a little balsam tree close by, giving us every opportunity for examination. From this camp also we heard the Barred Owl, thanks to the sleeplessness of my companion. The bird was at a considerable distance, but his notes were unmistakably not those of the Great Horned Owl.

During the first night's camp at this spot our slumbers were interrupted by a Porcupine, which was apparently eating up the canoe. An expedition in undress uniform was made to scare him away, but he was sitting out in the far end of the canoe and was not inclined to be interrupted, and when we spoke to him he chattered his teeth as if in defiance, and it was not until we hit him with a little stick that he ran down the length of the canoe at a surprising speed and disappeared in the woods. These animals are tolerably common, but are easy victims to the destructive instincts present in many persons, and we found the remains of one that had been recently and uselessly killed on Otter Slide lake. Even the rangers are said to kill this animal, although it is not only against the law, but it is indefensible destruction, as the worst harm that can be charged against the Porcupine is that he injures a few trees during the winter, and if the damage done were calculated on a basis of a percentage value of the standing timber, it would be so small as

to be almost invisible. It seems a pity that the rangers cannot be imbued with the spirit of protection which ought to be one of the great features of such a reserve as this park.

Many persons who visit the northern woods complain of the small number of birds seen, and the limited number of species, but the truth seems to be that their faculties have not been trained to observe the birds under altered conditions. On this trip we noted never less than 35 species each day, and the smallest number of individuals was 160, while for the whole trip we saw exactly 90 species. And when it is remembered that the song season was over and most of these birds had to be seen to be recognized, ninety is not such a small number for a short two weeks trip.

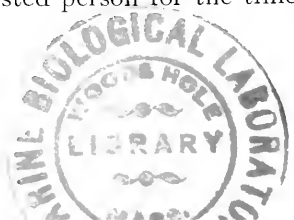
Coming from a region where rock ferns have no existence, we were both much interested in meeting a number of unaccustomed species, and besides the Common Polypody, we brought home roots of *Dicksonia*, *Woodsia ilvensis* and *Aspidium noveboracense*, which, though it is not strictly a rock fern, appeared in large clumps in some of the deeper woods. A few other plants which were unusual or unknown to us were *Hieracium aurantiacum* and *Trillium erythrocarpum*. A gentleman from Toronto whose acquaintance we made in the park told us this was *Trillium cernuum*, but reference to Gray's Manual shows that our surmise was correct, and it is *erythrocarpum*, the proof being in the long, attenuated points of the leaves.

The last day was spent in walking along the railway track for the sake of possible additions to our bird list, as there were a number of common species, such as the Crow, Vesper and Chipping sparrows which we did not see when canoeing.

We heard from Ranger Robinson of the occurrence of Spruce Partridge near Joe Lake station, and made a little walk through the region indicated, but without success.

It seemed strange that on the return journey we should meet a brother botanist at the station at Scotia Junction, in the person of Mr. Stevenson of Oshawa, who had been devoting special attention to the ferns, and was just then making a journey with the hope of finding the *Dicksonia*, of which we had seen such beautiful patches.

This little trip into the park left us filled with the desire to visit it again in the springtime, when all these interesting northern species would be nesting, and we could enjoy and study their songs and their home life. The songs of the Thrushes alone would probably repay any interested person for the time spent.



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DATA ON SEED MATURITY OF SOME ONTARIO PLANTS.

By W. Herriot, Galt, Ont.

During the seasons from 1909 to 1914, the writer collected extensively the seeds of many native and naturalized plants, in the vicinity of Galt, Ont., for the Seed Branch at Ottawa.

While our standard works on botany usually give the month of flowering of most plants, and many published lists of local floras give exact dates of flowering, very little has been published as to the time of the maturing of the seed.

Having accumulated considerable data on this point, the list published here may prove of some value; the dates given for flowering are when the plants are well into bloom, and in early flowering plants this may vary considerably in different years, according to weather conditions in spring. The dates given for seed maturing are when seed was collected, and where plants ripen and shed their seed during a short period, as in *Claytonia*, the dates can be taken to represent fairly well the fruiting season. In some few instances where the seed is persistent after maturity, as in *Rumex*, the date of collecting may be some little time after maturity, and, therefore, not so accurate. Again, the dates of flowering and of seed maturity in many cases were not taken during the same year, but, as before mentioned, except in early flowering species the time of flowering from year to year is fairly constant:—

NAME	Time of Flowering	Seed Mature
Sparganium diversifolium Graebner	Jul 15	Sep 23
Scheuchzeria palustris L.	Jun 8	Sep 4
Sagittaria arifolia Nutt.	Jul 27	Sep 9
Alisma Plantago-aquatica L.	Aug 14	Sep 7
Andropogon scoparius Michx.	Aug 7	Sep 17

NAME	Time of Flowering	Seed Mature
ANDROPOGON FURCATUS Muhl.	Aug 25	Sep 19
SORGHASTRUM NUTANS (L.) Nash.	Aug 25	Sep 17
DIGITARIA HUMIFUSA Pers.	Aug 17	Sep 21
DIGITARIA SANGUINALIS (L.) Scop.	Sep 1	Oct 2
PANICUM LINEARIFOLIUM Scribn.	Jul 6	Jul 23
PANICUM LATIFOLIUM L.	Jun 28	Jul 20
LEERSIA ORYZOIDES (L.) Sw.	Aug 5	Sep 18
MILLIUM EFFUSUM L.	Jun 3	Jun 17
ORYZOPSIS ASPERIFOLIA Michx.	Apr 23	Jun 10
MUHLENBERGIA MEXICANA (L.) Trin.	Sep 6	Oct 15
BRACHYELYTRUM ERECTUM (Shreb.) Beauv.	Jun 28	Jul 29
ALOPECURUS GENICULATUS L. var. ARISTULATUS Torr.	Jun 14	Jul 11
CINNA LATIFOLIA (Trev.) Griseb.	Aug 1	Aug 26
SPHENOPHOLIS PALLENS (Spreng.) Scribn.	Jul 6	Jul 20
DESCHAMPSIA CAESPITOSA (L.) Beauv.	Jun 16	Jul 2
AVENA STERILIS L.	Jul 26	Aug 12
DANTHONIA SPICATA (L.) Beauv.	Jul 1	Jul 19
SPARTINA MICHAUXIANA Hitchc.	Aug 1	Sep 17
POA ANNUA L.	Apr 30	Jun 3
POA TRIFLORA Gilib.	Jul 9	Jul 29
POA DEBILIS Torr.	May 28	Jun 16
POA ALSODES Gray	Jun 1	Jun 16
GLYCERIA CANADENSIS (Michx.) Trin.	Jul 6	Aug 8
GLYCERIA NERVATA (Willd.) Trin.	Jun 3	Jun 27
GLYCERIA GRANDIS Wats.	Jun 29	Jul 19
GLYCERIA SEPTENTRIONALIS Hitchc.	Jun 14	Jul 9
PUCCINELLIA DISTANS (L). Parl.	Jun 23	Jul 8
FESTUCA NUTANS Spreng.	Jul 1	Jul 13
MELICA STRIATA (Michx.) Hitchc.	Jun 21	Jul 13
BROMUS TECTORUM L.	Jun 13	Jul 13
BROMUS KALMII Gray	Aug 25	Sep 4
AGROPYRUM REPENS (L.) Beauv.	Jul 25	Sep 13
AGROPYRUM CANINUM (L.) Beauv.	Jul 1	Sep 11
ELYMUS STRIATUS Willd.	Jul 20	Aug 13
ELYMUS CANADENSIS L.	Aug 25	Sep 18
HYSTRIX PATULA Moench.	Jul 13	Sep 4
CYPERUS ESCULENTUS L.	Aug 18	Oct 30
ELEOCHARIS OVATA (Roth.) R. & S.	Jun 15	Jul 21
SCIRPUS VALIDUS Vahl.	Jul 27	Sep 9
SCIRPUS ATROVIRENS Muhl.	Aug 3	Oct 7
SCIRPUS CYPERINUS (L.) Kunth.	Jul 31	Oct 1
RYNCHOSPORA FUSCA (L.) Ait. f.	Aug 31	Sep 6
CLADIUM MARISCOIDES (Muhl.) Torr.	Aug 31	Sep 2
CAREX CRISTATA Schwein	Aug 6	Aug 25

NAME	Time of Flowering	Seed Mature
CAREX BEBBII Olney	Jul 3	Aug 6
CAREX SYCHNOCEPHALA Carey	Jul 30	Aug 26
CAREX SCIRPOIDES Schkuhr	Jun 3	Jun 24
CAREX VULPINOIDEA Michx	Jul 1	Jul 18
CAREX DIANDRA Schrank	Jun 20	Jul 11
CAREX STIPATA Muhl	Jun 4	Jun 21
CAREX STRICTA Lam	Jun 4	Jun 25
CAREX LEPTALEA Wahlenb	Jun 1	Jun 26
CAREX PUBESCENS Muhl	Jun 1	Jun 21
CAREX FLAVA L	May 28	Jul 13
CAREX HYSTERICINA Muhl	Jun 16	Jul 2
CAREX SCHWEINITZII Dewey	Jun 4	Jul 13
CAREX LUPULINA Muhl	Aug 1	Oct 7
CAREX ROSTRATA Stokes	Jun 10	Jul 9
ARISAEMA TRIPHYLLUM (L.) Schott	May 26	Aug 26
CALLA PALUSTRIS L	May 6	Sep 7
SYMPLOCARPUS FOETIDUS (L.) Nutt	Apr 20	Oct 14
JUNCUS TENUIS Willd	Jun 29	Jul 11
JUNCUS EFFUSUS L	Jun 23	Jul 29
JUNCUS CANADENSIS J. Gay	Aug 31	Sep 4
LILIUM SUPERBUM L	Jul 6	Sep 16
CLINTONIA BOREALIS (Ait.) Raf	Jun 3	Jul 22
SMILACINA RACEMOSA (L.) Desf	Jun 15	Sep 16
STREPTOPUS ROSEUS Michx	Jun 3	Jul 22
TRILLIUM GRANDIFLORUM (Michx.) Salisb	May 14	Jun 15
CANNABIS SATIVA L	Aug 23	Sep 25
URTICA GRACILIS Ait	Jul 25	Oct 15
BOEHMERIA CYLINDRICA (L.) SW	Aug 3	Oct 28
RUMEX BRITANNICA L	Jul 26	Sep 7
RUMEX VERTICILLATUS L	Jul 23	Sep 6
RUMEX OBTUSIFOLIUS L	Jul 8	Jul 27
RUMEX ACETOSELLA L	Jun 13	Jul 15
RUMEX CRISPUS L	Jun 27	Jul 15
POLYGONUM PENNSYLVANICUM L	Aug 3	Sep 1
POLYGONUM HYDROPIPER L	Aug 26	Sep 19
POLYGONUM SAGITTATUM L	Aug 6	Aug 23
POLYGONUM AVICULARE L	Sep 1	Oct 14
KOCHIA SCOPARIA (L.) Schrad	Aug 31	Oct 9
SPERGULA ARVENSIS L	Jun 26	Aug 17
ARENARIA SERPYLLIFOLIA L	Jun 1	Jun 28
CERASTIUM VULGATUM L	Jun 4	Jun 22
LYCHNIS ALBA Mill	Jun 5	Sep 19
SILENE LATIFOLIA (Mill.) B. & R	Jun 14	Jul 22
SAPONARIA OFFICINALIS L	Aug 2	Sep 22
CLAYTONIA VIRGINICA L	Apr 9	May 24

NAME	Time of Flowering	Seed Mature
CASTALIA ODORATA (Ait.) W. & W.	Jul 9	Aug 6
RANUNCULUS DELPHINIFOLIUS Torr.	May 7	Jun 18
RANUNCULUS SCELERATUS L.	May 24	Jun 21
RANUNCULUS ABORTIVUS L.	May 7	Jun 11
RANUNCULUS RECURVATUS Poir.	May 28	Jun 27
RANUNCULUS FASCICULARIS Muhl.	Apr 16	Jun 11
RANUNCULUS SEPTENTRIONALIS Poir.	Jun 4	Jul 4
RANUNCULUS REPENS L.	May 24	Jul 5
RANUNCULUS PENNSYLVANICUS L.f.	Jul 9	Aug 6
THALICTRUM DIOICUM L.	Apr 23	Jul 6
THALICTRUM POLYGAMUM Muhl.	Jul 13	Oct 18
HEPATICA TRILOBA Chaix	Apr 4	Jun 10
ANEMONE VIRGINIANA L.	Jun 14	Sep 11
CALTHA PALUSTRIS L.	May 10	Jun 17
AQUILEGIA CANADENSIS L.	Jun 1	Jun 24
ACTAEA RUBRA (Ait.) Willd.	May 24	Jul 15
MENISPERMUM CANADENSE L.	Jul 6	Sep 23
PODOPHYLLUM PELTATUM L.	Jun 7	Aug 15
CAULOPHYLLUM THALICTROIDES (L.) Michx.	Apr 4	Aug 25
SANGUINARIA CANADENSIS L.	Apr 9	Jun 25
CHELIDONIUM MAJUS L.	May 21	Jun 28
PAPAVER RHOEAS L.	Jul 21	Aug 15
FUMARIA OFFICINALIS L.	Aug 4	Sep 9
BERTEROA INCANA (L.) DC.	Jul 23	Oct 16
LEPIDIUM APETALUM Willd.	Jun 1	Jul 10
CAPSELLA BURSA-PASTORIS (L.) Medic.	May 24	Jun 17
CAMELINA MICROCARPA Andrz.	Jun 3	Jul 7
BRASSICA ALBA (L.) Boiss.	Jul 1	Sep 15
BRASSICA NIGRA (L.) Koch.	Jul 6	Sep 25
SISYMBRIUM OFFICINALE (L.) Scop.	Jul 9	Aug 31
RADICULA NASTURTIUM-AQUATICUM (L) B.&B.	Jun 15	Jul 25
BARBAREA STRICTA Andrz.	May 20	Jul 29
ERUCA SATIVA.	Aug 1	Sep 25
SARRACENIA PURPUREA L.	Jun 20	Aug 27
PENTHORUM SEDOIDES L.	Jul 30	Aug 26
MITELLA DIPHYLLA L.	May 11	Jun 3
PARNASSIA CAROLINIANA Michx.	Sep 16	Sep 31
PHYSOCARPUS OPULIFOLIUS (L.) Maxim.	Jul 3	Sep 7
POTENTILLA RECTA L.	Jun 18	Aug 6
POTENTILLA PALUSTRIS (L.) Scop.	Jul 1	Jul 23
GEUM CANADENSE Jacq.	Jun 25	Aug 25
GEUM STRICTUM Ait.	Jul 13	Sep 4
GEUM RIVALE L.	Jun 3	Jun 28
GEUM TRIFLORUM Pursh.	May 24	Jun 25
AGRIMONIA GRYPOSEPALA Wallr.	Jul 18	Sep 10

NAME	Time of Flowering	Seed Mature
GLEDITSIA TRIACANTHOS L.	Jun 14	Nov 17
LUPINUS PERENNIS L.	Jun 14	Jul 9
MELILOTUS OFFICINALIS (L.) Lam.	Jul 6	Aug 10
MELILOTUS ALBA Desr.	Jul 6	Aug 26
LOTUS CORNICULATUS L.	Jul 15	Aug 28
ROBINIA PSEUDO-ACACIA L.	Jun 20	Nov 23
DESMODIUM PANICULATUM (L.) D.C.	Aug 6	Sep 24
LESPEDEZA FRUTESCENS (L.) Britton	Aug 14	Sep 24
LESPEDEZA CAPITATA Michx.	Aug 24	Oct 26
GERANIUM MACULATUM L.	May 28	Jul 1
POLYGALA SENEGA L.	Jun 18	Jul 4
ACALYPHA VIRGINICA L.	Aug 25	Oct 1
EUPHORBIA CYPARISSIAS L.	May 24	Jul 7
FLOERKEA PROSERPINACOIDES Willd.	May 15	Jun 1
RHUS TOXICODENDRON L.	Jun 23	Oct 9
IMPATIENS FULVA Nutt.	Aug 1	Sep 10
CEANOTHUS AMERICANUS L.	Jul 28	Aug 25
MALVA ROTUNDIFOLIA L.	Jul 19	Sep 15
MALVA MOSCHATA L.	Jun 14	Aug 9
HYPERICUM PERFORATUM L.	Jul 4	Sep 18
VIOLA ARVENSIS Murr.	May 22	Aug 7
DECODON VERTICILLATUS (L.) Ell.	Aug 4	Sep 23
EPILOBIUM ANGUSTIFOLIUM L.	Aug 1	Aug 26
OENOTHERA BIENNIS L.	Aug 17	Sep 9
CIRCAEA LUTETIANA L.	Jul 17	Aug 13
ARALIA RACEMOSA L.	Jul 27	Sep 10
ARALIA NUDICAULIS L.	May 28	Jul 23
PANAX QUINQUEFOLIUM L.	Jul 1	Sep 5
SANICULA MARILANDICA L.	Jun 16	Sep 4
SANICULA GREGARIA Bicknell	Jun 8	Aug 26
SANICULA TRIFOLIATA Bicknell	Jun 19	Aug 13
OSMORHIZA CLAYTONI (Michx.) Clarke	May 28	Jul 25
OSMORHIZA LONGISTYLIS (Torr.) DC.	Jun 10	Jul 25
CONIUM MACULATUM L.	Jul 29	Sep 15
CICUTA MACULATA L.	Jul 25	Sep 20
CARUM CARVI L.	Jun 11	Jul 20
SIUM CICUTÆFOLIUM Schrank	Jul 23	Sep 25
CRYPTOTAENIA CANADENSIS (L.) DC.	Jun 16	Aug 26
ZIZIA AUREA (L.) Koch	Jun 5	Aug 6
FOENICULUM VULGARE Hill	Aug 15	Oct 4
TAENIDIA INTEGERRIMA (L.) Drude	Jun 14	Aug 12
AETHUSA CYNAPIUM L.	Jul 10	Sep 18
LEVISTICUM OFFICINALE (L.) Koch	Jul 6	Aug 15
ANETHUM GRAVEOLENS L.	Jul 15	Sep 30
HERACLEUM LANATUM Michx.	Jun 27	Sep 11

NAME	Time of Flowering	Seed Mature
CONIOSELINUM CHINENSE (L.) BSP	Aug 31	Sep 24
ANGELICA ATROPURPUREA L	Jul 8	Jul 25
DAUCUS CAROTA L	Aug 6	Sep 17
KALMIA POLIFOLIA Wang	Jun 4	Jul 8
LYSIMACHIA VULGARIS L	Jul 7	Sep 18
ANAGALLIS ARVENSIS L	Jul 17	Aug 31
GENTIANA CRINITA Froel	Sep 4	Sep 30
GENTIANA ANDREWSII Griseb	Sep 1	Sep 16
FRASERA CAROLINIENSIS Walt	Jun 15	Sep 15
HALENIA DEFLEXA (Sm.) Griseb	Aug 16	Sep 27
MENYANTHES TRIFOLIATA L	Jun 2	Jul 14
ASCLEPIAS TUBEROSA L	Jul 13	Oct 7
ASCLEPIAS INCARNATA L	Jul 11	Sep 11
ASCLEPIAS SYRIACA L	Jul 8	Oct 2
IPOMOEA PURPUREA (L.) Roth	Jul 29	Sep 1
CONVOLVULUS SEPIUM L	Jun 27	Oct 2
CUSCUTA GRONOVII Willd	Aug 23	Sep 16
HYDROPHYLLUM VIRGINIANUM L	Jun 30	Jul 28
LAPULLA VIRGINIANA (L.) Greene	Jul 17	Sep 10
MYOSOTIS ARVENSIS (L.) Hill	Jul 16	Aug 17
VERBENA URTICAEFOLIA L	Aug 3	Sep 18
VERBENA HASTATA L	Jul 11	Sep 18
MARRUBIUM VULGARE L	Jul 5	Aug 17
PRUNELLA VULGARIS L	Jun 29	Aug 25
LEONURUS CARDIACA L	Jul 1	Sep 11
HYSSOPUS OFFICINALIS L	Jul 10	Sep 18
LYCOPUS VIRGINICUS L	Aug 11	Sep 13
LYCOPUS AMERICANUS Muhl	Aug 11	Sep 11
SOLANUM DULCAMARA L	Jun 18	Oct 2
SOLANUM NIGRUM L	Sep 2	Oct 1
PHYSALIS HETEROPHYLLA Nees	Jul 15	Sep 24
NICANDRA PHYSALOIDES (L.) Pers	Sep 5	Sep 21
HYOSCYAMUS NIGER L	May 26	Sep 25
DATURA STRAMONIUM L	Aug 17	Oct 1
VERBASCUM BLATTARIA L	Aug 3	Sep 18
PENSTEMON HIRSUTUS (L.) Willd	Jun 8	Aug 5
CHELONE GLABRA L	Aug 11	Oct 2
DIGITALIS PURPUREA L	Jun 25	Aug 7
VERONICA OFFICINALIS L	Jun 16	Jul 29
GERARDIA VIRGINICA (L.) BSP	Aug 6	Sep 24
GERARDIA PAUPERCULA (Gray) Britton	Jul 25	Sep 30
PEDICULARIS CANADENSIS L	May 19	Jul 9
EPIFAGUS VIRGINIANA (L.) Bart	Aug 27	Oct 6
PHRYMA LEPTOSTACHYA L	Jul 21	Sep 9
PLANTAGO LANCEOLATA L	Jul 27	Aug 23

NAME	Time of Flowering	Seed Mature
GALIUM APARINE L.	May 21	Jul 1
GALIUM APARINE var. VAILLANTII (DC.) KOCH.	May 19	Jun 17
GALIUM CIRCAEZANS Michx.	Jun 30	Aug 13
GALIUM TRIFIDUM L.	Jun 15	Aug 23
GALIUM MOLLOGO L.	Jul 1	Sep 4
CEPHALANTHUS OCCIDENTALIS L.	Jul 27	Oct 7
TRIOSTEUM AURANTIACUM Bicknell	Jun 8	Sep 2
DIPSACUS SYLVESTRIS Huds.	Aug 11	Sep 11
ECHINOCYSTIS LOBATA (Michx.) T. & G.	Aug 2	Sep 25
LOBELIA SIPHILITICA L.	Jul 20	Oct 14
EUPATORIUM PURPUREUM L.	Aug 2	Sep 17
EUPATORIUM PERFOLIATUM L.	Aug 11	Oct 15
SOLIDAGO SQUARROSA Muhl.	Aug 27	Oct 15
SOLIDAGO JUNCEA Ait.	Aug 23	Oct 22
SOLIDAGO GRAMINIFOLIA (L.) Salisb.	Aug 25	Oct 22
ASTER MACROPHYLLUS L.	Aug 31	Oct 19
ASTER NOVAE-ANGLIAE L.	Sep 2	Oct 21
ASTER MULTIFLORUS Ait.	Sep 19	Oct 30
ASTER PUNICEUS L.	Aug 31	Oct 21
INULA HELENIUM L.	Aug 11	Oct 25
XANTHIUM SPINOSUM L.	Aug 5	Oct 29
XANTHIUM CANADENSE Mill.	Sep 1	Oct 16
XANTHIUM ECHINATUM Murr.	Aug 2	Oct 21
RUDBECKIA HIRTA L.	Jul 27	Sep 18
HELIANTHUS STROMOSUS L.	Aug 23	Sep 27
BIDENS FRONDOSA L.	Aug 31	Oct 2
BIDENS CERNUA L.	Sep 1	Oct 23
BIDENS LAEVIS (L.) BSP.	Aug 31	Oct 15
ANTHEMIS ARVENSIS L.	Jun 10	Jul 26
TANACETUM VULGARE L.	Aug 17	Oct 14
ARTEMISIA VULGARIS L.	Aug 22	Sep 29
ERECHTITES HIERACIFOLIA (L.) Raf.	Aug 20	Sep 17
SENECIO VULGARIS L.	Jul 10	Aug 20
CIRSIUM MUTICUM Michx.	Aug 31	Sep 2
ONOPORDUM ACANTHIUM L.	Aug 23	Oct 9
CENTAUREA CYANUS L.	Aug 1	Aug 25
CNICUS BENEDICTUS L.	Aug 15	Oct 1
LAPSANA COMMUNIS L.	Jul 15	Aug 13
TRAGOPOGON PRATENSIS L.	Jun 4	Jul 15
LACTUCA SCARIOLA L.	Aug 1	Aug 31

CANADIAN ANTHROPOLOGY AT THE WASHINGTON MEETINGS.

By HARLAN I. SMITH, Geological Survey, Canada.

The 19th International Congress of Americanists met in Washington from December 27th to 31st, 1915, in affiliation with the American Anthropological Association, the American Folk-lore Society, Section I of the "Pan-American Scientific Congress," the American Historical Association, and the Archaeological Institute of America. The meetings were chiefly held in the large auditorium of the United States National Museum, but branch meetings were held in one of the small lecture halls, and one session was held at Georgetown University, followed by a demonstration of Rare Americana and other objects, and a reception under the auspices of the University.

The programme was unusually full, so that it is possible here to refer only to the titles of papers relating to Canada, or on general subjects touching Canadian problems, and to indicate the part taken in the meetings by Canadian representatives.

"The Culture of a Prehistoric Iroquoian Site in Eastern Ontario," was presented by W. J. Wintemberg, of the Geological Survey of Canada.

"Archaeological Work in Northern Nova Scotia," illustrated with slides; and "Remarkable Stone Sculptures from Yale, B.C.," illustrated with slides, were presented by Harlan I. Smith, Geological Survey of Canada.

"The Beaver Indians" were described by Dr. Pliny Earle Goddard, Curator of Ethnology, American Museum of Natural History, New York.

"Early Jesuit Missions in North America" was the subject of a paper by Rev. John O'Connor, F.X., S.J.

"Le verbe dans les adjectives et les adverbs Porteurs" was the title of a paper presented by Father A. G. Morice, O.M.I., St. Boniface, Manitoba.

"The League of the Iroquois" was described by Mr. J. N. B. Hewitt, Bureau of American Ethnology.

"Preliminary Remarks on the Skeletal Material collected by the Jesup Expedition, especially on the Pacific Coast of Canada," were made by Dr. Bruno Oetteking, American Museum of Natural History.

"Terms of Relationship and the Levirate" were discussed by Dr. E. Sapir, Geological Survey of Canada.

"A critique on The Diffusion of Culture," and a paper on "Totemic Complexes in North America," were given by Dr.

A. A. Goldenweiser, Instructor in Anthropology, Columbia University, New York City.

"Chronological Relations of Coastal Algonkin Culture" were discussed by Alanson Skinner, American Museum of Natural History.

"The Huron-Wyandot Clans," and "The Growth of the Tsimshian Phratries," were the subjects given by Mr. C. M. Barbeau, Geological Survey of Canada.

"Herb Medicine Practices of the North-eastern Algonkins" were discussed by Dr. Frank G. Speck, Assistant Professor of Anthropology, University of Pennsylvania.

"Tribes of the Pacific Coast" were described by Dr. A. L. Kroeber, Associate Professor of Anthropology, University of California.

"Cayuga Ownership of New York Land" was the subject of a paper presented by Miss Grace Ellis Taft.

"Recent Developments in the Study of Indian Music" were discussed by Miss Frances Densmore, Special Investigator in Indian Music for the Bureau of American Ethnology.

"Pictures of the Eskimo Culture near Cape Farewell, South Greenland," illustrated with slides, was the title of a paper given by William Thalbitzer, Copenhagen, Denmark.

"Comparative Study of Pawnee and Blackfoot Rituals" was the subject of a paper sent by Dr. Clark Wissler, Curator of Anthropology, American Museum of Natural History.

The Aleutian Language was compared with the Greenlandic by William Thalbitzer, Copenhagen, Denmark.

"Prehistoric Sites in the State of Maine" were described by Warren K. Moorehead, Curator, Department of Archaeology, Phillips Academy.

"La Vinland—sa localisation probable," was the title of a paper read by Alphonse Gagnon, Secretary, Department of Public Works and Labor, Quebec Provincial Government.

"Indications of Visits of White Men to America before Columbus," illustrated with slides, was discussed by William H. Babcock.

Rev. A. G. Morice, O.M.I., St. Boniface, Manitoba, Harlan I. Smith, Geological Survey of Canada, M. Alphonse Gagnon, of Quebec, and Dr. Edward Sapir, Geological Survey of Canada, each acted as secretary for a session of the meetings.

On Wednesday evening a reception was given by the regents and secretary of the Smithsonian Institution to the Congress of Americanists and affiliated societies at the United States National Museum, and on Thursday evening a dinner was tendered to the members of the Congress by the organizing committee and local members of the Congress at the Cosmos Club.

Special exhibits in the United States National Museum had been prepared for the meetings. Twenty-four busts representing distinguished individual Indians, from delegations sent by various tribes to Washington, were exhibited as examples of accurate and permanent records of the normal types of Indians. Another exhibit showed three varieties of artificial skull deformation practised in America. Tattooing was also shown. It will be remembered that both skull deformations and tattooing are found among the Indians of the Pacific Coast of Canada. An archaeological exhibit of economic plants and plant products of prehistoric America was made by W. E. Stafford, Economic Botanist of the United States Department of Agriculture. This included specimens of corn, beans and squash seeds, similar to those found in the archaeological Iroquoian site at Roebuck, Ontario, recently explored by the Geological Survey.

BOOK NOTICE.

FOREST PROTECTION IN CANADA.

The Commission of Conservation has just issued a report on "Forest Protection in Canada, 1913-1914," which is of particular interest. It contains much information respecting the work of the provincial forest services and of the federal departments intrusted with the care of our forests.

Forest fire protection is assuming a large place in public attention. It is obvious that, if Canada is to continue as a wood-producing country, she must conserve her resources of this natural product. The report treats exhaustively of the fire protection of forest lands along railway rights-of-way. Through co-operative action, great headway has been made in securing the reduction of forest losses through fires traceable to railway causes.

The forests of British Columbia and on Dominion lands in the west have been dealt with in reports containing the results of special studies conducted by Dr. C. D. Howe and Mr. J. H. White. The Trent watershed in Ontario has also received especial attention, in a report of an investigation by Dr. C. D. Howe, in the townships of Burleigh and Methuen. This district is important in that, while of very little value as an agricultural area, it is being repeatedly overrun by forest fires, and the little remaining merchantable timber destroyed. It is suggested that the area be placed under the control of the Dominion Forestry Branch for protection from fires and for reforestation.

THE USE OF ORNAMENTAL TREES AND SHRUBS.*

BY W. T. MACOUN, DOMINION HORTICULTURIST.

The extensive forests of Canada are rapidly disappearing through the inroads made upon them by the axe and by fire, but one may yet see some fine woodlands and some magnificent specimens of the stately and attractive trees with which the Dominion is blessed in great variety. These have their economic value, but they have a sentimental and an ornamental value as well, a value which comes from the part they play in a beautiful landscape, either when growing together as in a forest, or when, as individual specimens, their attractive outlines are fully revealed. All who love trees should see to it that our native species are preserved wherever possible, and that areas of natural woodland near our cities and towns should be guarded well.

The value of the delightful and cooling shade of a tree in a hot summer day is not to be measured in dollars and cents. The contrast between a street having attractive shade trees and one without any is very great. Well planted home grounds, with trees and shrubs judiciously and pleasingly placed, how attractive they are!

There is great satisfaction in a well kept hedge, giving a trim but attractive boundary to the lawn or the garden, or screening unattractive objects beyond; and again, the homelike and softened effect of a vineclad house, how much we admire it!

In Canada the use of ornamental trees and shrubs is not at all general, although the abuse of them has been very great. In the country where the opportunities for beautifying the home grounds are abundant, very little is done, and the farmers' homes, in the great majority of cases, are most unattractive places indeed. Our cities, towns and villages are, in many cases, little better, except in limited areas, the unattractive dwelling houses being unrelieved by shade trees on the streets, or by ornamental trees and shrubs on the private grounds. All the native trees and shrubs have, in many places, disappeared, the natural beauty has gone, and instead there are houses with hard and ugly outlines.

In 1908, the Ottawa Horticultural Society offered to supply ornamental shrubs and vines free to residents on some of the

*Synopsis of lecture before O.F.N. Club, January 25, 1916.

most unattractive streets in Ottawa, and to plant them as well. Circulars to this effect were sent to every resident, but the movement was not popular, the people did not wish the planting done, the main reason given being that if their places were made more attractive the assessment would be raised, and if the assessment were raised the rent would be raised. Whether their fears were well grounded or not we do not know. The shrubs and vines were planted, but planted about public buildings in Ottawa, not private residences. There are some well planted private places in Ottawa, but not nearly as many as there might be.

In 1909, a by-law was prepared by the Ottawa Horticultural Society and submitted to the City Hall, by which tree planting and tree mutilation were to be regulated through a Tree Inspector, under the City Engineer. The planting of certain kinds of trees was to be prohibited, the distance apart of the trees was to be limited, and there were many other good features of the proposed by-law. It was, however, not passed.

When will there be greater uniformity in the planting of shade trees on the streets of Ottawa? At present anyone plants what he pleases, and there may be a hundred kinds of trees on one street for all that is done to prevent it. Ottawa has much to learn from some of the prairie towns in this repect. There the city, not the individual, plants the trees, and plants a whole street with one or two kinds, with the result that instead of a hundred species, more or less, of trees of all ages, there is uniformity, with a much more pleasing effect.

As an example, take Clemow Avenue, where the uniformity of the avenue of elms is most pleasing, although later on they will be much too close for best effect, unless thinned. What an improvement this is over the planting on many of the streets of Ottawa!

A Civic Improvement League for Canada was recently organized, and no doubt, some day before long we shall have a branch in Ottawa. It can do good work by getting an improved by-law under which our trees shall be properly planted and cared for. Ottawa, as the capital of the Dominion, should be the most beautiful city in Canada, and some day it may be. Much has been done to make it attractive, but much remains to be done. The fact that it is situated where the climate is rather cold does not prevent the use of many attractive ornamental trees and shrubs, and few cities in America are so fortunate as to have in their vicinity such a collection of trees and shrubs as is to be found at the Experimental Farm, where their merits may be studied before planting is done in the city.

About 3,000 species and varieties of trees and shrubs may be grown at Ottawa.

For street planting, the Sugar Maple, (*Acer saccharum*), and the American Elm (*Ulmus americana*), are two of the best trees. The maple has not the graceful outlines of the elm, but as a shade tree is very desirable. It grows rapidly, does not split or break easily, and the foliage is handsome in summer and very attractive in autumn. It is not, as a rule, much affected by insects or disease.

The American elm is particularly suitable for wide streets and in front of public buildings, and has an advantage over the Sugar Maple in that it can be pruned up quite high, without making the tree less attractive, but rather improving its appearance; whereas in the case of the Sugar Maple it makes the tree much less attractive if it is pruned very high. The elm is, however, more subject to injurious insects than the maple, and the fall web worm often renders the tree very unsightly.

Among the trees which might be used as a street tree more than it is, is the Red Oak (*Quercus rubra*). This is a rapid growing tree, not a slow grower, as many suppose. The glossy foliage is quite attractive in summer, and it takes on very pleasing shades in autumn. The foliage remains on the trees longer than that the Sugar Maple and much longer than that the elm.

Some of the best ornamental trees are among the native evergreens. The White Pine (*Pinus Strobus*),is the most desirable pine for ornamental purposes. It is more graceful than most other pines, and the foliage is a pleasing shade of green. The Yellow or Bull Pine (*Pinus Ponderosa*), of British Columbia, is a very stately species, succeeding well at Ottawa.

Douglas Fir (*Pseudotsuga Douglasii*), the big tree of British Columbia, after twenty-five years' growth at Ottawa, promises to continue to do well, and is a very attractive tree.

Englemann's Spruce (*Picea Englemanni*), a native of the Canadian Rocky Mountains and Selkirk Mountains, is a beautiful tree, and has thriven well at Ottawa. While not as blue in colour as the Blue Spruce (*Picea pungens*), it has softer foliage and is of a different shape. Those who have grown the Blue Spruce longest find that when the tree gets to be twenty-five or thirty, or perhaps more, years of age, the branches die at the bottom, even when the tree itself is in the open. This is due to the fact that the growth is stronger part way up than it is at the base, and the branches at the base eventually die. The Englemann's Spruce, on the other hand, remains broadest at the base.

The White Spruce (*Picea canadensis*), formerly *P. alba*, makes a fine ornamental tree, but, unfortunately, it has, in recent years, been badly affected with the Spruce Gall louse, which disfigures it very much. While young, or up to perhaps thirty years, the Norway Spruce (*Picea excelsa*), is one of the most attractive evergreens, and is a very rapid grower, but it gets ragged looking as it grows older.

THE FIRE AND THE MUSEUM AT OTTAWA.

By HARLAN I. SMITH, Geological Survey, Ottawa.

The Museum of the Geological Survey, Ottawa, is to Canada practically what the National Museum is to the United States and the British Museum to the United Kingdom. This museum has been greatly affected by the fire which, beginning about 9 p.m., February 3, 1916, destroyed the Dominion Parliament building, and caused the loss of several lives. Before 2 a.m., February 4, while the flames were still spreading, a member of the Cabinet was considering the use of the large auditorium in the Victoria Memorial Museum building as possibly a suitable place for the meetings of the House of Commons, and members of the Geological Survey were holding themselves in readiness to clear any of the other space necessary.

The Geological Survey occupied practically all the building except the three and a half floors in the east wing and an office which was used by the National Gallery. Each hall and wing is practically one hundred and twenty feet long by sixty feet wide.

About ten a.m., February 4th, the morning of the fire, the Survey staff was informed of the intended use of the building as a temporary home for the Dominion Parliament. The large auditorium with its gallery, which was only partially furnished and had been but little used for lectures, was immediately released from museum uses, and prepared by the Department of Public Works, so that the House of Commons was enabled to begin its session at 3 p.m, or in less than twenty hours after its deliberations had been disturbed by the fire. The throne used by the Governor-General in the privy council room, which was rescued from the fire, served for the Speaker of the House of Commons. A press gallery was built back of the Speaker.

The west hall was occupied by the tentative exhibit of minerals. This exhibit was packed and removed in six hours, or by 4 p.m., Friday, which was less than twenty hours after the fire began. The costly cases in which these minerals were exhibited had meanwhile been taken apart and placed in storage. Rooms for the members of the Senate were made here.

The west wing, which was being prepared for geological and mineralogical exhibits, was cleared before Monday noon. The Senate met at 8 p.m. on Tuesday in this new chamber, which had been vacated by the museum within seventy-five hours after it became known that the Senate would meet in the museum.

The east hall, with invertebrate palaeontological exhibits, similar in size to the other exhibition halls, contained thousands of small and delicate specimens. These were all carefully wrapped, packed and taken away. Forty hours after the beginning of the fire, all the museum specimens and cases had been moved from this part of the building, which was made into offices for the members of the House of Commons.

Of the east wing, containing tentative vertebrate palaeontological exhibits, three-quarters were cleared, and these exhibits were stored, with those of the other quarters, along the walls of the southern half of the hall. This clearing involved not only the moving of small exhibits in cases, but also of such heavy fragile specimens as the titanotherium and the skulls of dinosaurs and mammoths, yet it was all done within two hours after this notification, that is by noon, or in less than twenty hours from the time that the fire broke out.

The ethnological specimens were taken out of the tower hall, which was then fitted up and used before Friday noon as a newspaper library corresponding to the one where the fire originated.

Before noon, that is within less than two hours after notice, the tentative exhibit of Canadian archaeology, in seventeen cases, covering three-quarters of the west hall, was cleared of specimens and cases, while the tables upon which the cases stood were left for the use of the members of parliament. The specimens were transferred to sixty-eight trays and stored in the archaeological laboratory in the basement. Meanwhile the remaining quarter of the hall had been cleared of a tentative exhibit of entomology in four cases. In this hall a place for the press gallery staff to work, various offices for members of the Senate, and offices for the Hansard staff, which records the deliberations of the House, were made ready before Monday noon.

The exhibits in the permanent anthropological hall were left intact. Besides the exhibits the archaeological specimens in storage under the exhibition cases were also undisturbed. The ethnological exhibits which are of specimens from the Eskimo, the Indians of the north-west coast of America, and the Algonquian and Iroquoian Indians of the eastern woodlands, were undisturbed. The aisles in this hall, however, were used for storing furnishings and specimens from various other departments, and for office space for the ethnologists.

The zoological hall, similar in size to the others, was cleared by Sunday noon. This necessitated the taking apart of splendid large group cases, and the dismantling of groups of seals, mountain goat, mountain sheep, musk oxen, and various other exhibits, and the removal to storage in the aisles of the anthropological hall cases, containing exhibits of mammals, birds and reptiles. The space was divided into offices for the members of the House of Commons.

The offices on the second floor were promptly vacated with the exception of two, that of the curator and mineralogist and that of the vertebrate palaeontologist. The invertebrate palaeontological offices were moved to the third floor. The archaeological office was moved to smaller space in the entomological laboratory on the third floor, all specimens being taken to the laboratory. The known loss to archaeological specimens caused by the move from both office and tentative exhibition is negligible, the damage being less than one dollar. Work on monographs will be hampered for lack of space to spread out the material for study, but every specimen is still available, on permanent exhibition, in storage under the exhibits, or in the laboratory, where aisles allowing for the free passage of trays are maintained, though the storage reaches the ceiling in most of the remaining space. The ethnological office was moved into the south end of the anthropological exhibition hall, and the botanical office was moved into the botanical herbarium on the third floor. The library was not disturbed. The vacated rooms were at once occupied, chiefly by the Cabinet and other members of the House of Commons.

The offices, drafting room, workshops, and storage on the third floor, were mostly retained, but the little lecture hall was released. The lectures in course were postponed indefinitely. The zoological study material and the herbarium were undisturbed. The physical anthropological office was concentrated into about half its former space, and an ethnological storage room was vacated.

In the basement the workshops and laboratories were mostly

retained, as were the taxidermist department, the laboratory of vertebrate palaeontology, the photographic department, and half a hall devoted to the workshop of the National Gallery. Some work rooms were vacated, however, and the distribution offices, with their vast store of publications and maps, were moved to another part of the city.

Of about a hundred and forty members of the Survey staff, over seventy moved about a mile to a series of buildings recently taken over by the Government on the north side of Wellington Street, between Bank and Kent streets, while some sixty of those most intimately connected with museum work retained room in the Victoria Memorial Museum building. In this work of moving, militia motor lories were pressed into service, as well as sleighs and other transports, and the office furnishings and working specimens went out at the rate of sixty loads in one day.

His Royal Highness, the Governor-General, inspected the House of Commons and the other parts of the Victoria Memorial Museum building turned over for the use of Parliament, at eleven a.m. on Monday, less than eighty-seven hours after the fire began, or less than seventy-four hours after the museum authorities were notified of need for the space.

The Museum retains intact only one and a quarter of the exhibition halls, namely, the anthropological hall and part of the hall of vertebrate palaeontology.

A sample museum, by means of which to advance museum interests in the Dominion, has been begun in the anthropological hall. The archaeological and ethnological exhibits are are intact, some of the best zoological exhibition cases of birds, reptiles and insects, have been placed in the wider aisles where they may be viewed; while mounted mammals and skeletons of various animals have also been placed in the aisles and on top of the cases.

On the whole, the scientific work of the museum may go on practically unhampered. The lecture work is being carried on in other auditoriums. The exhibitions eventually may be facilitated by the present apparent set back, as the museum staff is undiscouraged, and the members of parliament, who are now in daily proximity to the exhibits, and constantly meeting museum workers, may become so interested that they will provide future facilities for museum work in the Victoria Memorial Museum building, or in a building even better adapted for museum purposes. Besides this they may carry home to all parts of the Dominion inspiration to establish useful museums and to improve those already in existence.

ENCOURAGE THE BIRDS—WHAT BROCKVILLE IS DOING.

An interesting movement is now under way in Brockville, Ont., for the protection and encouragement of birds. Definite plans, under the co-operation of the various educational institutions, were decided upon at a large meeting held on March 24, 1916, on which occasion Dr. C. Gordon Hewitt, Dominion Entomologist, of Ottawa, gave an illustrated address.

The movement promises much success, and the committee in charge will, it is hoped, reach their goal, namely, the making of Brockville a city of song birds. Every Brockville boy is invited to make a bird box to exhibit at an exhibition of bird houses to be held on April 28 and 29. Special prizes will be awarded for:—

1. The best house from the standpoint of workmanship.
2. The best bird house.
3. The most artistic bird house.
4. The most unique idea in a bird house.
5. The first house to have a bird build in it.
6. The boy taking the best picture of a bird house after it is placed for the season.
7. The best picture of a bird on or near a bird house made this year, both bird and house to appear in the picture.
8. The best picture of a song bird in Brockville.

The committee in charge of the campaign, namely, Mr. W. A. Remmer, Principal of Public Schools; Mr. G. E. Cox, Instructor of Manual Training, and Mr. W. H. Wood, Secretary Community Work, are to be congratulated on the successful commencement of their undertaking. It is hoped that the boys of Brockville will do their part, and thus lead the way for similar campaigns in other cities. The subject of bird encouragement is one which is gradually receiving more attention from the general public. Outside of the economic value of many of our wild birds, their very presence in our cities is pleasing to most of us, and in inviting them to stay with us, the popular form of invitation is the placing of suitable nesting boxes in our trees.

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THE OTTAWA NATURALIST, VOL. XXIX., 1915-16

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