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THE

OTTAWA NATURALIST

Being Volume XXIX of the

TRANSACTIONS

OF THE

OTTAWA FIELD-NATURALISTS' CLUB

Organized March, 1879. Incorporated March, 1884.

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McDougall, Miss J. C.

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Michaud, Geo.
Miller, *Prof.* W. G., (Toronto).
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Morris, H.U.
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Scott, Miss Mary McKay.
Scott, W., *B.A.*, (Toronto).
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Sooper, John.
Sowter, T. W. E.
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Sweaton, W., *B.A.*
Symes, P. B.

Taylor, F. B., (Fort Wayne, Ind.)
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Terrill, L. M., (St. Lambert, Que.)
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Venables, E. P., (Vernon, B.C.)

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Walker, E. M., *B.A.*, *M.B.*, (Toronto).
Walker, Bryant, (Detroit).
Wallace, J. S., (Toronto).
Wallis, J. B., (Winnipeg, Man.)

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Watson, J. F.
White, E. G.
White, George, R.
White, James, (Snelgrove, Ont.)
White, J. F., *M.A.*, *LL.D.*
Whyte, Miss Ida V.
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Whyte, R. B.
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Williams, J. B., (Toronto).
Williams, N.Y.
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Wilson, Morley, E.
Wilson, W. J., *Ph.B.*
Wilson, E., (Armstrong, B.C.)
Winchester, H. S.

Young, A. N.
Young, C. H.

Ziemann, Arthur.

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GREENE, DR. E. L. ,United States National Museum, Washington, D.C.
HILL, ALBERT J., *M.A.*, *C.E.*, New Westminster, B.C.
HOLM, THEODOR, *Ph.D.*, Brookland, Washington, D.C.
MERRIAM, DR. C. HART, Department of Agriculture, Washington, D.C.
WICKHAM, PROF. H. F., Iowa City, Iowa, U.S.

THE OTTAWA NATURALIST

VOL. XXVII. APRIL, 1913 No. 1

ANNUAL REPORT OF THE OTTAWA FIELD-NATURALISTS' CLUB, 1912-13.

During the past year a good deal of quiet, steady work has been done by the officers and members of the Club. The Council has held six meetings during the year. The following is a brief synopsis of its work. At the first the various committees were appointed, and arrangements were made for an extra lecture by Mr. C. Leden on "Our Neighbours of the North." At the second the spring outings were arranged for, a delegate was appointed to attend the meetings of the Royal Society in May, and a committee of four was appointed to consider the advisability of publishing the Constitution. This, as you have seen, was done in the October number of THE OTTAWA NATURALIST. In September a meeting was held to arrange for some fall excursions. At this meeting twelve new members were elected. At the next meeting the programme of winter lectures, as proposed by the indefatigable chairman of the Lectures Committee, was received and ordered to be printed. And, at the last meeting the reports of several committees and branches were received, and a vast amount of routine work dealt with, including some valuable suggestions for the next Council, and the election of seven more members.

MEMBERSHIP.

In all 21 new members have been elected, 12 have resigned, leaving a total of 330 members now on the books. One of the corresponding members, the Rev. G. W. Taylor, has died, as reported in the September issue of THE OTTAWA NATURALIST.

PUBLICATIONS COMMITTEE.

As no matters of a sufficiently important nature to warrant the calling together of the Committee arose during the past year no special meetings were held. The chief work of the Committee, namely, the publication of THE OTTAWA NATURALIST, has proceeded very satisfactorily, thanks to the careful work of our Editor, Mr. Arthur Gibson, to whom we wish to express our indebtedness and appreciation of the regular manner in which our journal has appeared. It has contained a number of interesting and important papers which have not been confined to our local fauna and flora.

The Librarian, Mr. A. E. Currie, has arranged the back issues of THE OTTAWA NATURALIST so that we now know definitely what numbers are available.

The report of the Librarian is as follows:—

A short while ago the surplus copies of THE OTTAWA NATURALIST, issued since April, 1910, were transferred from the residence of Mr. Arthur Gibson to the Osgoode St. School, and placed along with the older numbers.

About a year and a half ago, while first arranging the back numbers of the NATURALIST in an accessible position, there were five parcels found, each bearing the legend, "Nos. required to complete this set, Sept., 1891; April, 1892; Jan., 1895; Feb., 1895, and March, 1896." Recently, while examining these parcels and loose numbers more closely, it was found that the five numbers were never issued. There are, therefore, five complete sets of THE OTTAWA NATURALIST still available and no doubt at least another two sets could be compiled from the loose numbers.

During the year the various publications received through exchange have been placed, with the library of the Club, on the north-west stack of the second floor of the Carnegie Library.

EXCURSIONS COMMITTEE.

As the experience of the preceding season seemed to indicate that a programme of fortnightly excursions did not give a sufficient number of excursions after the deduction of those inevitably cancelled through bad weather or other unforeseen circumstances, it was decided to revert to the practise, previously followed by the Club, of holding an excursion every week during the earlier part of the season. A programme of weekly excursions was accordingly arranged for. The first excursion was on April 27th to Beechwood, and the two succeeding ones on May 4th and May 11th to Blueberry Point and Britannia respectively. Notwithstanding the backward season these were well attended and in every way successful. Detailed reports of them will be found in THE OTTAWA NATURALIST.

An excursion was held on Saturday, June 1st, to Chelsea, at which several leaders and a large number of members took part. While waiting for the return train the leaders gave an instructive account of the botanical and geological specimens that were observed and studied. No account of this was published.

The excursion to Ironsides on June 8th was spoiled by a deluge of rain, which rendered it impossible to make observations. On June 22nd a few members held an enthusiastic and successful excursion to the Mer Bleue.

On October 5th an excursion was held to the Experimental Farm, but, owing perhaps to the lateness of the date, only a small number of members attended. And the following Saturday a small but very enthusiastic party did some explorations near MacKay's Lake. It would seem that if the attempt to revive fall excursions is to be successful they must be arranged for dates a little earlier in the season.

LECTURES COMMITTEE.

During the winter season five public lectures were held, all of which were well attended. All of the lectures were held in the Assembly Hall of the Normal School.

The following printed programme was carried out:—

November 29, 1912—"School Gardens as a Factor in Education," Prof. H. L. Hutt, B.S.A., Professor of Horticulture and Landscape Gardening, Ontario Agricultural College, Guelph, Ont.

December 10th, 1912—"Short Talks on Local Natural History," by members of the Club.*

January 28th, 1913—"Modern Museum Work for the Scientist, the Teacher and the Public," Mr. Harlan I. Smith, Archæologist, Geological Survey, Ottawa.

February 11th, 1913—"Heredity: Its Meaning and Application," C. Gordon Hewitt, D.Sc., Dominion Entomologist, Central Experimental Farm, Ottawa.

February 25th—"Some Conditions of Progress in the Plant World," Prof. W. T. MacClement, D.Sc., Professor of Botany, Queen's University, Kingston, Ont.

March 18th, 1913—ANNUAL MEETING. President's Address. L. H. Newman, B.S.A., Secretary, Canadian Seed Growers' Association, Ottawa. (Carnegie Library).

In addition to these there was one lecture in the spring, shortly after the last annual meeting. It was delivered by Mr. Christian Leden, on the Esquimaux, and was illustrated by views, and also by phonographic reproductions of their weird music.

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*At the meeting on December 10th, the following members took part: J. W. Gibson, "On some Problems in Animal Ecology, with special reference to Insects"; (2) J. W. Eastham, "The Life History of a Slime Mould, and Notes on some Ottawa species"; (3) E. E. Lemieux, "Notes from Blueberry Point, and Observations on Fish and Game on the Petewawa"; (4) J. M. Swaine, "Some Forest Insects in Clark's Bush"; (5) F. E. Buck, "The Rose".

BOTANICAL BRANCH.

There have been eight meetings of this branch held during the past year. Two meetings have been held at the residences of the following members: Messrs. W. T. Macoun, R. B. Whyte and G. H. Clark; and one at the residences of Messrs. A. E. Attwood and J. J. Carter. A synopsis of three of these have been published, one will appear next month, and one will be published in full. It is hoped that a report of the other meetings will be obtained and published.

The subjects presented at these meetings were: Problems in Horticulture of Interest to Botanists, by W. T. Macoun; A Summer in Britain, illustrated with lantern slides, by R. B. Whyte; Nature Study of Plants in Relation to their Identification, by Dr. M. Oscar Malte: The Ottawa Flora from an Ecological Point of View, by J. M. Macoun; A Trip to Bermuda in January, by R. B. Whyte; Common Fungi on Wood, by J. W. Eastham; Elevator Screenings as a Means of Plant Dispersal, by J. R. Dymond; The Shade Trees of Ottawa, by Dr. E. H. Blackader; The Effect of Temperature on Fruit and Trees, by W. T. Macoun; Hardiness from a Physiological Standpoint, by L. H. Newman.

The attendance has been good and the interest sustained at all these meetings.

ENTOMOLOGICAL BRANCH.

During the past year considerable field work was accomplished by members interested in this branch of the Club's activities. Large numbers of insects were collected throughout the Ottawa District and some of these have been found to be new to science. Certain groups were sought after particularly, and many of these have been determined, and definite records for the locality obtained.

The most important outbreak of an insect which has occurred for many years was that of the Forest Tent Caterpillar, *Malacosoma disstria*, which devastated miles of forest country in the Gatineau Valley, north of Ironsides. The foliage of certain trees, particularly poplar and birch, was entirely eaten by the caterpillars and for a certain period the trains leaving Ottawa for Kazabazua and Maniwaki were unable to make the grade between Ironsides and Chelsea, owing to the thousands of caterpillars which were present on the rails.

The Treasurer's report shows a balance on hand of $9.79.

The thanks of the Club are due to Principal White for the use of the Normal School Hall, to the Library Board and the Librarian of the Carnegie Library for the use of the lecture and

committee rooms on several occasions, to the gentlemen who have so kindly and willingly assisted us in our course of winter lectures, and to the press of the city for the free insertion of notices of meetings and publication of the lectures and excursions of the Club.

All of which is respectfully submitted,

E. H. BLACKADER,
Secretary.

TREASURER'S STATEMENT FOR YEAR ENDING 18TH MARCH, 1913.

RECEIPTS.

Balance from year 1911-12		$ 13.85
Subscriptions:		
Arrears	$ 34.00	
1912-13	178.45	
1913-14	26.00	
		238.45
Advertisements in OTTAWA NATURALIST		109.50
OTTAWA NATURALIST sold		.15
Author's Extras sold		16.20
Government Grant		200.00
		$578.15

EXPENDITURE.

Printing OTTAWA NATURALIST, Vol. XXVI, nine numbers with covers	$342.76	
Illustrations	18.22	
Author's Extras	46.30	
Miscellaneous Printing: circulars, mailing envelopes, etc	32.76	
	$440.04	
Postage on OTTAWA NATURALIST	33.14	
Editor	50.00	
		523.18
Lecture expenses		24.82
Sundry Expenses: postage, envelopes, etc		20.36
Balance		9.79
		$578.15

W. T. MACOUN,
Treasurer.

Examined and found correct.
J. BALLANTYNE,
E. C. WIGHT,
Auditors.

MEETINGS OF THE BOTANICAL BRANCH.

Feb. 1st, at the residence of Mr. R. B. Whyte, members present: Messrs. F. E. Buck, L. H. Newman, F. Jones, W. T. Macoun, G. O. McMillan, W. Dreher, E. D. Eddy, A. E. Attwood, J. J. Carter, G. H. Clark, J. R. Dymond, C. J. Tully, Dr. Blackader and the host, Mr. Whyte, who gave a very interesting account of his impressions of Bermuda after a short visit there in January.

The Bermudas consist of five large islands, bridged together, viz.: Bermuda, St. George, St. Davids, Somerset and Ireland. The total length is 25 miles, and from half to three wide. The highest point is 260 feet above tidewater. To the north-west there is a long, low coral reef, and the entrance to the harbor is from the east. One out of the pleasure trips is to take a glass-bottomed boat and go out towards the reef, and see the marine organisms at a depth of 5 to 50 feet below through the clear water. The temperature of the water is 71°.

Bermuda is entirely of coral formation, resting on a substratum of limestone. The temperature in January was 65-68°. The minimum for the year is 57° and the maximum 80°. The rain falls on an average 200 days in the year, with a total rain-fall of 65 or 70 inches. Nearly all the drinking water is collected from the roofs of the houses, and conducted and stored in cemented cisterns. Some few wells are sunk into the coral rock, but if sunk too deep the water is salty.

The total area is 12,378 acres, of which 2,300 is in cultivation; of this 1,000 is good, 1,000 fair, and 300 poor. Agriculture is very primitive. The farms are all small, and cultivation is done mostly by hand and with the spade, quickly followed by the rake. The soil is red and very friable, and has to be fertilized after every second or third crop. The chief crops are onions, potatoes, lily bulbs and flowers, parsley, carrots, beets, radishes, arrowroot, beans, tomatoes and peas.

Animal life is scarce, excepting introduced and more or less domesticated species. The native birds are the Ground Dove (*Chaemepelia passerina bermudiana*), Redbird (*Cardinalis cardinalis cardinalis*), Bluebird (*Sialia sialis sialis*), Catbird (*Dumetella caroliniensis*) and Bermuda Vireo, or Chick-of-the-village (*Vireo griseus bermudianus*). The crow, partridge and English sparrow are also common. The white-eyed vireo is also seen.

The indigenous plants are the cedar (*Juniperus Bermudiensis*), palmetto (*Sabal umbraculifera*), mulberry (*Morus rubra*), seashore grape (*Cocoloba uvifera*), mangrave (*Rhizophora mangle*), argemone (*A. mexicana*), creeping sorrel (*Oxalis virginica*), bay

bean (*Dolichos roseus*), butterwood (*Conocarpus procumbens*), Burrbush (*Triumfetta althaeoides*), passion flower (*Passiflora minima* and *P. coerulea*), fennel (*Foeniculum vulgare*), prickly pear (*Opuntia vulgaris*), vervain (*Stachytarpheta jamaicensis*), sage bush (*Lantana crocea* and *L. odorata*), bindweed (*Polygonum convolvulus*), spurge (*Euphorbia buxifolia*), pigeon-berry (*Duranta plumieri*), Spanish bayonet (*Yucca aloifolia*), aloe (*Aloe soccotrina*).

There are 27 ferns, including a very pretty Maiden-hair.

A list of plants which had escaped from gardens, noticed during the visit was presented as well as one of introduced weeds. Numerous specimens and views were shown by the speaker as well as some fruit, but unfortunately this latter had not kept well. Several questions were asked by members present, and altogether it was a most interesting meeting.

E. H. B.

Feb. 15th, at the home of Mr. Geo. H. Clark, the following members being present: Messrs. G. H. Clark, R. B. Whyte, H. T. Gussow, J. W. Eastham, J. R. Dymond, H. A. Honeyman, A. Eastham, E. D. Eddy, J. J. Carter, D. Freeman and J. W. Gibson. Two topics were presented, (1) "Elevator Screenings as a Means of Plant Dispersal," by Mr. J. R. Dymond, of the Seed Branch of the Department of Agriculture. (2) "Common Fungi in Wood," by Mr. J. W. Eastham, Chief Assistant Botanist of the Experimental Farm. Both topics were treated by the respective leaders in a thoroughly capable manner and were discussed by the members present.

Mr. Dymond, who has made a thorough investigation of the uses as well as the dangers connected with elevator screenings, having spent some time at the large elevators at Fort William, first dealt with the great menace to agriculture arising out of the rapid spread of noxious weeds in Canada. He gave some figures that cannot but challenge the attention of everybody interested in our leading industry—agriculture. He stated that no less than 10,000 tons of weed seeds were screened from western grain handled at the elevators at Fort William annually, and estimated that the cost of harvesting, threshing, freighting and screening weed seeds was in the neighbourhood of half a million dollars per year. These seeds, however, were not entirely worthless, and sometimes represented quite a considerable revenue to the elevator companies, who shipped them in car load lots to Chicago and other American cities, where they were used as fodder. From $10 to $12 a ton is paid for such elevator screenings at Fort William, so that the con-

sumer has to pay from $15 to $18 a ton for them. Such screenings frequently contain seeds injurious to the health of animals, but it has been found that sheep are able to eat them without any apparent injury, and indeed thousands of sheep are fattened on such screenings every year. The feeding value of such screenings depends largely upon the character of the fodder grains found in them. For example a composite sample of wheat screenings was found to give the following analysis:—20 per cent. wheat and barley; 12 per cent. oats and wild oats; 30 per cent. buckwheat screenings; 12 per cent. lamb's quarters; 3 per cent. tumbling mustard; 2 per cent. other mustards; 2 per cent. other weed seeds; 19 per cent. chaff, etc.

It was explained how, that on account of this gigantic waste the present system of grain inspection has been evolved. All grain, practically, coming to Fort William, is docked. The average dockage in wheat is 2½ per cent., and on flax is 5 per cent. to 7 per cent. As a rule the elevator companies get whatever revenue comes from the sale of all screenings. The total dockage for 1911-12 was as follows:- wheat, 23,000 tons; flax, 14,000 tons; oats, 1,500 tons; barley, 750 tons.

In conclusion Mr. Dymond pointed out the importance of doing two things: (1) To provide some means whereby grain screenings could be devitalized on a commercial basis, and (2) to take out such seeds as are injurious to stock, and to dispose of the saleable part to Canadian stock men rather than to Americans.

In discussing fungi, Mr. Eastham first reviewed some general characteristics of the class, such as absence of chlorophyll, parasitism and saprophytism. He referred to the injurious nature of parasitic fungi in causing many diseases in plants and to the equally beneficial nature of saprophytic fungi in reducing fallen leaves, trees and other organic debris to simpler materials which at once become the food of growing plants again. He stated that there was no hard and fast line separating saprophytic from parasitic fungi, as for example, when a certain species of parasitic fungus had worked the destruction of a living tree it might still continue to exist upon the wood of the dead tree (saprophytic). He pointed out that the part that one sees above the substratum on which it grows is but the fruiting body, whereas the part which actually destroys the wood, viz., the mycelium, is buried out of sight and is found penetrating the fibres of the wood sometimes for several feet from the point where the external fruiting body is located. He traced the evolution in the structure of the fruiting body from the simplest of freely exposed plate-like discs to the more complex gill-bearing and tube-forming species. In this connection it was also noted

that each species had its own peculiar adaptation for the successful distribution of its spores. In one case, viz., that of the common polypore which grows on the sides of trees, it was admirably shown by an excellent specimen that the vertical position of the spore-bearing tubes is essential to distribution of spores and that when the position of the fruiting body had been altered by the falling of the tree that a re-adjustment of the plane of the fruiting body through 90° had taken place the succeeding season. Another specimen exhibited showed the effects of the mycelium in changing the colour of the wood fibres from the normal shade to a brilliant green.

During the discussion which followed Mr. Eastham's address Mr. Gussow referred to several peculiar uses of the tissue produced by the fruiting bodies of certain fungi that grow on wood. He cited an instance which had come under his own observation where the silk-like fibres from the under or spore-breeding surface of a polypore had been used in the making of a remarkably good cap. He also referred to the peculiar way in which rude fire-arms were discharged at the time of the Thirty Years' War in Europe. Some of the dry and spongy fibres collected from the fruiting bodies of certain wood fungi were used somewhat after the manner of a fuse. This was ignited by sparks from a steel and flint and "eventually" the gun went off. J. W. G.

NOTES ON THE OCCURRENCE OF INTERESTING FORMS OF CYPERACEÆ IN QUEBEC.

By Bro. Victorin, Longueuil College, Longueuil, Que.

Very little is known of the distribution of our local Cyperaceæ. Being of slight or no economic value, these plants are of no interest to the average man, and even botanists themselves frequently overlook them.

Apart from any utilitarian consideration, the sedges play an important part in nature. It is by means of this type of organism that plant life takes hold of marshes, shoals, river-banks and damp places generally. If the finality of the multitude of individuals appears obvious, that of the immense number of species is yet an unsolved problem. It is to be remembered that the study of the *Carex* species alone, numbering about 1,000, constitutes a whole science by itself, and demands the labour of numerous specialists.

The object of these notes is to make known several species, or varities, of this family, collected by the writer, in Quebec, which are, he believes, mostly new for that province, if not for Canada.

1.—*Cyperus Schweinitzii* Torr.: Collected at Oka, P.Q., on the alluvial barrens bordering the Lake of Two-Mountains. It was hitherto known in Canada only from the Great Lakes region, southern Ontario and the Northwest. The limits of this *Cyperus* are, therefore, considerably extended; it will probably prove to be fairly abundant in the Lower Ottawa Valley, when properly separated from common *C. esculentus* L. In the field, *C. Shcweinitzii* can be readily distinguished from *C. esculentus* L. by its much more slender culm.

2.—*Scirpus Torreyi* Olney: Collected at St.-Eustache, P.Q., in the Ottawa River, near the outlet of the Lake of Two-Mountains. This large Bulrush belongs to the group of common *Scirpus Americanus* Pers. Up to the present time, the northern limit of *Scirpus Torreyi* was not supposed to intersect the boundary line between Canada and United States. The present discovery would lead us to conclude that it occurs throughout the waterways of western Quebec. *Scirpus Torreyi* fruits later than any other tall Bulrush in the east. In early August, the St-Eustache specimens were yet poorly developed though sufficiently mature to permit certain identification.

3.—*Scirpus pedicellatus* Fernald: St-Bruno, P.Q. In clearings, on peat, August, 1912. Recently separated by Prof. Fernald, of the Gray Herbarium.,

4.—*Scirpus atrocinctus* Fernald: Alluvial banks, Lake Nominingue, P.Q., August, 1912. Also recently separated. Will prove abundant in Quebec. Many herbarium specimens labelled *S. cyperinus* are likely this species.

5.—*Scirpus atrocinctus* Fernald, var. *brachypodus* Fernald. Châteauguay, P.Q., July, 1912. Spikelets in dense, irregular clusters, the boreal form of the species.

6.—*Scirpus cyperinus* (L) Kunth, var. *pelius* Fernald. Alluvial banks, Lake Nominingue, P.Q., August, 1912. Growing intermingled with *S. atrocinctus*. The very long involucral bracts characterize the species as does the deep colour of the involucels for the variety. The plant begins to fruit when *S. atrocinctus* is already mature.

7.—*Scirpus subterminalis* Torr.: Aquatic, nearly submerged species. First collected in 1908, in Megantic Co. (Nat. Can. XXXVI, No. 5; mai, 1909). Found again in a small lake near St-Jerome, Terrebonne Co. This interesting species must range throughout Quebec.

That further investigation will add much to our knowledge of the Cyperaceæ in Quebec, is beyond doubt. More material, however, and a close study of collections already made, are necessary before a complete treatment of the subject can be undertaken.

BOOK NOTICE.

CANADIAN ALPINE JOURNAL; Special Number; pp. 96, with map and many plates. This special number of the Canadian Alpine Journal is made up of reports on the mammals, birds and plants collected and noted by the naturalists who accompanied the Alpine Club expedition to Jasper Park, Mount Robson, and the Yellowhead Pass, in July and August, 1911, and forms a supplement to the detailed, fully illustrated report of the Topographical Section of the Alpine Club published in Vol. IV of the Canadian Alpine Club Journal. Copies of both the Journal and the special number here reviewed may be had from the Secretary-Treasurer of the Alpine Club, Sidney, B.C., the price of the latter being $1.00.

About half of the special number is made up of Mr. N. Hollister's report on the "Mammals of the Alpine Club Expedition to the Mount Robson region," which is prefaced by a short itinerary and the delimitation of the life-zones represented in the region covered by the expedition. Six new mammals are described, two bats (*Myotis pernox* and *Myotis altifrons*), a marmot (*Marmota sibila*), a chipmunk (*Eutamias ludibundus*), a spermophile (*Callosperophilus lateralis tescorum*) and a caribou (*Rangifer fortidens*). Very full descriptive and other notes make this list of mammals the most valuable one that has been published on the Canadian Rocky Mountain region. It is followed by a short list of the Reptiles and Batrachians.

In his paper on the birds collected or observed on the expedition, Mr. J. H. Riley enumerates seventy-eight species, and while no new forms are described not the least valuable part of Mr. Riley's contribution is his notes on the habits of some of the more important birds, and the plumage and other variations noted. Altogether his list will be of great value to visitors to Jasper Park and will serve as a basis for future work in that region. As no species are enumerated which were not collected or noted by the Alpine Club party the list is not complete, but is all the more valuable on that account, as no doubtful species are included.

Messrs. Hollister and Riley made in connection with their work a small collection of plants, 147 in all. These plants have been determined, and four species described, by Mr. Paul C. Standley. It is unfortunate that Mr. Standley should have prefaced his paper by saying that: "It was to be expected that plants from this particular area, where previously no botanical collections had been made, would contain many things of interest." As a matter of fact many of Drummond's types were collected in or near this very area, and, in 1898, Mr. William Spreadborough, of the Geological Survey staff, spent the whole

collecting season in the Jasper Park region. No complete list of Mr. Spreadborough's plants was published, but many new species were described in *Pittonia*,* by Dr. Greene, and notes on interesting species by the writer in THE OTTAWA NATURALIST.† Drummond's plants are all labelled "Rocky Mts. between Lat. 52° and Lat. 56°," but it is known that he went west from Edmonton to the Rocky Mountains and worked north. All four of the species described by Mr. Standley (*Carex atrosquama*, *Vagnera pumila*, *Gaillardia bracteosa* and *Artemisia lævigata*) were collected by Spreadborough and are in the herbarium of the Geological Survey. None of them were thought worthy of specific rank or even of separation from well known species, although *Carex atrosquama*, now described by MacKenzie, may stand as a segregate from the *C. atrata* group. Of *Vagnera pumila* it may be said that none of the characters given by Mr. Standley as separating it from *V. trifolia* are peculiar to the Jasper Park plant, many of our northern Canadian specimens exhibiting all of them; the best that can be said of this proposed species is that if separable from *V. trifolia* of the United States it extends from Newfoundland to the Northern Rockies; among Spreadborough's specimens we find the long-exserted raceme and those barely longer than the leaves among plants of the one collecting. An attempt was made by Prof. John Macoun in 1884‡ to separate the forms of *G. aristata*, but they so intergraded that it was found to be impossible. An examination of some thirty sheets from western Canada shows a wide range of variations and Spreadborough's specimens from Maligne River and from near Henry House give *between them* all the characters used by Mr. Standley to separate *G. bracteosa* from *G. aristata*. Without comparison with a large series of Canadian specimens *G. bracteora* might stand as a species, but after comparison it must be considered to be only one of the many intergrading forms of *G. aristata*. *Artemisia lævigata* may be all right, but it also belongs to a very variable group from which many segregates have been described. It was first collected by Drummond in the Rocky Mountains in Lat. 52°. Drummond's plant was referred to *A. Norvegica* by Hooker and to *A. arctica* by Torrey and Gray. Spreadborough collected it in the Yellowhead Pass. The list of plants, notwithstanding the above criticisms, is a most useful one and the only one available for the Jasper Park region.

This special number of the Alpine Club Journal brings together just the kind of information that will be wanted by visitors to Jasper Park and should be in the hands of everyone who goes there. J. M. M.

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*Pittonia Vols. IV and V.

†Ottawa Naturalist. Vol. XII, p. 161 et seq.; Vol. XIII, p. 166 et seq.; Vol. XV, p. 269 et seq.; Vol. XVI, p. 217 et seq.

‡Cat. Can. Plants, Vol. I, p. 250.

PRELIMINARY LIST OF OTTAWA SPHÆRIIDÆ.

In the NATURALIST for March, 1890, the late Revd. Geo. W. Taylor and the writer published a catalogue of the recent Mollusca of Ottawa, as recorded in the publications of the Club up to that time. The list included five *Sphæria—sulcatum, striatinum, stamineum, rhomboideum* and *occidentale*; four *Musculia—partumeium, securis, rosaceum* and *truncatum*; and five *Pisidia—virginicum* (as adamsi), *compressum, abditum ventricosum*, and *rotundatum*. Three of the *Pisidia* are listed with a (?), indicating doubtful identification.

In many of the years that have since elapsed, but little work was done. Not much leisure until recently fell to the lot of any of the remaining few who were disposed to interest themselves in things so uncommercial as our inland shells. During the past three summers, however, opportunities afforded for the first time were taken advantage of. The hunting grounds of other days and manners were revisited, and new ones sought farther afield. A very large quantity of material was collected—some species in thousands—and submitted to Dr. V. Sterki of the Carnegie Museum, who is recognized the world over as the supreme authority in the *Sphæriidæ*. The list which follows has in every case the sanction of his identification. I am under the deepest obligation to him. I also desire to acknowledge my indebtedness to Mr. C. W. Johnson, of the Boston Museum of Natural History, for his kindness in comparing specimens from Ottawa with Prime's types, or with shells bearing Prime's labels. Dr. Sterki has in addition generously presented me with co-types of many of the species which he has described.

While the list which follows is intended to be merely preliminary, it is believed to be correct as far as it goes. No species has been included from localities not in the Ottawa Valley, and with few exceptions the shells have been found within or near the limits of the Capital City.

SPHÆRIUM.

1. S. sulcatum, Lamck.
2. S. striatinum, Lamck.
3. S. stamineum, Con.
4. S. rhomboideum, Say.
5. S. occidentale, Prime.
6. S. aureum. Prime.
7. S. crassum, Sterki.
8. S. emarginatum, Prime.
9. S. flavum, Prime.
10. S. torsum, Sterki.

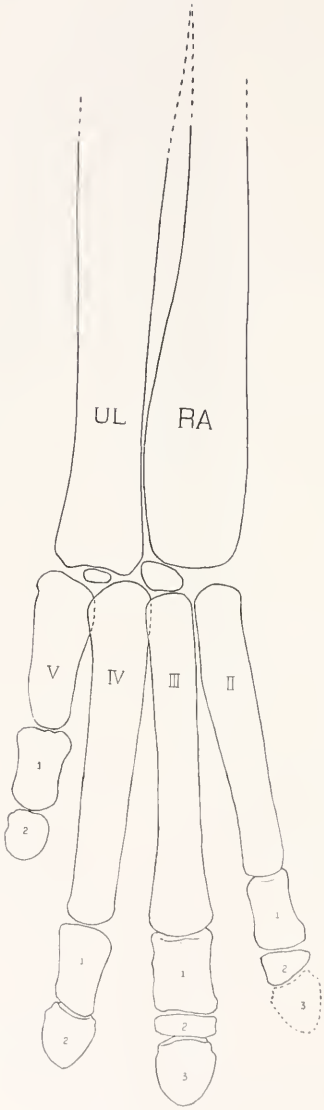
MUSCULIUM.

11. M. partumeium, Say.
12. M. securis, Prime.
13. M. rosaceum, Prime.
14. M. truncatum, Linsley.
15. M. transversum, Say.
16. M. parvum, Sterki.
17. M. ryckholti, Norm.
18. M. winkleyi, Sterki.
19. M. declive, Sterki.

PISIDIUM.

20. P. virginicum, Gm.
21. P. compressum, Prime.
22. P. abditum, Hald.
23. P. ventricosum, Prime.
24. P. rotundatum, Prime.
25. P. aequilaterale, Prime.
26. P. affine, Sterki.
27. P. glabellum, Sterki.
28. P. milium, Held.
29. P. minus, Adams.
30. P. noveborascense, Sterki.
31. P. ohioense, Sterki.
32. P. pauperculum, Sterki.
33. P. politum, Sterki.
34. P. rotundatum, Prime.
35. P. sargenti, Sterki.
36. P. splendidulum, Sterki.
37. P. streatori, Sterki.
38. P. strengi, Sterki.
39. P. subrotundum, Sterki.
40. P. succineum, Sterki.
41. P. variabile, Prime.
42. P. walkeri, Sterki.

There is a quantity of material still under consideration and much more will, it is hoped, be secured during next summer. Several additions will, I think, be made to the list of Sphæria and Musculia, and many to the already lengthy catalogue of our Pisidia. These minute shells occur everywhere throughout the district in such great numbers and variety that their determination is a matter of extreme difficulty. When Dr. Sterki has further studied the specimens now before him and the collections of 1913, a fairly complete list might be published, with the localities in which they are found, and figures of the larger or more beautiful species. L.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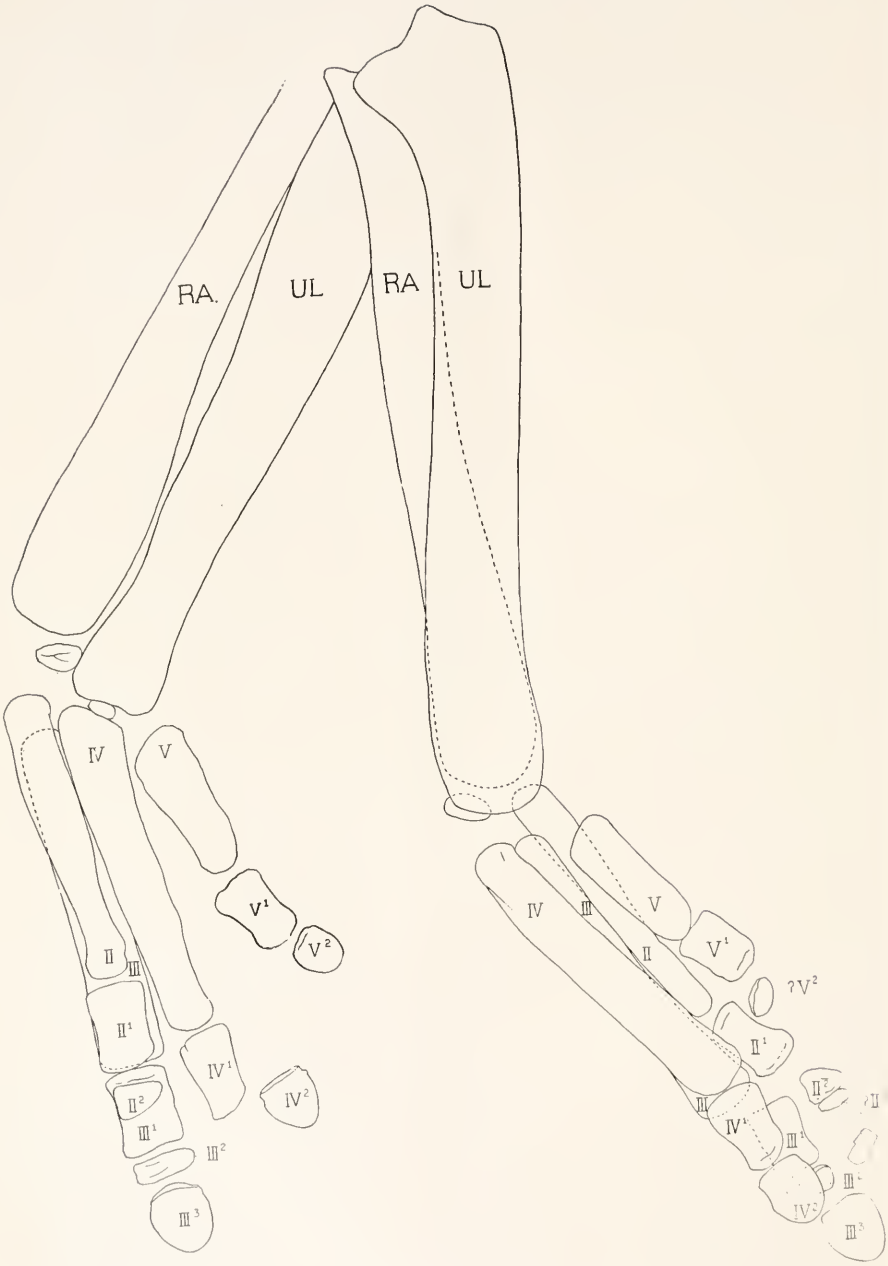
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THE OTTAWA NATURALIST

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THE MANUS IN A SPECIMEN OF TRACHODON FROM THE EDMONTON FORMATION OF ALBERTA.*

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

The present paper has particular reference to the osteology of the front feet, or hands, of a specimen of Trachodon discovered last summer in the Edmonton formation (upper Cretaceous) of Red Deer river, Alberta, by the Geological Survey vertebrate palæontological field party under Charles H. Sternberg. This specimen is now being mounted in high relief preparatory to being placed on exhibition in the museum of the Geological Survey, Ottawa.

The skeleton of this Trachodon is almost complete from the front margin of the snout to the sixth caudal vertebra, but the remainder of the tail is missing. This defect, however, can be remedied to a great extent in mounting the specimen as fortunately a large portion of the tail of another individual of similar size was found at the same locality and can be used to take the place of the missing vertebræ.

This skeleton was found on its right side with the head bent downward, the front legs stretched out, and the long hind legs drawn up. Although it has been subjected to considerable pressure, the effect of which is apparent, there has been remarkably little displacement of any of the bones. The specimen is being mounted in the exact position in which it was discovered. The rock is a sandy clay, mostly soft and easily cut away, but a tenacious layer of clay iron-stone coats some parts of the skeleton and is removed with difficulty. The bones have undergone a varying amount of silicification and are in parts considerably fractured.

A clear and sharp impression of the tuberculated skin is preserved to the left of the mid-line of the back, above the sacrum, for a distance of about four feet. Large polygonal tubercles,

* Communicated with the permission of the Director of the Geological Survey.

averaging about $\frac{1}{4}$ of an inch in diameter, are here seen to form oval shaped clusters, from 2 to 3 inches in maximum diameter, surrounded by small tubercles, about $\frac{1}{10}$ of an inch in average diameter, occupying the intervening spaces, which are about $\frac{3}{4}$ of an inch across.

Of particular interest is the lattice-like arrangement of the ossified tendons in three tiers, or layers, on each side of the neural spines of the back. These rod shaped tendons have been known to occur in Trachodon, but in no specimen, so far as the writer is aware, has their exact disposition been revealed and described. In the Red Deer river specimen of last summer's collection some of the tendons are seen to fork, or bifurcate, and their arrangement in a triple series is shewn in a very clear and perfect manner. A somewhat similar disposition of ossified tendons, in a double series, in the back and tail has been suggested in published descriptions of Iguanodon and Camptosaurus.

The Red Deer river specimen is in an excellent state of preservation as a whole, and is one of the most complete of the skeletons of Trachodon mounted in the museums of this continent. As it is unusual to find the front feet with most of the bones represented, and but little disturbed, a short description of them is here given. It is proposed to publish, at a later date, particulars regarding the shape and position in this skeleton of the ossified tendons, and of such other structural characters of interest as further study of the osteology of the individual may bring to light.

Of the four digits in the manus all the phalanges are represented with the exception of the terminal one of digit II. As digits III, IV and V ended distally in a hoof (or nail) carrying bone it is probable that digit II, the inner finger, bore a terminal hoof-phalanx also.

The phalangeal formula presented by this specimen is as follows:—

Digit II. . Three phalanges, the terminal one presumably a hoof-bone.
Digit III. . Three phalanges, the terminal one a hoof-bone.
Digit IV. . Two " " " " "
Digit V. . " " " " " "

This formula differs materially from the one given by Mr. Barnum Brown in a paper entitled "The Osteology of the Manus in the Family Trachodontidæ*" and descriptive of the fore foot of a specimen of *Trachodon annectens* (Marsh) in the American Museum of Natural History, Cat. No. 5060, from the Lance

* Bull. Am. Mus. Nat. Hist., vol. xxxi, art. x, pp. 105-107, fig. 1. New York, U.S.A., May 28th, 1912.

formation of Converse County, Wyoming, U.S.A., a specimen remarkable for the completeness of the skin impression which has been made the subject of a recent memoir by Professor Henry Fairfield Osborn.**

The phalangeal formula of the fore foot of this specimen of *Trachodon annectens* is given by Mr. Brown as being—

Digit II.....with three phalanges, the third a hoof.
Digit III..... " " " " " "
Digit IV..... " " " no hoof.
Digit V..... " " " " "

It is thus evident that this formula, as interpreted by Mr. Brown, is not applicable to the family Trachodontidæ as a whole.

In the Red Deer river Trachodon from the Edmonton beds the fore feet were in the position indicated in plates I and III. In removing the rock particular care has been taken to keep each bone in the exact position in which it was found, so that any observer of the mounted skeleton, or any reader of this paper, with the aid of the illustrations provided, would be in a position to interpret for himself the phalangeal formula presented. This policy of nondisturbance of the bones has been carried out in the preparation and mounting of the entire skeleton.

In both hands the metacarpals II, III and IV are grouped together in close contact, whilst the fifth metacarpal lies somewhat apart.

In the right manus the dorsal surface of digit II, and the palmar surface of the other three digits are presented to view. Owing to the pressure to which the specimen has been subjected digits IV and V have been brought to the same level as digit III. Digit II is at a higher level, directly over and pressed down on digit III.

In the left manus the palmar surface of digits II and III, and the dorsal surface of digits IV and V are uppermost. Digits II and III lie in the same horizontal plane whilst digits IV and V are at a higher level, digit IV resting on digit III.

The right ulna and radius are seen from behind, and the left ulna and radius obliquely from without and behind.

The ulna and radius in each arm, and some of the metacarpals and phalanges, shew the effect of vertical compression, to a varying extent, in an exaggerated breadth. This distortion is given in the accompanying figures, but is probably most clearly expressed in plate III, reproduced from a photograph.

** Memoirs Am. Mus. Nat. Hist., new series, vol. I, part II, Integument of the Iguanodont Dinosaur Trachodon, pp. 33-54, plates V-X, with seventeen text figures. New York, 1912.

Regarding the fore feet as webbed and adapted for swimming, the digits were most probably capable of being spread laterally to some extent, probably more than is indicated in the figure forming plate II, which is intended to represent the hand in a moderately quiescent state.

As shewn in plates I and III, the metacarpals II, III and IV of both hands are parallel to each other and pressed together, with metacarpals II and IV brought round metacarpal III toward each other; the result probably of the contraction of the skin after the death of the animal and not indicative of the proper position of these bones when the creature was alive. Mr. Brown, in figure 1 of his paper, already cited, representing the "Manus of Trachodon correctly assembled" places metacarpals II, III and IV in this position of close contact which is not, in the writer's opinion, the true position of these bones in a fore foot capable of being used with much effect in swimming.

In the Red Deer river specimen the different bones of the digits are distinctive in shape and can be recognized in each hand. Metacarpals III and IV are of about equal length. Metacarpal II is considerably shorter, and metacarpal V is less than half as long as Nos. III and IV. The distal end of metacarpal III is enlarged, but in the other metacarpals the proximal end is the larger, the difference in size between the two ends being not so great in metacarpal II. The articulating surfaces of these bones are evenly rounded.

Plates I and III shew accurately the relative position of the bones of the hands to each other as found.

Digit V has two phalanges, of which the terminal one is smaller than that of digits III and IV. It has a more rounded outline, but, as in the others, is thick proximally and thin toward the distal margin. This terminal bone is well preserved in the right hand, is in position, and is in all respects a typically shaped hoof-bone. In the left hand a fragment regarded as the proximal end of the corresponding bone of digit V is shewn slightly in advance of the first phalanx.

The hoof-bone of digit IV of the right hand was found slightly out of place, as indicated in plates I and III. The corresponding bone in the left hand was missing and has been restored in plaster.

The three phalanges of digit III of the left hand are preserved and were found practically in place as shewn. The second phalanx of digit III of the right hand was missing and has been restored from the left hand, the restoration being placed in the sacpe found between the first and third phalanges.

The only bone not represented in either of the hands is the terminal phalanx of digit II, which is shewn in dotted outline in plate II, as a true hoof-bone on the assumption that, as the other three digits bore flattened hoof-bones, it is probable that the moderately long digit II had a terminal phalanx of this nature also. Two fragments found lying near and in front of the second phalanx of digit II of the left hand may be part of the missing hoof-bone in this hand, but it was not found possible to identify them as such.

The second phalanx of digit II is a distinctly triangular bone and is preserved in both hands, where it occurs with its pointed side directed inward. A similarly shaped bone is described and figured by Mr. Brown as occurring in the manus of *Trachodon annectens* as the second phalanx of digit IV with its narrow side pointing outward.

A carpal bone is preserved in each hand, in the same position, viz., at the ulnar side of the end of the radius. In addition, a smaller carpal bone was found in the right hand, at the middle of the end of the ulna, but a corresponding second carpal was not found in the left hand.

The teeth of the Trachodon from the Edmonton formation, whose fore feet are described above, agree in size, shape and marginal sculpture with those of *Trachodon marginatus*, Lambe*, from the lower horizon of the Belly River formation, whose beds are exposed a few miles farther down Red Deer river to the south-east. As the marginal sculpture of the teeth is one of the principal specific characters of *T. marginatus* the specimen from the Edmonton formation is regarded as belonging to the species from the Belly River formation until evidence is obtained to prove that a specific difference exists between them.

EXPLANATION OF PLATES.

PLATE I—The fore feet of the specimen of Trachodon from the Edmonton formation of Red Deer river, Alberta, Cat. No. 8399, shewing the bones in the position in which they were found. One-sixth the natural size.

PLATE II—The right fore foot of the same specimen, dorsal aspect, with the bones in, what is considered to be, their natural position. One-sixth the natural size.

PLATE III—Reproduction from a photograph of the fore feet, of the same specimen, as mounted. One-sixth the natural size.

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* Contributions to Canadian Palæontology, vol. III (quarto), part II, 1902. New genera and species from the Belly River series.

A FURTHER NOTE ON CRYPTOLITHUS VERSUS TRINUCLEUS.

BY PERCY E. RAYMOND.

Judging from the protests which I have received since the publication of my note on "Some Changes in the Names of the Genera of Trilobites" in the February number of the NATURALIST, there is a deep and universal feeling against giving up the familiar name *Trinucleus*. It is readily admitted by all that the name *Trinucleus* has no standing, but it has existed so long and has become so familiar, that the general opinion seems to be that it would be unwise to give it up now. It is interesting to note how this same feeling has come down through the literature. It will be remembered that *Cryptolithus* was described in 1832 by Green[1], who gave a recognizable description and figure. In describing *Trinucleus* in 1839, Murchison[2] cites *Cryptolithus* as a synonym of the *Trinucleus*, Lhwyd, 1698, but after his generic description he adds: "Seeing that these distinctions, as above defined, prevail in several species of Trilobites, I have formed them into a *new* genus under an old name assigned to one species of an animal of this kind of Lhwyd."

In this same year, Emmrich[3] referred four of Murchison's species to *Cryptolithus*, and Goldfuss in 1843 also used *Cryptolithus*, as did Emmrich again in 1845. In these same years, however, (1840-1845), Milne-Edwards, Eichwald, Burmeister, Munster, Portlock, and Lovén all used *Trinucleus*, either under the influence of the prestige of Murchison, or for the reason which influenced Hall[4] in 1847 in "adopting the generic name of Lhwyd as given by Murchison." Hall evidently believed in priority, but the third edition of Linnæus had not then been fixed upon as the point beyond which one should not go in reviving old names.

Barrande, in 1852, gave a good resumé of the uses of the names, and while he decided for *Trinucleus* on account of priority, he says: "Quelques savans, au nombre desquels nous distinguons Bronn et Goldfuss, ont maintenu le nom de *Cryptolithus* qui, sous certains reports, a le droit de priorité. La plupart des paléontologues ont employé de préférence la dénomination plus ancienne de *Trinucleus*, bien qu'elle date d'une époque où la nomenclature systématique n'était pas encore introduite dans la science. Il y a là une question de droit, qui

[1] Monthly American Journal of Geology, vol. 1, No. 12, p. 560, 1832.
[2] Silurian System, p. 659, pl. 23, 1839.
[3] De Trilobitis, etc., p. 49, 1839.
[4] Paleontology New York, vol. 1, p. 249, 1847.

nons semble compliquée. Il nous appartient pas de la résoudre, et dans le doute, nous avons adopté le nom généralement admis dans tous les pays, et que nous voyons introduit jusqu'en Amérique, par J. Hall, dans son bel ouvrage sur la Paléontologie de New-York."[5]

The next year, Salter[6], in speaking of the name *Trinucleus* says: "The name of the genus can only be retained by general consent, for the typical species was formerly denominated *Cryptolithus*, and sufficiently described by Green;"....."But in this case strict priority may be allowed to yield to classical feeling." In 1854, Angelin[7] used the family name *Cryptolithidæ* though he employed *Trinucleus* for the genus.

From 1854 to 1890 *Cryptolithus* seems to have been pretty effectually submerged, but attention was drawn to it in the latter year by Vogdes[8], who says of *Cryptolithus*: "This generic name should replace that of *Trinucleus*"; and again: "Sir. R. I. Murchison has revived this old name of Lhwyd's, and all subsequent paleontologists have adopted it. Lhwyd's description meant no more than the general name trilobite of the more modern writers, and could not, except by courtesy, set aside Dr. Jacob Green's genus *Cryptolithus*."

Thus we may divide the users of these names into three classes: first, those writers who from 1832 to 1851 used *Cryptolithus*; second, those who, like Hall, Barrande, and their followers, turned to *Trinucleus* on the ground of supposed priority; and third, men like Murchison, Salter, and many modern writers, who knew that *Cryptolithus* had priority, but who preferred the better name. On the mere ground of sentiment, which of course should have no weight at all, there would seem to be as much in favor of *Cryptolithus* as *Trinucleus*, and as a matter of simple justice everything points to the former name. The only argument against returning to *Cryptolithus* is the one of present convenience, and I must admit that is, practically, a very weighty argument. *Trinucleus* has gotten such a firm hold upon us that it will take more than ordinary courage to give it up. And it should be pointed out that we are in a fair way to saddle ourselves with more cases of this same kind. It will be interesting to see whether present day paleontologists are going to allow such names as some of those recently proposed by Jaekel for Agnostid genera or the still more flagrant *Glockeria* of

[5] Systeme silurien du centre de la Boheme, vol. 1, p. 610, 1852.

[6] Memoirs Geol. Sur. Unit. Kingdom, Dec. 7, p. 5, 1853.

[7] Palaeontologia Scandinavica. Pars 1. Fasc. 2, p. 64 of 3d ed., 1878.

[8] Bull. U.S. Geol. Survey, No. 63, pp. 107, 148.

Wedekind[9] to get the same standing that *Trinucleus* has.

Enough of the destructional phase of the subject. When I wrote before I did not see any way in which the name *Trinucleus* could be retained, but after studying the large collection in the Museum of Comparative Zoology, a way has presented itself. The present tendency is to split our large genera up into a number of smaller groups, and "*Trinucleus*" must doubtless be so divided. There are at present only two divisions in use, *Cryptolithus* or *Trinucleus*, and *Tretaspis*, McCoy. As stated in my previous paper, Murchison's first species, *Trinucleus caractaci*, is strictly congeneric with *Cryptolithus tessellatus*, but fortunately Murchison described six species when first proposing *Trinucleus*. The fifth of these species, *Trinucleus nudus*, is well known to be an *Ampyx*, and the sixth, *Trinucleus? asaphoides*, was referred by Salter to *Ogygiocaris buchii*. This leaves four species, the first and fourth of which, *Trinucleus caractaci* and *T. lloydi*, belong to the earlier genus *Cryptolithus*. The second and third, *Trinucleus fimbriatus* and *T. radiatus*, have been referred by Salter[10] to *Tretaspis*. Now the type of *Tretaspis* is *Trinucleus seticornis*, (Hisinger), as that species was understood by McCoy[11]. *Tretaspis* differs from *Cryptolithus* in having only the anterior part of the glabella bulbous, while the posterior part is constricted and shows two pairs of deep glabellar furrows. The cheeks also show eye-lines and simple eyes are present, even in the adult. Young specimens of some species of *Cryptolithus* show a poor development of these same characters, but as they are retained in the adult of *Tretaspis seticornis*, *T. bucklandi*, and other forms, (*Tretaspis reticulatus*, Ruedemann is a good American example), the genus is a valuable one, and well founded. *Trinucleus fimbriatus* and *T. radiatus* do not, however, conform strictly to the type of either *Cryptolithus* or *Tretaspis*.

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[9] Since my previous paper was written, this recent blunder, for such it seems, has come to my attention. Wedekind, in an article on the "Klassifikation der Phacopiden" in the Zeitschrift der Deutschen Geol. Gessellschaft, Bd. 63, heft 3, p. 323, 1912, has proposed the generic name *Glockeria* with *Phacops glockeri* as the type. Reed, as recently as 1905, on page 226 of the Geological Magazine of that year, proposed the name *Phacopidella* with *Phacops glockeri* as the type. Wedekind refers frequently to Reed's paper, and quotes *Phacopidella*, though he nowhere says that that name is preoccupied or otherwise unusable. Wedekind's *Glockeria* is not the same as Reed's *Phacopidella*, but it seems obvious that we can not found two genera upon a single species. I regret to have to add that the name *Reedia* was used by Ashmead in 1904 for a genus of wasps (Canadian Entomologist, 36, p. 9), so that Wedekind's intended compliment to Professor Reed is lost. In passing, it might be noted that *Phacops fecundus* Barrande, is not the type of *Phacops* s. s. as Wedekind has made it.

[10] Mem. Geol. Sur. Unit. Kingdom, Dec. 7, p. 8, 1853.

[11] Ann. Mag. Nat. Hist., ser. 2, vol. 4, pp. 401, 410, 1849.

Speaking principally of *T. fimbriatus*, which is the better known species, it has glabellar furrows, though not so well developed as in the typical *Tretaspis*, but, so far as I can learn, lacks the simple eyes and eye-lines of that genus. But the greatest obvious peculiarity of the species is the character of the fringe, which, instead of being marked by concentric rows of perforations, is crossed by a system of radiating ridges and furrows. Reed has recently studied the fringes of the various English species of "*Trinucleus*", and he speaks thus of the fringe in *Trinucleus fimbriatus*:[12] "The upper surface has all the pits arranged in radial sulci except near the genal angles." And again; "the dividing radial ridges vary from the extreme development in *T. fimbriatus*, Murchison, to the scarcely differentiated structures in *T. nicholsoni*." I am aware that Reed also says of the arrangement of the pits in concentric or radial rows that "Frequently different stages occur in the same species or different parts of the fringe of the same individual," and that he does not seem to give very high classificatory value to the pattern of the fringe. Still, we have here an extreme development along one line, which, taken with the other characteristics of the specimens, form a combination which may have the value of a generic group. The principal characters seem to be as follows: Glabella obovate, glabellar furrows present, but weaker than in *Tretaspis*, eye-lines and simple eyes absent in the adult, fringe ornamented with radiating furrows separated by strong ridges. I would therefore propose to select Murchison's second species, *Trinucleus fimbriatus*, as the type of *Trinucleus*, and let the genus stand or fall on the basis of that species. Ruedemann's *Tretaspis diademata*[13] would certainly belong to the genus as thus restricted, and probably *Trinucleus coscinorhinus*, Angelin[14], as well. Professor F. R. Cowper Reed has announced his intention of revising the British species of *Trinucleus*, and it will be interesting to see if, when the species are better known, such a grouping will be of value. We seem to have four possible courses open to us, and of them I personally prefer the fourth:

First, use *Cryptolithus* and make *Trinucleus* a direct synonym.

Second, ignore *Cryptolithus* and continue to use *Trinucleus* on the score of convenience.

Third, make *Trinucleus fimbriatus* the type of the genus and make a broad enough definition to include the type of *Tretaspis*, in which case *Trinucleus* would replace *Tretaspis*, the latter

[12] Geological Magazine, vol. 9, Dec. 5, pp. 349, 385 .1912,
[13] Bull. N. Y. State Museum, No. 49, p. 46, pl. 3, figs. 12-14,1901.
[14] Pal. Scandinavia, vol. 1, 3d ed., 1878, p. 65, pl. 34, fig. 4.

genus going into the synonomy. This would be practically the position of Salter except that we would use *Cryptolithus* for *Trinucleus*, and *Trinucleus* for *Tretaspis*.

Fourth, use the three names, *Cryptolithus* for the type of *tessellatus* and *caractaci*, *Trinucleus* for *fimbriatus* and its allies, and *Tretaspis* for *seticornis* and the like.

ZAPUS PRINCIPS MINOR.

A NEW MOUSE RECORD FOR MANITOBA.

The mouse whose name appears above was one of a small collection recently determined through the courtesy of Dr. H. W. Henshaw, of Washington, who informs me that its capture at Aweme, Manitoba, constitutes, not only a record for the Province, but also extends the known range of this rodent considerably further eastward. As a matter of fact, however, these mice appear to be the usual race met with in south-western Manitoba, as we have yet to discover any other. They are found not infrequently on the edges of woods among low bushes and occasionally in tall grass in open situations.

Like other members of the genus, they are by no means easy to capture and their long jumps (from five to seven feet) combined with their habit of doubling, often completely mystify a dog, as they would doubtless a coyote or fox; besides this they have an instinctive knowledge of their colour resemblance to the surrounding objects and so, after a few puzzling leaps, will crouch down and remain perfectly motionless until danger seems past, when they creep silently away. This is when they have strayed from their burrows. When their homes are at hand they quickly vanish beneath the ground.

Zapus princips minor may be described briefly as follows: length 219 mm., tail vertabræ 131, hind foot 30: colour agaty, sides ochraceous, moderately covered with black tipped hairs; lower parts yellowish with a slight tinge of pink fading to white beneath. It resembles closely other species of the genus, particularly *Z. hudsonius campestris*, from which it differs, however, in being slightly smaller and more brightly coloured.

But one of these mice has previously been recorded for Manitoba, namely *Z. hudsonius*, the type locality for which is Hudson's Bay. Probably at least one other—*campestris*—will eventually turn up within our boundaries, and since the extension of the Province to Hudson's Bay, others may well be discovered in the north country. STUART CRIDDLE.

THE SHADE TREES OF OTTAWA.*

In this paper several introduced species are included, but only in a few cases are varieties referred to. Those who wish to learn about the most valuable varieties can readily do so at the Central Experimental Farm, where all hardy and useful varieties are being tested. We exclude from consideration in this paper all evergreens and fruit trees.

SALICACEAE.

There are about six species of native Willows that attain the character of trees, yet few of them can stand the dry soil of a city. They are more common in the country and along the borders of streams. As a family they have soft pliant wood, slender branches, and large fibrous roots. The roots are remarkable for their toughness and tenacity of life.

There are several large willows in a vacant lot near Rideau Gate, and throughout lower town they are more frequent than in the other parts of the city. I am not sufficiently familiar with the particular characteristics of this family in the winter to say to which species they belong—whether *Salix alba*, *S. nigra*, or *S. fragilis*, but think they belong to the first, the white willow. This willow possesses some of the more important qualities requisite for a shade tree: it can readily be transplanted and it has great tenacity of life. As long as it has sufficient moisture it will grow. And yet it is not a tree to be recommended. It cannot compare in beauty either of foliage or of outline with other trees. Yet there are some exceptions.

The Weeping Willow, *Salix Babylonica*, is an introduced species, and deserves mention as a remarkably graceful tree, although it is more commonly associated with cemeteries than as a city shade tree; and I do not know of one growing in the city, although it is included in the catalogue of trees and shrubs that grow at the Experimental Farm, and is classed as "hardy." There are about 150 species or varieties of willow planted there, of which one half are counted as hardy, and possibly more would have thrived if planted on the low ground near the Canal. The Wisconsin Weeping Willow, *S. Babylonica dolorosa*, has been introduced along the Driveway and is doing well.

Among the Poplars the most important is an introduced one, *Populus nigra pyramidalis*, the Lombardy Poplar. This tree possesses a very characteristic outline, even more so than the elm, and is therefore well known to everybody. This outline is just as marked in the winter as in the summer. Its branches

*Paper read by Dr. E. H. Blackader at a meeting of the Botanical Branch held at the residence of Mr. J. J. Carter, March 1st, 1913.

are perpendicular and long, the terminal twigs having a slight inward curve. When blown by the wind the whole tree sways with a graceful feathery effect. Perhaps the best known of these poplars are the ones that can be seen from the Plaza in Major Hill Park. They overlook the canal, and from their position show to good effect, and form a picturesque sky-line. There are many other Lombardy Poplars throughout the city, and their number might well be increased, for this is a handsome tree, holding its leaves late into the autumn.

The Balsam Poplar, *P. balsamifera*, is a native species, and holds its own in the city, although it appears to be rarely transplanted to the street line, but grows in gardens or in neglected lots. In some cities it is recommended where there is much coal smoke. It is a large, handsome tree, with several shades of yellow or greenish-yellow to brown on the large limbs.

The Cottonwood, *P. monilifera* or *deltoides*, grows to a large size and is fairly common. One great objection to this poplar is the enormous quantity of cottony stuff that falls for two or three weeks in the early part of the summer, and is carried everywhere by the wind.

The Abele, or Silver or White Poplar, *P. alba*, probably also grows about the city, and may be recommended where there is plenty of space. The peculiar white-tomentose matter on the under surface of the leaves is characteristic, and the peculiar mingling of green and white makes this tree a very effective ornamental one. This beautiful silveriness of the under surface is rather heightened in the twilight. One great disadvantage of this tree is the numerous suckers it produces.

JUGLANDACEÆ.

The Butternut, *Juglans cinerea*, grows commonly all around Ottawa, and there are probably some growing within the city limits. When in the open its huge branches spread out almost horizontally. Its terminal twigs are large, and its leaves are late in coming out and fall early. Nevertheless, the large compound pinnate leaves give a very handsome effect, and the tree is well worthy of cultivation where there is plenty of space.

The Walnut, *J. nigra*, deserves to be planted more commonly around the city. The branches are much more upright or ascending than the butternut. The bark is darker in color. and the leaves are quite smooth above. The only tree I know of in the city is situated well in from the street line at the south-west corner of O'Connor and Somerset Sts.

The Hickory, sub-family *Carya*, is mentioned more for the wish to see it than the fact that it exists here. *Carya alba* or *Hicoria ovate*, the shell-bark hickory, is the most important and

the most characteristic of the family. Its wood is so valuable that possibly it has become exterminated in this locality. It ought to be replanted, especially in the large parks at Rockcliffe or Britannia, or if the Government provide for a National Park. It appears to be spreading on Mount Royal Park at Montreal. No doubt the fruit would be appreciated both by squirrels and boys. The bark of this tree is characteristic and peculiar. It breaks up into oblong plates, the ends of which curve outwards, while they cling at the centre. This peels off easily, hence the name, shell-bark or shag-bark.

BETULACEÆ.

(Including the Birches and the Hornbeams.)

Of the Birches the most ornamental and therefore the most valuable are the cut-leaved and pendulous or weeping varieties. How many varieties there are, I am not prepared to say, but they all seem related to *B. alba* or *B. populifolia*. Of course these beautiful varieties are of use only on lawns, but they are fairly common about the city. Their lower limbs come too low for them to be used along the street line, to say nothing of how much and how quickly they would be ruined by horses and passers-by.

The Common White Birch, *B. populifolia*, is common at Rockcliffe, and is too easily recognized to need description.

The Yellow Birch, *B. lutea*, also grows at Rockcliffe, but is much less common. It prefers rich, moist woodland. There are several trees in the hollow near where the new artesian well has been sunk. This is a beautiful tree in its native haunts. The bark of the trunk is of a yellowish or silver-grey color, which detaches horizontally in thin filmy layers which curl up like ribbons. In the spring the inner bark is a rich golden yellow. The catkins are upright, sessile, and very short in proportion to their breadth.

Of the Ironwoods the Hop Hornbeam, *Ostrya Virginiana*, is the only species, so far as I know, that is represented in the city. There is one on Gladstone Ave. near Metcalfe St., and several in Major Hill Park on the bank overlooking the pond. It is a tree that is more conspicuous and beautiful in the winter than in the summer, although the peculiar hop-like strobiles on the terminal twigs may attract the attention of some. But in the winter, and when standing all alone, then the tiny graceful birch-like twigs, tipped with bunches of two or three upright catkins, appear in all their native beauty. The trunk also is characteristic. It gives the appearance of strength. The bark is grey and split into numerous partly exfoliated strips, much narrower and tinier than on any other tree.

The other Hornbeam, *Carpinus carliniana*, may not grow within the city limits. A peculiarity of its growth is the manner in which the sinews of the branches are prolonged down the trunk, giving a peculiar muscular or Gothic effect. This is seen also to some extent in the beech. This tree is recommended for arbor-walks in the parks in some cities.

FAGACEÆ.

This includes the Beech, *Fagus ferruginea* or *grandifolia*, and the Oaks, *Quercus*, of which we have only two representatives. (The Chestnut, *Castanea dentata*, is rather a fruit tree, and does not thrive well here).

The Beech deserves to be planted much more commonly than it is. One great objection is that it is apt to be destroyed by boys with their penknives.

It is surprising, since our trees are leafless one half of the year, that so little attention is paid to planting for winter beauty. The winter beauty of the beech is considered quite equal to that of the elm. It is no less charming in early spring, and in the summer-time a forest of beeches has a most beautiful and bewitching effect. The compact, light grey bark of the beech tree is characteristic. This remains unbroken to a great age, and is perpetuated on the branches. Another noticeable feature is the muscular or buttress effect running down from the large branches, and more marked as the tree gets older.

There are several varieties of the Purple or Copper Beech, which add a beauty to a large lawn or park. Some fine specimens may be seen along the Driveway.

There are two species of oak that may be found in the city as shade trees, the Mossy-cup Oak and the Red Oak.

The Mossy-cup or Bur Oak, *Q. macrocarpa*, is very common in Ottawa South. The corky ridges on its branches gives it some resemblance to the Corky Elm. But the branches themselves are very different. In the elm the branches have all an outward and downward direction, in the oak they are contorted and angular, and never drooping.

The Common Red Oak, *Q. rubra*, is the prevailing type at Rockcliffe and in Rideau Hall grounds. This species belongs to the second group of oaks. Their leaves are bristle-pointed, and the fruit matures the second year. It most nearly approaches the English Oak, *R. robur*, in the effect it gives of massy strength and durability. These two species have the widest range, especially to the north, of any of the native species.

URTICACEÆ.

The American Elm, *Ulmus americana*, is deservedly the best known and the most popular of all our shade trees. Whether in the city or the country it is equally well known and equally useful and beautiful. It possesses many advantages. It can be readily transplanted, and stands a great amount of cutting and pruning. It thrives on almost any kind of soil. It is a fairly rapid grower, and soon spreads out in a broad umbrageous outline. Its lower limbs may be pruned away, leaving plenty of space for air and sunshine, and not losing in beauty of outline.

Besides the Common White Elm, there are several other interesting and valuable species in the city.

The Cork or Rock Elm, *U. racemosa*, is a valuable timber tree and is commonly planted. Perhaps it is too common, for the large corky ridges on its lower branches have a rather ungainly effect. The corky ridges on the lower branches are characteristic and probably more pronounced in the city than in its native soil.

The Slippery Elm, *U. fulva*, probably also grows in the city. It is a fortunate thing for its life that it is not so easily recognized. Its limbs are more rigid and divide at a slightly greater angle than the common elm. Its terminal branches and twigs do not have the outward and downward sweep that is so characteristic of the common White Elm. The simplest way of identifying this elm is to bite and moisten a twig with the saliva. The mucilaginous or slippery quality is then easily recognized by rubbing between the fingers.

The English Elm, *U. campestris*, and the Scotch Elm, *U. glabra*, are also planted about the city. There is one English Elm near the arcade on Parliament Hill. On Gloucester St. between Bank and O'Connor streets, there are several Scotch Elms, *U. glabra*.

The Hackberry, *Celtis occidentalis*, is mentioned more for the wish than the fact of its growing here. There was one tree growing along the banks of the Rideau River, in Ottawa South, but it perished last year in the march of city growth. There is no reason why this tree should not grow well along the Driveway. The hackberry has the outline of the elm, but it is out of its range here and rarely produces its fruit so far north.

Red Mulberry, *Morus rubra*, grows on Lisgar St., a few doors east from Bank St., on the south side. It is probably the only specimen in the city. The bark is scaly, and has a reddish tinge.

The terminal twigs are fine, and have an elm-like appearance. It seems to be a valuable and long-lived shade tree.

ROSACEÆ.

The only species that calls for our attention as a shade tree is the Mountain Ash. This is fairly common. Its bright red berries are conspicuous during the fall and early part of the winter, and make it a deservedly popular ornamental tree. There are several varieties of the European Rowan Tree, *Pyrus aucuparia*.* The American one, *P. americana* is at its best in our latitude. It becomes a shrub farther south, and extends far north to the shores of James Bay.

LEGUMINOSÆ.

The Kentucky Coffee Tree, *Gymnocladus dioica* or *canadensis* is far from home in this latitude. There is only one specimen, so far as I know, growing in the city. It is on the Normal School grounds on Elgin St., but there are several at the Experimental Farm. This tree is remarkably homely in winter. Its smaller branches are so thick and blunt, and its leaves so late in coming out that it has earned the title, *Chicot*, the dead tree, among our French-Canadian neighbors. But, in summer its leaves are characteristic and beautiful. It is one of the very few trees that produce doubly compound leaves.

The only other large tree that produces such leaves is the Honey Locust, *Gleditsia triacanthos*. It grows at the Experimental Farm and is marked as half-hardy.

The Common Locust, *Robinia pseudacacia* would be far more valuable both as a shade tree and for its timber if it could be effectually protected from the ravages of boring insects. There is almost an avenue of these trees near Rockcliffe, and the street is appropriately named, Acacia Avenue, but it is a rare tree in other parts of the city. Some say it is not a beautiful tree in winter. Its bark is deeply furrowed, and inclined to scale; the trunk is often twisted, the branches are irregular and contorted and twiggy. The seed-pods hang on the tree all winter.

(To be continued.)

* One member here stated that all the mountain ashes about the city belong to the introduced European species, and that it is even spreading to nearby woods.

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REVISION OF THE SILURIAN OF SOUTH-WESTERN ONTARIO.

By M. G. WILLIAMS.*

At the 1912 meeting of the Paleontological Society of America, Professor Charles Schuchert read a paper entitled "The Cataract, a New Formation at the Base of the Silurian in Ontario and New York." During the summer of 1912 the writer was engaged by the Geological Survey of Canada in revising the Silurian of Manitoulin Island and Georgian Bay, and was with Professor Schuchert during his field observations in these regions. A preliminary statement of the results of the work will appear in the Summary Report of the Geological Survey of Canada for 1912. In the meantime, it may be stated that the "Cataract" formation in the Georgian Bay region consists of two very distinct divisions—a lower dolomite member 11 or 12 feet thick near Collingwood, and 50 feet or more in thickness on parts of Manitoulin Island; and an upper shale member of varying thickness.

For the dolomite division of the Cataract formation the name "Manitoulin member" is proposed, because of its importance on Manitoulin Island. Here it rests upon soft green shale at the top of the Richmond formation. At Cabot Head 6 feet or more of soft, red shale intervene between the green Richmond shale and the base of the Manitoulin dolomite.

The red clay-shale, which forms the upper division of the formation on Manitoulin Island, is well exposed along the road between the villages of Kagawong and West Bay, at a locality north-east of Kagawong Lake. For this division, the name "Kagawong member" is proposed. In the Manitoulin region the Kagawong shale is overlain by about 6 feet of green shale about 6 feet thick which appears to grade upward into the argillaceous dolomite of the Lockport formation. At Cabot Head probably 16 feet of firm red shales underlie soft red clay-shale similar to that on Manitoulin Island. Firm red shale,

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

containing bryozoa, overlie the Manitoulin dolomite along the south side of Georgian Bay. According to the interpretation of the writer, all the red shales are to be included in the Kagawong member. The age and complete stratigraphic relations of a considerable thickness of gray to green shales, occurring above the red shales at Cabot Head, are not yet definitely determined, although they may, in part at least, represent a later phase of the Kagawong sedimentation. They are overlain by about 6 feet of green shale beneath argillaceous dolomite of Lockport age, as is the case with the Kagawong shale on Manitoulin Island.

THE SHADE TREES OF OTTAWA.

(Continued from page 36).

ACERACEÆ.

The Maple family. It is difficult to decide which is the most valuable among so many useful species.

The Sugar or Rock Maple, *Acer saccharum*, probably ranks first because of its well known and valuable qualities. It is among the finest forest trees, and it is handsome and thrives well in the city as long as there is not too much dust and coal smoke. The bark is rugged or shaggy with deep long furrows; the trunk is straight and opens into a shapely oval outline. It is a slow-growing tree, but long-lived.

The Black Sugar Maple, *A. nigrum*, grows near the city and may grow along the streets, but it is difficult to distinguish it in winter.

The White or Silver Maple, *A. saccharinum*, is one of the commonest, and is deservedly popular. It is a fast grower. The trunk soon divides into 3 or 4 secondary stems with an upward sweep, from which side branches droop outward and downwards. The bark on the branches is smooth and of a light grey color until of considerable size. Both in poise and outline this tree suggests the elm, and the method of city pruning increases the effect. It is one of the first trees to blossom in the spring.

The Norway Maple, *A. platanoides*, is an introduced species and deservedly ranks high. The leaves resemble the Sugar Maple, but are thicker and of a darker green. They remain on the tree a week or more longer than the other maples, and fall without turning color. The petioles exude an acrid milky juice which coagulates. This is characteristic, and is a test easily made. The bark closely resembles the White Ash. On the upper limbs it is of a brownish-grey color. The trunk is apt to divide too low into numerous small branches, forming a broad, rounded head. At an early stage it should be pruned well up.

The Red or Swamp Maple, *A. rubrum*, is somewhat allied to the White Maple. It is also a soft maple and a rapid grower. It does not grow to such a large size, and its branches are more upright. It is in its native home in the forest that it appears in all its glory and sheds its characteristic halo of beauty over all the autumn woods. The Red Maple is appropriately named. Its first blossoms flush to a bright red before the leaves appear, the keys ripen scarlet in June, its leaves swing on scarlet stems all summer, and its young twigs are reddish, and in autumn its leaves turn a magnificent scarlet before they fall, and there is a characteristic tinge of red in the bark in the winter.

The Striped Maple, *A. Pennsylvanicum*, and the Mountain Maple, *A. spicatum*, hardly attain to the dignity of trees.

The Box Elder or Manitoba Maple, *Acer negundo* or *N. aceroides*, comes last in value among the maples as a shade tree. It grows very rapidly, and for this reason it may be grown as a protection for more valuable trees. The trunk divides into several wide-spreading branches and numerous long straggling branchlets. This is the only maple that has compound leaves. These leaves have no beauty in the fall. And the pendulous bunches of keys remaining on the tree all winter are not attractive; and sooner or later its thicket of branchlets so cut off the light that the whole tree has to be cut down.

SAPINDACEÆ.

The well-known Horse Chestnut, *Æsculus hippocastanum*, is a handsome tree in summer, but in the winter is homely. It is recognized by its large terminal buds, which are covered with a resinous gum. The branches have the double compound curve, and the terminal twigs point upwards. This tree is much more common in Toronto and other western cities. We might well have more of them here.

TILIACEÆ.

The Linden, or Basswood, tree may be considered famous in that it gave its name to the father of the great botanist, Linneus (or in its Swedish form, Linné).

Our species, *Tilia americana*, deserves to be planted more frequently in the city than it is. It has a fairly characteristic outline. The large trunk gradually tapers as it gives off numerous side branches with a double compound curve. The trunk is not lost until fully two-thirds way up in the oval-columnal outline of branches. The leaves are larger and unequal-sided. The flowers come out in June and are very sweet-scented, and attract large numbers of honey bees.

The European Linden, *T. europea*, is distinguished by its smaller and more regularly heart-shaped leaves.

OLEACEÆ.

The family is represented by the Ash, *Fraxinus*, of which the common White Ash, *F. americana*, is the best species. The bark is a brownish-grey tinged with red. It is furrowed on old trees, but smoother on the upper branches. This is a forest tree, but is well adapted to city life. Its lower branches have the compound curve. They can be pruned off, and leave a tall, columnar stem reaching above the highest dwellings and casting a grateful shade.

BIGNONIACEÆ.

Represented by the Catawba or Catalpa, *C. speciosa*. The bark is very rugged. The pods remain on the tree all winter and appear to be longer in the cultivated tree than in the wild one. They grow nearly a foot long. The fragrant flowers grow in an erect terminal panicle somewhat like the horse-chestnut, and are very beautiful. Two large specimens of this tree grow in front of the porch at Rideau Hall.

There are two trees, both closely related to the evergreens, that deserve to be more commonly planted as shade trees. One is the European Larch, *Larix Europea*, which is of a deeper shade of green than our native larch, *L. laricina*; its needles are a trifle longer, its branches droop more, and its cones are longer, and have more scales.

Finally, the Japanese Ginko tree or Maidenhair Tree, *Ginko bilobata*, although a slow grower, is quite hardy and deserves special mention as a shade tree. The terminal twigs are upright. In summer, when clothed in its bright green, thickish leaves, it is indeed very beautiful. The leaves somewhat resemble the leaflets of ourMaidenhair Fern, hence its common name.

USEFUL WILD PLANTS OF CANADA.

By J. W. EASTHAM, B.Sc.

With a flora so extensive and as yet so little studied from an economic point of view as that of Canada, it is reasonable to expect that future investigation will bring to light many plants of economic value amongst those which at present we do not consider useful. A brief account indicating the richness of our flora in such useful plants, even with our present knowledge, may help to stimulate interest and enquiry in this direction.

FOOD PLANTS. Our supply of such important fruits as Cranberries, Blueberries and Huckleberries is derived largely from plants growing without cultivation, while the Wild Raspberry and related species of *Rubus* and the June or Service-berry (*Amelanchier*) are also well known and appreciated. Such nuts as the Butternut and Hickory must also not be omitted. Most, however, of our other wild fruits and nuts will not be considered by most people satisfactory substitutes for our common cultivated ones. There is, however, one large group of food plants almost ignored by the majority of people, namely, the Fleshy Fungi. Most people classify these plants into one particular kind which they term "*the* mushroom" and lump the rest together under the name of "toadstools," a name intended to imply properties if not actually poisonous at any rate more or less disagreeable. This is unfortunate since many of these fungi are as good for table purposes as the Common Mushroom (*Agaricus campestris* L.) and some of them are much more abundant in many places or at certain times of the year, *e.g.* the Morels (*Morchella*), the Fairy Ring Mushroom (*Marasmius oreades*), the *Lepiotas*, the Coral fungi (*Clavaria*), the Shaggy Mane Coprinus and others. No doubt the fact that certain fungi are very poisonous has caused the whole group to be viewed with suspicion, but with a very little trouble it is possible to recognize at sight at least a dozen common and delicious kinds.

Another plant which may be mentioned here is the Wild Rice (*Zizania*), the large seeds of which are esteemed by many as a delicacy. If due care is taken in the selection of a suitable locality and in the introduction of the seeds or plants, it is fairly readily established, and apart from any value it possesses in supplying an article of human food, it affords food and shelter for water fowl wherever it may be desired to encourage them.

FODDER PLANTS. There are many situations in which the natural plants will probably always have to be depended upon for fodder purposes, as being better adapted to their environment than any likely to be introduced, as, for example, the Marsh or Cord grasses (*Spartina*) of the Salt Marshes of the Maritime Provinces and the Buffalo Grasses (*Bouteloua*) and Western Rye Grass (*Agropyron tenerum* Vas.) of the West. It is also possible that amongst the great variety of Western leguminous plants some will be found of special value as forage plants.

DRUG PLANTS. A large number of plants are credited in a greater or less degree with medicinal properties, from such popular remedies as Burdock and Dandelion to officinal drug plants like Golden Seal (*Hydrastis canadensis* L.) and Seneca Snake-root (*Polygala Senega* L.) and *Rhamnus Purshiana* DC., a British Columbia plant from which the well-known Cascara

Sagrada is obtained. In certain localities these drug plants may be sufficiently abundant to make the collection of them remunerative, although in most cases the plants are specially cultivated for the preparation of a drug on a commercial scale. In such cases it is necessary to reproduce as nearly as possible the natural environment of the plant. While there is a considerable demand for drug-plants on the part of many wholesale firms and druggists, it may be said that with the present high price of labor in Canada the cultivation of drug plants is not likely to prove very remunerative, and the collecting and drying of the wild plants is in most cases a somewhat precarious source of income. In addition to these plants of established medicinal value we have in our native flora plants belonging to the same genera as certain drug plants of the Old World, *e.g. Arnica*, *Aconitum*, and some of these may be found to be of value for the same purposes, while again, other drug plants of foreign origin as the Henbane (*Hyoscyamus niger* L.) and the Thorn-apple (*Datura Stramonium* L.) have become established in certain localities. In connection with medicinal plants mention must be made of the Ginseng (*Panax quinquefolium* L.). This plant is not now valued very highly by the medicinal practitioner of western countries, but is regarded as possessed of almost supernatural virtue by the Chinese, with whom there is an extensive demand for it at very high prices. It is a native of the rich, cool woods of Eastern Canada, but owing to its scarcity and slowness of growth those who wish to profit by its high market value will find it necessary to cultivate it.

HONEY PLANTS. As the desirability of bee-keeping as a source of income receives greater recognition, the subject of honey-yielding plants becomes one of importance. While there are probably no wild plants in this country which occur in such masses as to influence the location of apiaries in the same way as the Heather moors do in Britain, the Basswood (*Tilia americana* L.) is exceedingly valuable and so to a less degree are the Maples (*Acer*), and an adjacent "bush" of this kind is a valuable adjunct to an apiary. The planting of these trees for ornamental and shade purposes where bee-keeping is followed can, therefore, be recommended. The Boneset (*Eupatorium perfoliatum* L.), a common plant of swampy ground, is a very heavy yielder of honey, and its growth in such places should be encouraged, but although many other wild plants are valuable sources of honey it is probably not worth while to cultivate or encourage the growth of them in preference to such plants as white clover, buckwheat or orchard trees and bushes which are of so much more use in other ways.

In addition to those already mentioned there are other wild plants which find employment in various ways, as, for example, the Sugar Maple (*Acer saccharum* Marsh) whose sap yields maple syrup and maple sugar, the Wild Bergamot (*Monarda fistulosa* L.) often cultivated in gardens for its fragrant essential oil, Wintergreen (*Gaultheria procumbens* L.) yielding the well-known "oil of wintergreen," the Cherry or Sweet Birch (*Betula lenta* L.) which also yields the same oil, and whose sugary sap when fermented gives Birch Beer, while closer study will possibly reveal amongst our native flora, fibre plants of commercial value.

EARLY WINTER BIRD NOTES: 1912-13.

By L. McI. TERRILL, ST. LAMBERT, QUE.

Though winter conditions set in fairly early, during the latter part of November, lengthy intervals of mild or rainy weather have left us at present (January 25th) with very little snow—perhaps an average of three or four inches—many wind-swept fields being practically bare.

The following notes are from two localities: Montreal, and Bury, a village in Compton County, 125 miles east of Montreal. This latter place is in the heart of a hilly, well-wooded district, where the snowfall is more uniformly retained and birds are more evenly distributed than in the level, wind-swept and sparsely-wooded district about Montreal.

My walks, in the vicinity of Montreal, were taken chiefly on the south shore of the St. Lawrence.

HERRING GULL, *Larus argentatus*.—Seen almost daily above the river, at St. Lambert, until January 12th, when the last bird was noticed.

GOLDEN-EYE, *Clangula clangula americana*.—Both of these ducks fairly common on the river near Laprairie; last seen January 12th.

CANADA GOOSE, *Branta canadensis canadensis*.—Last seen at Bury, December 13th, when two flocks of four and five birds flew south over the St. Francis River.

CANADA SPRUCE PARTRIDGE, *Canachites canadensis canace*.—One shot December 9th, at Bury. (Becoming quite scarce in this district).

CROW, *Corvus brachyrhynchos brachyrhynchos*.—One heard at Bury, December 14th. December 18th, saw about 35,

singly, and in companies of two and three, at several points between South Stukely and Montreal. December 29th, commonly noted throughout the day at Ahuntsic, a few miles from Montreal. Though there was a considerable flock in this locality, I have not seen them elsewhere near the city. Probably the many fields of uncut corn, fringed with woods in the background, offered the best food and shelter. Following their tracks near the woods I came across several places where the Crows had uncovered the two or three inches of snow from clusters of Sumac seed (probably *Rhus glabra*). The same tracks led me into a second-growth thicket where a greater depth of snow had been removed from other piles of sumac debris. Apparently it was not chance that led the birds to the dozen or more isolated clusters of seed. As a parallel instance, I have seen piles of potato parings and other refuse, in ditches by railway tracks, exposed in hollows in the snow at a depth of six inches. Have crows a well-developed sense of smell? On the other hand the abundance of fruit panicles adhering to sumac shrubs seem to be untouched by the Crow, though I have seen Robins, in late fall, feeding on them, and Grouse and Pine Grosbeaks, during the winter.

BLUE JAY, *Cyanocitta cristata cristata.*—December 13th, one heard at Bury; apparently unusually scarce; at least very seclusive.

NORTHERN HAIRY WOODPECKER, *Dryobates villosus leucomelas.*—Noted daily at Bury during my stay in the locality from December 9th to December 17th inclusive. December 15th, Bury; watching one at work 30 feet from the ground, was surprised to see it fall, an inert bundle, to pick up its fallen prey from the snow. Occasionally noted at Montreal to date.

DOWNY WOODPECKER, *Dryobates pubescens medianus.*—About as numerous as *villosus*.

ARCTIC THREE-TOED WOODPECKER, *Picoides arcticus.*—First seen near Montreal on October 6th. Last noticed December 1st (3 birds).

NORTHERN PILEATED WOODPECKER, *Phlœotemus pileatus abieticola.*—Bury; seen or heard daily from December 9th to 17th. Their cackling calls were usually heard during or preceding mild weather. Several times saw their tracks in the snow encircling the bases of trees. A common permanent resident in this district.

PINE GROSBEAK, *Pinicolas enucleator leucura.*—First seen at Montreal, December 1st. Fairly common to present date.

Very common at Bury, December 9th to 17th. December 15th, watched one extracting seeds from cones of White Pine trees; at the same time heard two singing from the tops of neighboring pines.

REDPOLL, *Acanthis linaria linaria*.—Not seen at Bury until December 14th; a few noted between that date and December 17th. Scarce at Montreal; noted small flocks on two dates only, December 29th and January 1st.

GOLDFINCH, *Astragalinus tristris*.—As notable by its presence as is the absence of the Redpoll. Bury; commonly noted daily from December 9th to 17th, generally in small flocks, sometimes singly. One evening, after dark, I brushed the lower branches of a Balsam in passing, and disturbed a Goldfinch, which tumbled out of its bed and went dipping away. As it flew, the sudden note of alarm was instantly followed by the musical flight notes. The Goldfinch has scarcely a harsh note in its repertoire and therein differs from the Redpoll. Montreal, December 29th, one flock of from 20 to 30 birds seen feeding on seeds in tops of Yellow Birches.

SNOWBIRD, *Plectrophenax nivalis nivalis*.—Bury; noticed several times in small flocks from December 9th to 17th. Montreal; first seen November 3rd; very common from that date to the present time. On November 10th unusually large numbers were seen near Laprairie, roughly estimated at 4,000 birds. They were feeding amongst grass and low weed growth about a chain of shallow surface pools. Continually shifting their position, small bands were constantly in view. As I slowly approached they kept bobbing into sight, from 15 to 25 feet ahead of me, alighting again after a short flight. It seemed incredible that so many conspicuously-colored birds could be so effectively concealed in the scanty growth, and it was only when an individual, plover-like, raised its wings above its head, that I discovered some of them squatting closely. Nearing the ponds I saw that the main body of birds were feeding about the margins—some of them wading into the water with a see-saw, sandpiper-like walk. Whilst thus feeding the chorus of notes reminded me strongly of the twitter of a flock of Bank Swallows about their nesting-place. As the birds arose, by little bounds, they invariably uttered the usual tremulous twitter, followed, on the second bound, by a single lark-like note.

NORTHERN SHRIKE, *Lanius borealis*.—Montreal, January 1st. Saw one fly to perch in tree-top. As I approached it again flew in a northerly direction, but almost immediately

swerved upwards and turned due south, in zig-zag pursuit of several Redpolls.

BROWN CREEPER, *Certhia familiaris americana*.—Montreal; three or four seen December 1st, and five on January 19th. Bury, December 9th to 17th; noticed daily; generally only two or three noticed in a flock, though there were probably usually more, as it is difficult to detect all in a flock.

RED-BREASTED NUTHATCH, *Sitta canadensis*.—Bury, December 9th to 17th; noted daily in considerable numbers. Seen more commonly on ridges of White Pine. During mild weather I was often attracted to flocks of this species, sometimes numbering fully 75 individuals, by their chorus of insistent call-notes—scarcely a well organized chorus, however, pronouncing their views with various degrees of feeling—at times a veritable babel. This species spends much more time amongst the foliage in tree-tops than the White-breasted. It is a common permanent resident in the vicinity of Bury—of course numbers may migrate, but enough remain to make it a common bird.

GOLDEN-CROWNED KINGLET, *Regulus satrapa satrapa*.—Montreal; last seen December 1st.

ROBIN, *Planesticus migratorius migratorius*.—Bury, December 10th; two plainly seen and heard chirping. Robins are usually gone from this locality by the end of October. Have only two records for November and none later. Montreal; last seen November 3rd.

I have omitted mention of the ever-present Chickadee and the Owls—of the latter I noticed only the Barred and Saw-whet at Bury.

MEETINGS OF BOTANICAL BRANCH.

Held at the home of Mr. James M. Macoun, Saturday evening, April 19th, the following members being present: James M. Macoun, G. H. Clark, A. Eastham, A. E. Attwood, R. B. White, Mr. Honeyman, Dr. M. O. Malte, J. R. Dymond, J. J. Carter, F. E. Buck and L. H. Newman.

Mr. Macoun reviewed Dr. L. H. Pammel's "Manual of Poisonous Plants" as follows:—

THE POISONOUS PLANTS OF CANADA.*

While it is not possible to summarize in a few paragraphs

*Part of a Summary of Pammel's "Manual of Poisonous Plants" made for the Botanical Branch of the Ottawa Field-Naturalists' Club, by J. M. Macoun. Published by permission of the Director of the Geological Survey of Canada.

an exhaustive work of nearly a thousand pages, a general idea of the nature and scope of Dr. Pammel's† book can be given and special reference may be made to the various kinds of vegetable poisons and the species or groups of species of plants which are most injurious to man and other animals. An idea of the completeness with which Dr. Pammel's work has been done may be gathered from the fact that 1,097 books and papers are enumerated in the bibliography of poisonous plants which concludes the volume.

The introductory chapters deal with Bacterial Poisons; Dermatitis or skin diseases caused by plants; Forage Poisoning, Ergotism and Aspergillosis, the latter caused chiefly by moulds; and Poisoning from Fungi. It is, however, chiefly plants of the higher orders that will be referred to in this summary and only the commoner or best known species, the order followed in their enumeration being that of Engler and Prantl and Gray's Manual.

The only fungi that need be mentioned are of the genus *Amanita* of which *A. muscaria*, Fly Agaric, and *A. phalloides*, Death Cup, are the commonest and most dangerous species. As distinguished from the ordinary mushroom, both species have white gills and a bulbous base, while the mushroom has pink or brownish gills and is without a bulbous base. Both species of *Amanita* grow usually in woods or along the borders of woods and seldom on lawns or in open fields. There are no ferns that are known to be very injurious to animals, although some are suspected of being so, but *Equisetum arvense* when in large quantity frequently poisons and sometimes kills horses. This has been proved by recent experiments, but fortunately it seems to be only the dried plant that is injurious. Hay which contains much *Equisetum* should not be used either for food or bedding. Many grasses are poisonous under certain conditions, but recent research shows that much of the poisoning that has been attributed to grasses is due to fungus growths rather than to the grasses themselves. *Lolium temulentum*, Poison Darnel, has long been known to be poisonous, its effects being usually seen when it is ground up with wheat. Some species of *Araceæ* such as *Acorus Calamus*, *Symplocarpus fœtidus*, *Calla palustris* and both species of *Arisaema* are acrid and under some conditions poisonous. Only a few species of liliaceous and orchidaceous plants are poisonous. *Zygadenus* frequently poisons sheep and other stock in the west, but so far as experiments have gone only before the plants flower, and animals are usually killed by eating the leaves, or more frequently the bulbs, before the plant

†Manual of Poisonous Plants, by L. H. Pammel, *Ph. D.*: The Torch Press, Cedar Rapids, Iowa, U.S.A

has blossomed in the spring. The local name for *Zygadenus* is in many places "Lobelia," and cases of poisoning are so common in Oregon and Nevada that the term "lobeliaed" has been used to indicate the result from this kind of poisoning. In one band of sheep 2,000 were poisoned and 100 died, in another 200 were poisoned and 90 died. *Zygadenus* is common is southern Alberta and throughout British Columbia. *Veratrum viride*, American Hellebore, is well known to be poisonous both to man and animals, but as the plant is acrid it is not relished by stock; young animals sometimes eat it with fatal results; chickens have been killed by eating the seeds. *Trilliums* have long been considered poisonous, and the roots are certainly emetic. The fruit should be regarded with suspicion. The underground roots of *Iris versicolor*, Blue Flag, are known to be very poisonous. As the roots are very acrid there would be little danger of their being eaten were it not for the resemblance of the commoner name to that of Calamus, Sweet Flag; if eaten it would prove seriously if not fatally poisonous. It was not until 1875 that it was discovered that at least two species of *Cypripedium*, *C. hirsutum* and *C. pubescens*, produce dermatitis very much resembling that produced by Poison Ivy. Prof. MacDougal's experiments with stems and leaves upon individuals have shown that more than half of them were affected. It was discovered that these plants are provided with glandular hairs which cover the whole surface of the stem and leaves and contain a poisonous oil which is especially abundant at the fruiting season. Later experiments by Nestler have shown that *C. hirsutum* is by far the most poisonous species.

Many species of *Ranunculaceæ* are poisonous, but the genus *Delphinium* is the only one to which the poisoning of stock in large numbers has been directly traced, and, in Alberta, *D. glaucum* has done the most injury to cattle. It is in the early spring, before green food is abundant, that the worst effects are noticed and experiments have also shown that the plants are more poisonous at that time. Observations in the United States have also shown that very frequently after a light snow-fall other vegetation is covered and larkspur, being the only green food, is eaten. Sheep are not often affected by this species probably because they are not on the high ranges where it grows at a time when more palatable food is not to be had. *D. Menziesii*, however, which grows in southern Alberta and throughout British Columbia is often eaten by sheep. Of 600 sheep that were affected on one range in Montana in May, 1897, 250 died. Other species of Canadian *Delphiniums* are nearly, if not quite, as poisonous as the two mentioned above, but, except on Vancouver

Island, do not grow in quantity where they are likely to be eaten by cattle. All the species of Aconite are more or less poisonous, but no injury to cattle has been recorded. *R. sceleratus* is the most dangerous species of the genus *Ranunculus*, growing as it does in marshes and along ditches where cattle are likely to eat it with other forage plants; it is also the most poisonous species. The juice of several species will, if rubbed on the skin, produce blisters and sometimes ulcers.

Although the berries of Mountain Ash, *Pyrus Aucuparia*, are poisonous to man, *Prunus* is the only rosaceous genus that causes serious injury either to man or stock. The leaves of all the species may be eaten while fresh, but when wilted contain a virulent poison, hydrocyanic or prussic acid. *P. serotina* is the most poisonous species in the north, although *P. pennsylvanica* and *P. virginiana* are almost equally so. Poisoning is frequently caused by cattle and sheep eating the wilted leaves, and children occasionally die from eating the kernels of the seed. So many sheep are killed by browsing *Prunus* leaves when being driven along trails in the west that in many places the bushes have been cut out, in others the dangerous places are marked by flags. Leaves wilted in bright sunlight to about 75 per cent. of their original weight, or until they appear slightly limp, yield the maximum amount of prussic acid.

Many of the *Leguminosae* are injurious to stock and it is to this family that all the "loco weeds" belong. Of these, in Canada at least, *Oxytropis* causes the greatest damage to sheep, horses and cattle. No Canadian species of *Astragalus* is known to cause injury. One effect of eating any of the "loco weeds" is that a depraved appetite is developed and the animals prefer the "loco weed" to wholesome food, and will even dig up the roots to satisfy their craving. The first stage of the disease is the effect on the nervous system, which in time drives the animal frantic; in the second stage there is emaciation, exhaustion and finally death from starvation. *Thermopsis rhombifolia*, which is common in the prairie country, is said to be injurious to stock, and several cases of children having been poisoned by eating the seeds are recorded by the Canadian Department of Agriculture. It is only in recent years that it has been shown that poisoning from lupine occurs almost always when the plant is fruiting, and experiments in Germany have shown that the active poison, ictrogen, is found chiefly in the seeds and pods. It is after the first frosts destroy other vegetation that the lupine is eaten in the greatest quantity. Of one land of 200 sheep let into a field of lupine for a short time when in a hungry condition 100 had died within a few hours and 50 others succumbed later on, and on another occasion 150 rams were given a feed of lupine hay and

during the night 90 of them died. In the first instance the lupine pods were fully formed but the seeds not ripe; in another case 1,150 sheep died out of a band of 2,000, and in still another 1,900 out of 3,000. The first symptom after eating lupine is excitement followed by frenzy and then spasms and falling fits. In many cases death occurs within an hour. The common lupine in southern Alberta is *L. argenteus*, one of the most poisonous species.

Poison Ivy, *Rhus Toxicodendron*, is known to everyone, though comparatively few people are affected by it. No case of poisoning among the lower animals has been recorded. Of the many cures recommended for Ivy poisoning the best is powdered sugar of lead dissolved in a 50 per cent. solution of alcohol. Various methods for the destruction of poison ivy patches have been tried; the certain way is, of course, rooting it out, but covering with tarred paper creosoted below is said to be effective and Dr. Pammel recommends pouring a solution of two pounds of commercial sodium arsenic to 10 gallons of water around the roots. Whether *R. Vernix*, Poison Sumac, *R. diversiloba*, Poison Oak, or *R. Toxicodendron* is the most poisonous has not yet been determined.

The family *Umbelliferæ* contains the best known and most poisonous plants, at least in the east, and the resemblance of innocuous species to those that are deadly poison has caused many deaths. *Conium maculatum*, Poison Hemlock, though not indigenous is a common species in waste places. Poisoning has arisen from eating the seed for that of anise, the leaves for parsley and the roots for parsnips, also from blowing whistles from hollow stems; many domestic animals have been killed by eating the plant. All the species of *Cicuta*, Water Hemlock, are very poisonous, especially *C. maculata*, Cowbane, in the east, and *C. vagrans* in the west; many cases of human poisoning, especially among children, have been recorded, the roots being mistaken for those of edible plants such as parsnips, horse-radish and artichokes; stock of all kinds are frequently killed, generally in the spring, when the ground is soft and the roots pull up easily. The deadly nature of the root has been shown by cutting one in small pieces, mixing it with carrot and feeding to a two-year-old heifer. It died in an hour and a half, though only a small portion was eaten; two grams were found in the stomach. A further experiment made with the same lot of roots showed that it was only when in the dormant state that they were poisonous. After some of them had been grown a month in a greenhouse they were found to have no injurious effect at all. So many persons believe the wild parsnip, *Pastinaca sativa*, to be poisonous that it is well to record the fact that there are no authentic cases of such

poisoning. Many experiments on man and other animals has proved conclusively that no ill effect results from eating the roots. The flowers and leaves do, however, sometimes produce dermatitis when brought in contact with damp skin, some persons are also affected by the carrot in the same way.

One would hardly expect to find poisonous plants among the *Ericaceæ*, but all the species of *Kalmia* are very poisonous, and *K. angustifolia*, Sheep Laurel, and *K. latifolia*, Mountain Laurel, destroy many sheep and cattle, and chickens are said to have been poisoned by eating the vomited matter from poisoned animals. The flesh of partridge is said to be rendered poisonous when the birds eat the buds, and honey derived from the nectar of the flowers appears to be poisonous. Many of the Solanaceous plants are more or less poisonous, but the genus *Solanum* is the only one that causes much injury. The berries of *S. nigrum*, Common Nightshade, are often cooked for food, but when green are poisonous to man, and cattle are poisoned by eating the leaves of either this species or *S. Dulcamara*.

A few species of *Compositæ* are poisonous. Among these *Senecio Jacobaea* has done the greatest damage, though its bad effects on cattle seem so far to be confined to parts of Nova Scotia and New Brunswick, where it is supposed to be the cause of what is known as Pictou disease. It is most dangerous in its young state. *Helenium autumnale* also occasionally causes death when eaten by cattle, and many genera such as *Artemisia* and *Tanacetum* are poisonous to man if the volatile oils are taken in large doses. *Eupatorium urticæfolium*, White Snake Root, is generally believed to cause the "trembles" in cattle, horses and sheep and milk sickness in man. The trembles cause many deaths among cattle, and butter and cheese made from the milk of affected animals is poisonous to man. Until quite recently there seemed to be no doubt that *Eupatorium* was responsible for the trembles, but recent investigators do not believe this to be the case unless it should be at times the carrier of some pathogenic organism. The pollen of several composite plants such as ragweed, goldenrod and chrysanthemum are said to cause hay fever. *Ambrosia artemisiifolia* is regarded as specially troublesome as an exciting cause with reference to hay fever. There is as yet, however, no conclusive proof that hay fever is ever caused by pollen or that pollen has any greater irritating effect on the air passages of sensitive people than any other dust of an organic character.

In the discussion which followed the above review some interesting observations were made as to the action of various plants which were believed to produce poisonous effects in man or beast.

The common rhubarb was claimed by Mr. White to be

exceedingly poisonous during the early stages of its growth when the early shoots were only an inch or two in length. The poisonous element here was believed to be oxalic acid, which, in the young shoots as well as in the tissue of the leaf, is very prevalent.

In discussing the effects of *Equisetum* (Horse Tail), reference was made to a statement in the book in question which claimed that this plant produces the same effect when fed to cattle as that produced by mouldy corn, viz., diarrhœa.

Reference was made to the claim by Freeman that *Lolium temulentum* is poisonous in one part of the United States and not in certain others.

An example to show the poisonous effects of *Zygadenus venenosus* Wats. on sheep, in southern Alberta, was cited by Mr. Clark.

In Lupines and certain other plants the seeds rather than the vegetative parts of the plants are poisonous.

In the well-known loco weed (*Oxytropis Lamberti*) barium is generally believed to be the poisonous element.

Water Hemlock was believed to be the most poisonous plant of all those belonging to the family Umbelliferae.

The Common Wild Parsnip was shown to produce dermatitis quite in the same manner as poison ivy and certain other plants.

In discussing the peculiar effects of *Ledum palustre*, Dr. Malte referred to the fact that the European form of this plant was used during the pre-Christian era in Scandinavia in beer to produce a certain effect.

An interesting experience was cited by Mr. White in connection with the common elderberry which had produced an intense secretion of saliva.

The Wonderberry, which is said to be a cross between certain western forms of *Solanum Nigrum* was claimed by some to have a poisonous effect, although the author of the above book seemed to think otherwise.

Seeds of *Lychnis Githago* were believed to be poisonous to poultry, although in Scandinavia and Russia these seeds are eaten by boys without any apparent effect.

Reference was made to an experiment at the Poultry Department of the Ontario Agricultural College at Guelph, Ont., where screenings were fed to poultry with injurious effects.

Reference was also made to an experiment in feeding common mustard seed to animals for a long period of time, which resulted in the production of ulcers and blisters which were believed to be identical with the blisters formed by the applicaton of mustard plasters.

Before the meeting ajourned Dr. Malte outlined the work which had been done by Prof. Macoun, Mr. James M. Macoun

and himself in the production of a new "Ottawa Flora" and expressed the hope that the Botanical Branch would co-operate in seeking to perfect this work. He believed that each member of the Branch could assist very materially by specializing on a certain genus and in this way bring together information which might be of great value in connection with this work. He also thought that excursions of the Branch might be held to advantage. These excursions were not to take the place of the ordinary excursions of the Club, but would rather be supplementary to these. Excursions by a few persons desiring to do exact work would, in his opinion, contribute most to our present knowledge of the flora of the Ottawa district. The ordinary excursions of the Club are concluded just at a time when special work can be done to best advantage so that there should be no difficulty in arranging for this extra work.

Mr. Macoun offered an excellent suggestion to the effect that the meetings of the Botanical Branch should continue until the excursions are finished, a meeting being held on each evening of the Saturday on which the excursion took place. By this arrangement there would be an inducement for members of the Branch to attend the excursions for the purpose of collecting specimens which might be used as a basis for discussion at the evening meeting. As a beginning in this direction Dr. Malte agreed to discuss "The Plants of the Season" at a meeting of the Club on Saturday evening, May 3rd, an excursion of the O.F.N.C. being held on that day.

L. H. NEWMAN.

Held at the home of Mr. R. B. Whyte, Saturday evening, May 3rd, the following being present: Messrs. Whyte, Carter, Attwood, Dwight, R. Campbell, Dymond, Malte, J. M. Macoun, Newman.

An account of the different species and forms of violets growing in the vicinity of Ottawa was on this occasion given by Messrs. Macoun and Malte. The study of the wild violets to which this spring much attention has been paid by the said gentlemen has proven to be extremely interesting from many a point of view. At the meeting of the Club the members present were given an opportunity to study the characters of the different species on living specimens collected in the field and by the obliging kindness of Mr. R. B. Whyte, kept in pots for the meeting.

The discussion was opened by Mr. Macoun, who explained that many species are now recognized which had at first been lumped under one species or variety known as *V. cucullata* or

V. palmata var. *cucullata*. This fact, and the number of the species into which this group was subsequently divided, is explained in an article published by Mr. Macoun in a former number of THE OTTAWA NATURALIST.*

In connection with this discussion the interesting fact was brought out that practically all of the forms, first separated in the field by Mr. Macoun and described by Dr. Edward L. Greene, of Washington, D.C., have proven to be quite worthy of the species-rank given them by Dr. Greene.

Dr. Malte defined the different groups of violets as found in the vicinity of Ottawa and illustrated, by means of the specimens mentioned, the differences which are to be found between these groups. It was explained that the violets in this group belong all species with leafy stems and which produce flowers in the axils of the leaves. Under the second group are placed all species, the flowers of which are borne on peduncles produced directly from rootstocks (acaulescent violets).

From the first group two sub-divisions can be separated, one of which has *entire stipules* and the other *fringed stipules* and blue or violet flowers. In the first sub-division three well-defined species are found, namely, *V. pubescens* Ait, *V. scabrinscula* Schwein and *V. canadensis* L. To the second of these sub-divisions the following four species belong, namely, *V. labradorica* Schrank, *V. conspersa* Rchb., *V. rostrata* Pursh and *V. leucopetala* Greene.

Regarding the latter species the opinion was expressed that it might possibly better be regarded as an albino form of *V. conspersa* than a species proper.

Under the second main group of violets, namely, the acaulescent or stemless forms, two divisions are made. Under one division are placed all stemless violets having a fleshy and thickened rootstock without runners, while in the second division are placed those species, the rootstocks of which are long and filiform and generally produce slender runners.

The following species belonging to the first division of the stemless violets were demonstrated at the meeting, viz., *V. cucullata* Ait, *V. sororia* Willd, *V. septentrionalis* Greene, *V. Macounii* Greene, *V. venustula* Greene and *V. Fletcheri* Greene.

Of these only the three first mentioned are recognized as good species in the last edition of Gray's Manual of Botany. *V. venustula* is considered synonymous to *V. affinis* Le Conte. However this may be, the plant described by Dr. Greene as *V. venustula* is a very clearly defined species, flowering two weeks

*Notes on Some Violets, *Ottawa Naturalist*, 1899, pp. 181-187.

or more later than the other acaulescent violets.

V. Macounii is not mentioned in Gray's Manual. It is, however, a well defined species, growing on limestone foundation. It differs from all other acaulescent violets in having *all* petals hairy on the inside. (The other species have at most three petals hairy on the inside).

Regarding *V. Fletcheri*, its specific value is less clear and the opinion was expressed that it might turn out to be *V. septentrionalis* out of place.

Under the second division of the stemless violets, i.e., those which possess rootstocks which are long and filiform, seven species have been recorded from the Ottawa district. Of those the following were demonstrated and explained at the meeting, viz., *V. pallens* (Banks) Brain, *V. blanda* Willd and *V. renifolia* Gray.

The specimens of *V. pallens* presented at the meeting were collected at Blueberry Point by Messrs. Macoun and Malte. When collecting the specimens it was noticed that among the typical plants were growing individuals, characterized by having much larger flowers and by being much hairier all over. In other respects they resemble *V. pallens* very closely, and the opinion was expressed that they represent a hairy variety of *V. pallens* not sufficiently distinct from that species to be considered a species of its own.

An interesting discussion took place regarding the biology of violets, it being explained that while, in the acaulescent species, seed usually was produced from cleistogamous flowers developed after the showy spring flowers had disappeared, it was occasionally found that plenty of seed could be produced by the spring flowers which generally are sterile. Such a phenomenon had been observed, during one season, by Mr. Macoun to be qnite frequent in *V. Macounii*.

One of the most interesting features in connection with the discussion of the evening was the exhibit and examination of a strange form which was believed to be a hybrid betweeno *V cucullata* and *V. septentrionalis*. An examination of the pollen by Dr. Malte had shown that at least 90% of this was undeveloped. Undeveloped pollen is an indication of hybridity.

Before closing the discussion, Dr. Malte announced that Mr. Macoun and he were arranging to study the different species and forms of violets during the fruiting season, and to note any peculiarities which might be utilized in distinguishing the different species. Any observation of value might be used, if necessary, in connection with the key to the genus, which key, it was hoped, would be available for distribution before the violet season opens next spring.

L. H. NEWMAN.

EXCURSIONS.

The first excursion of the year was held to Rockcliffe and vicinity on Saturday, May 3rd.

Owing to the warm weather of the previous two weeks, a large number of spring flowers were found. Hepaticas were almost gone, but *Claytonia virginica*, *Erythronium americanum*, *Trillium grandiflorum* and *T. erectum*, *Dicentra canadensis*, *Caulophyllum thalictroides*, *Uvularia grandiflora*, *Asarum canadensis*, *Dentaria diphylla*, *Viola pubescens* and *V. canadensis* were quite common. *Ranunculus abortivus*, *Sambucus canadensis*, *Thalictrum dioicum* and *Mitella diphylla* were also collected.

The Tent Caterpillars were just becoming prevalent.

At 5 o'clock short talks on collections made were given, at the pavilion, by Messrs. Halkett, Dymond, McGillivray and Carter and Miss Matthews. J. R. D.

The second excursion was held to Leamy's Lake, Hull, on Saturday afternoon, May 10th. The day was rather cold, there having been severe frost during the previous night.

The party divided into three groups, with the following leaders: Mr. Halkett, Zoology; Dr. Williams, Geology; Mr. Newman, Botany. At 5 o'clock the divisions re-united for the usual talks by the leaders. Mr. Halkett spoke on Daphnia, a fresh-water crustacean, and of a species of Helicoid or air-breathing mollusc. Dr. Williams discussed Brachypods and Trilobites. In Botany, the interesting find was that of *Viola rostrata*, a rather uncommon species, by Miss Ruth Burpee. Other violets collected were *V. pubescens*, *B. scabriuscula*, *V. canadensis* and *V. conspersa*. J. R. D.

BIRD NOTES.

On December 18th, 1912, while driving through the hills north of Kaladar Station, Lennox County, Ont., I saw a flock of seven or eight Canada Jays. When I next visited the same locality, January 28th of this year, although I kept a sharp look-out, I did not observe any; but a few days later, some distance south, I saw one flying about in a farmer's barn yard. It will be interesting to know whether these birds have been observed as far south in other parts of the province. None have been noted near Kingston, Ont.

On February 12th the first flock of Pine Grosbeaks was observed at Kingston, and on the 23rd, Evening Grosbeaks.

ED. BEAUPRE, KINGSTON, ONT.

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DESCRIPTION OF A NEW SPECIES OF TESTUDO, AND OF A REMARKABLE SPECIMEN OF STYLEMYS NEBRASCENSIS, FROM THE OLIGOCENE OF WYOMING, U.S.A.*

BY LAWRENCE M. LAMBE, F.G.S., F.R.S.C.,
Vertebrate Palæontologist, Geological
Survey, Ottawa, Canada.

The specimen of Testudo to be described below is one of a small collection of turtles from the Oligocene of Wyoming, U.S.A., lately acquired by the Geological Survey, Canada. The collection, consisting altogether of ten well preserved specimens, was made by Charles H. Sternberg and C. M. Sternberg, in 1911, at Seaman's old ranch, Sage creek, a branch of Old Woman creek, Niobrara county (formerly included in Converse county), Wyoming. The majority of these specimens, with the exception of the one regarded as representing an undescribed species of Testudo, are for the present referred to *Stylemys nebrascensis*, Leidy.

The principal character distinguishing this Testudo from other species of the genus is the great development of the epiplastral lip which forms a very conspicuous feature of the plastron.

Of the known species of Testudo which shew a decided enlargement of the epiplastral lip, *T. thomsoni*, Hay, from Oligocene deposits in South Dakota, U.S.A., approaches most closely to the Sage creek form. *T. thomsoni* was described by Dr. O. P. Hay, in 1908, in his monumental work on North American turtles[1] from "the skull, the greater portion of the anterior lobe of the plastron, some cervical vertebræ, and parts of the left foreleg" . . . . "obtained in 1904, by Mr. Albert Thompson, of the the American Museum of Natural History,

*Communicated with the permission of the Director of the Geological Survey, Canada.

[1]The Fossil Turtles of North America, by Oliver Perry Hay, Washington, D.C. Published by the Carnegie Institution of Washington, 1908.

New York, at Corral Draw, in Ziebach county, South Dakota" . . . . "in a block of limestone which had come from the Lower Oreodon beds." A comparison of the imperfect anterior lobe of the plastron of *T. thomsoni*, the only portion of the shell of this species known, with the corresponding part of the plastron of the Sage creek specimen discloses in the latter the much greater proportionate size of the epiplastral lip and differences throughout in the proportions of the elements forming the lobe.

The Sage creek specimen consists of the carapace and plastron in a good state of preservation. The sutures between the bones are clearly seen and the sulci indicating the boundaries of the scutes are distinct. The carapace has been injured in the neighbourhood of the eighth neural, and that bone is missing. The plastron has been crushed in between the inguinal notches with the result that in this portion of the shell the sulci and sutures have been partly destroyed. The fractured humerus of both of the fore limbs protrudes from the rock which fills the axial notches, and the distal ends of the tibia and fibula of the left hind leg are exposed in like manner behind.

The carapace has been slightly flattened and its breadth in this way increased to some extent, but as it now is the maximum breadth is 410 mm. and the greatest length 479 mm. It rises 120 mm. from its lateral margin to the centre. Viewing it from above, its breadth decreases more rapidly forward than backward, so that the posterior is greater than the anterior half and has a squarer outline. This is caused mainly by the enlargement of the peripherals above the hind limbs. The lateral peripherals and the pygal continue the general convexity of the shell downward at an increased angle; the peripherals in front are produced almost horizontally forward toward their free edges whilst the more posterior lateral ones are only moderately inclined.

The nuchal bone measures 90 mm. along its free margin in front. It broadens slightly backward to its maximum breadth of 103 mm. and then rapidly narrows to its full length of 95 mm. It is notched behind to receive the front edge of the first neural.

Of the eight neural bones the first is the longest; it is much longer than broad, narrows toward the front, and its outline is convexly rounded in front and behind. The second is hexagonal with the two short sides directed backward, and the front and back edges incurved or concave. The third is quadrangular, longer than broad, with its front edge convex and the hinder one straight. The fourth, fifth, sixth and seventh are hexagonal with their two short sides directed forward.

There are two suprapygal bones of which the first is deeply notched behind, with the forks in contact with the pygal and the eleventh peripherals. Its surface is broadly convex in all

directions and has a maximum breadth behind of 102 mm., with a length, measured from its sutural junction with the pygal to the centre of its front margin, of 84 mm. The second suprapygal is diamond shaped, slightly longer than broad, and more pointed in front than behind. The surface of the pygal is longitudinally and transversely convex, broader in front than behind, with a length slightly exceeding the front breadth; its dimensions are—anterior breadth 62 mm., posterior breadth 47 mm., length 70 mm.

The second, fourth, sixth and eighth costal bones are greatly expanded distally, with a resultant decrease in the distal breadth of the third, fifth and seventh costals. The proximal end of the second costal abuts against the first and second neurals, and the third is in contact with the second, third and fourth neurals. The proximal ends of the seventh and eighth costal bones came within the area of injury, which has resulted in the loss of the eighth neural and the posterior half of the seventh, and are missing.

The first and third vertebral scutes are about as broad as long. The sulcus marking the back border of the third curves sharply forward in the centre whilst crossing the fifth neural. The second and fourth vertebral scutes are slightly longer than broad. The fifth vertebral is greatly expanded behind and its lateral sulcus passes down the midlength of the tenth peripheral bone. The nuchal scute is 34 mm. long and 26 mm. broad. The supracaudal scute is 145 mm. broad behind at the free border of the shell, and 73 mm. long in its middle line, its anterior sulcus crossing the second suprapygal 15 mm. in advance of the centre of the latter's posterior margin. The dimensions of the neural and costal bones and vertebral scutes are given in mm. in the following table:—

Neural bones			Costal bones			Vertebral scutes		
No.	Length	Breadth	No.	Proximal breadth	Distal breadth	No.	Length	Breadth
1	68	44	1			1	100	97
2	40	47	2	36	94	2	77	82
3	41	34	3	52	22	3	78	88
4	37	48	4	40	85	4	—	82
5	36	45	5	39	17	5	—	162
6	34	44	6	35	73			
7	—	44	7	—	19			
8	—	—	8	—	67			

The plastron has a length of 493 mm. Its most conspicuous and interesting feature is the greatly extended epiplastral lip which projects 28 mm. beyond the line of the front margin of the carapace. The entoplastron is roughly five sided, and is sharply pointed in front with its maximum breadth far back; its hinder edge is broad and slightly convex. It measures 86 mm. in length and 90 mm. in breadth. The anterior lobe is 163 mm. long, with a breadth of base of 229 mm. The posterior lobe is 147 mm. long, and 239 mm. broad at the base. It is divided behind by a V shaped notch, 40 mm. deep, on each side of which the free border curves rather broadly round to the side. Throughout the plastron the free border comes to an acute edge.

The anterior lip has a length of 72 mm., in advance of a line drawn between the outer termination of the gulo-humeral sulci; its breadth is 98 mm. It is 19 mm. thick on each side of the deeply impressed gular sulcus and thins outward to the acute lateral border. On the upper surface it is more convex transversely than beneath, where it ha sa flat slope outward from the midline. It maintains the same breadth forward from the base to near the front, where it ends in two apices widely separated by a V shaped notch 22 mm. deep. The border within the notch is smooth and thick, but on either side in front it is thin and irregular.

The gular scutes appear to extend on to the entoplastron, but the sulci here are not preserved. The humero-pectoral and the pectoro-abdominal sulci cross the plastron 25 mm. and 59 mm. behind the back edge of the entoplastron respectively. The pectoral scutes are thus very narrow, meeting along the midline of the plastron for a distance only of 34 mm. The abdomino-femoral and the femoro-anal sulci are not preserved toward the centre of the plastron, but measured between their outer terminations the abdominal scute is 131 mm. long from front to back, near the bridge, and the femoral scute has a length of 85 mm. at the free border.

The characters revealed by the Sage creek specimen place it in the genus Testudo. The great enlargement of the epiplastral lip distinguishes it from all other described species of the genus. Another interesting character is the extreme differentiation of the costals in breadth, an alternation in the size of which is found in a greater or less degree in some species of Stylemys as well as of Testudo. The neurals, as a series, more nearly approach those of Stylemys in shape than those of Testudo, in which there is usually an alternation of octagonal with tetragonal neurals. The first, second, third and fourth neurals and their manner of contact with the three anterior costals are somewhat after the pattern found in *Testudo laticunea*,

Cope, from the Oligocene of Colorado.

Regarding the present specimen as representing an undescribed species of Testudo, the name *præextans*, having reference to the marked prominence and size of the epiplastral lip, is here proposed for the species with this specimen (Cat. No. 8401) as the type.

In plates I and II, shewing the carapace and plastron respectively, the sutures between the bones and the sulci marking the boundaries of the scutes are well shewn and can be readily traced.

Of the specimens belonging to the collection of turtles from the Oligocene of Sage creek, mentioned in the opening paragraph of this paper, and regarded as referable to *Stylemys nebrascensis*, Leidy, one in particular is of interest.

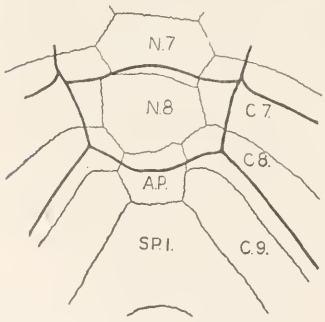
In this specimen certain abnormalities occur in the carapace which are considered of sufficient importance to warrant description. The plastron appears to be quite normal.

The shell as a whole has been somewhat distorted. A horizontal pressure on the left side has caused the left costal bones to be unduly bent down and the bridge peripherals to be incurved below. The plastron has been moved to the right and pressed upward along its longitudinal midline. Otherwise the specimen is splendidly preserved. The carapace is 276 mm. long and 215 mm. broad in its present state; its highest central point is about 119 mm. above the lower edge of the peripherals near the bridge. Plates III and IV, reproduced from photos graphs, shew the carapace and plastron with the bones and scute-clearly defined and reference need only be made here to the divergence of the carapace from the normal type of structure.

In the carapace there are seven costal scutes on each side instead of the usual four, and an additional vertebral scute between the fourth and the broad posterior one. Also an accessory bone occurs between the eighth neural and the first suprapygal, and there is a ninth pair of costal bones.

With the exception of the above structural peculiarities the carapace conforms to the usual type of *S. nebrascensis*. The first neural bone is of an elongated quadrangular form, and the succeeding ones are hexagonal. The costal bones shew a slight differentiation in distal breadth. The marginal bones reach the usual number of eleven on each side, as do also the marginal scutes. There are two suprapygal bones, of which the first is bifurcated behind; the second is diamond shaped and much broader than long. The nuchal scute is extremely narrow. The supracaudal scute is undivided. These characters are normal to the species.

As regards the peculiarities of structure in the carapace of this individual. The first costal scute is the largest, but its hinder sulcus has been crowded forward to some extent. The succeeding six are narrow antero-posteriorly, and take the place of the large second, third and fourth costal scutes which occur in nearly all fossil turtles with the exception of those belonging to the Trionychoidea. The first and second pair proceed outward on either side from the second vertebral scute, the third and fourth pair from the third vertebral, the fifth and sixth pair from the fourth vertebral, and the seventh pair from the accessory fifth vertebral. The relative position and size of the bones of the carapace and of their overlying scutes can be best understood by reference to plate III. The costal scutes correspond exactly on either side of the shell in each pair. The second, third, fourth, fifth, sixth and seventh measure distally, in an antero-posterior direction, 39, 26, 29, 26, 28 and 38 mm. respectively. The sulci between them pass down the second, third, fourth, fifth, sixth and seventh costal bones. The hinder sulcus of the seventh scute is on the eighth costal bone in advance of the latter's hind margin. The additional vertebral scute is small in comparison with the others, is broadest in front, and measures 28 mm. in length and 44 mm. in breadth anteriorly. Its front sulcus crosses the seventh neural and the hinder one the accessory plate.



N. 7, N. 8, neural bones 7, 8;
AP., accessory plate;
C. 7, C. 8, C. 9, costal bones 7, 8, 9;
SP. 1, first suprapygal bone.

The accompanying text-figure, one-half the natural size, shews the shape relative size and position of the bones and scutes of the carapace in the neighbourhood of the additional vertebral scute, the boundaries of the scutes being indicated by the heavy outlines.

The seventh neural bone is hexagonal, but differs from the preceding hexagonal ones with two short sides directed forward, in having its four lateral margins about equal. Both the eighth neural and the accessory plate are slightly irregular in shape. The eighth has six sides, of which two are short and are directed obliquely backward. The accessory plate is hexagonal with two short sides toward the front, and it joins the preceding eighth neural in an irregular manner, as shewn in the figure. The eighth pair of costal bones are in contact with both the eighth neural and the accessory plate.

The ninth pair abuts proximally against the accessory plate only.

The neurals of *S. nebrascensis* shew variations to a limited extent. In the majority of specimens of this species the second and succeeding neurals are hexagonal with the maximum breadth well forward. In the type of *Testudo culbertsoni*, Leidy, now generally regarded as properly referable to *S. nebrascensis*, the second neural is octagonal and the third quadrangular; also there is an additional bone between the eighth neural and the first suprapygal. The presence of a ninth pair of costal bones, seven pairs of costal scutes and an additional vertebral scute is considered to be, in the specimen from Sage creek, a unique example of extreme individual variation. So far as the writer is aware, in no turtle, belonging to any of the groups having large epidermal scutes in the carapace, has so great a development of vertebral and costal scutes hitherto been recorded.

EXPLANATION OF PLATES.

Plate I—Carapace of *Testudo præextans*, viewed from above; one-fourth the natural size.

Plate II—Plastron of the same shell, inferior aspect; one-fourth the natural size.

Plate III—Carapace of *Stylemys nebrascensis*, as seen from above, to shew the abnormal number of costal and vertebral scutes etc.; one-half the natural size.

Plate IV—Plastron of the same specimen, inferior aspect; one-half the natural size.

IS BARTRAM'S SANDPIPER DISAPPEARING FROM THE PRAIRIES?

Twenty years ago the Bartramian Sandpiper (*Bartramia longicauda*) was a common summer resident on the prairies of Alberta, but for the past ten years it has become one of our rarest birds, at least in central Alberta. During the summer of 1892 and several years following one could see a dozen pairs in as many miles. About the year 1900 I did not see this many in a whole season, and from that time until the present they have gradually become rarer each year until this present season I have only seen one pair.

I cannot find a reason for this disappearance, and I would like to have the experience of other observers of this bird given in the NATURALIST.

F. L. FARLEY, Camrose, Alberta.

THE BROAD-STRIPED SKUNK.
(*Mephitis hudsonicus* Rich.)

By NORMAN AND STUART CRIDDLE.

The subject of this article, including its various races and relations, covering the continent, has a reputation that none will envy and few appreciate until they come into actual contact with the animal in its vicious moments, when, closely pressed and in danger of death, it gives forth that fetid odor for which it is notorious.

In modern times it has become an instinct to consider that the name skunk implies an animal wholly obnoxious, and in consequence the name itself has become synonymous of all that is odious and depraved. The impression arrived at is, of course, due to lack of knowledge combined with the far too common practice of exaggeration. We hope in this little sketch to dispel some of these notions and to prove by the narrative that although the odor is very real, it is not necessarily a part of the animal's every-day life.

The Broad-striped Skunk was, in days gone by, a common mammal in Manitoba, and at our home at Aweme its numerous encounters with coyote, dog and probably owl, often impregnated the air with an unsavory odor which was far from pleasant. As time went on, however, conditions changed and constant persecution greatly reduced its numbers, so that to-day we have but a remnant of what went before, although the animal seems to be holding its own fairly well in the less-settled districts.

There are few handsomer mammals than skunks in this part of the world, and of the whole genus few, if any, equal the species under discussion. Unlike the eastern animal its stripes of white along the back are broad and prominent and show up strikingly in contrast to the black. In addition, it has a large white patch at the back of its head and a narrow stripe down the nose which often varies sufficiently to enable one to be separated from another; besides this there is the magnificent tail which almost wholly hides the back when held over it. Skunks in many respects are not unlike weasels; this is particularly so of the head, but the body increases in width towards the tail in such a manner as to give the animal a wedged-shaped appearance when viewed from above. In gait they are clumsy. The walk is a wabble, and in running they gallop. They are by no means fast in movement and it seems that the immunity afforded by the terrible weapon of self-defence has been to some extent acquired at the expense of speed, or possibly with such a weapon speed is no longer necessary.

In preparing for her young the female skunk seeks out some hole or covered place, such as that afforded by a barn or old building, where she can make her way beneath the foundation. She then locates a convenient grass patch where the old growth lies thickly and by means of her long claws rakes this up into bunches and drags it to her burrow, always moving backwards, by which means the long claws are used to full advantage. Several nights are occupied over this work and a vast amount of grass taken in before she becomes satisfied. In this nest are born several young, six probably being an average. Here they are reared and remain out of sight for some little time. Later they follow their mother in her wanderings after food, but it is quite late in the season before they finally separate; indeed, on some occasions they are said to winter in the same burrow.

Our species seems to be an almost omnivorous feeder, readily devouring anything in the animal line from an evil-smelling bug to a rabbit, while various fruits as well as ordinary vegetable matter is consumed. Nor must we forget eggs, of which they are very fond. But the choicest titbits of all seem to be insects; grasshoppers are taken wholesale and eaten with the utmost relish. If it were not for their habits of raiding poultry houses and their fondness for eggs it seems probable that skunks would be classed as almost wholly beneficial, but on account of these habits death is unfortunately often a necessity as it is practically impossible to drive them away. We have known them to take eggs from beneath a brooding hen without disturbing her, and likewise young chickens; at other times fully grown poultry were killed, but as a rule these are not molested when eggs or young are available. In winter time such food as is eaten must be made up almost wholly of rodents and vegetable substances. We have little evidence under this head, but on one occasion, at this season, a freshly cleaned out home revealed much Horsetail (*Equisetum*), which suggests that this plant was used for food and that perhaps, like weasels, skunks store up food for future use.

With reference to the powerful odor for which the animal has become celebrated, much misconception prevails. We are usually led to believe that this scent is carried about as a sort of attraction, not unlike some people's scent bottles, and that a liberal amount is sprinkled over the animal for that purpose, but as a matter of fact nothing is further from the truth, and to meet an odoriferous skunk is as unusual as it is objectionable. In reality they are by no means anxious to part with their perquisite and only do so when closely pursued and when life is endangered. When such emergencies arise, however, they make full use of this weapon, and woe to the enemy that gets

in its way or stands within thirty feet of the line of fire. It is not, however, the skunk that carries the odor thereafter. To show how sparingly such a defence is resorted to we may relate that the junior writer has on various occasions trapped skunks and that in no instance did they make use of it. While more than once he actually liberated them and permitted them to run off without even an indication of unpleasantness, which is more than can be said of most mammals. But, kill one, no matter how suddenly, and the scent glands seem to be at once released, causing the yellow fluid to be scattered broadcast, accompanied by that never-to-be-forgotten odor.

Like the badger and the bear, skunks appear to sleep fairly constantly during the winter months and only emerge from their burrows occasionally; there is seldom a week, however, that they do not show signs of activity, though long journeys are seldom indulged in before March.

The males do not seem to take any part in the family welfare and on this account are seldom met with, in fact, there is even reason to suspect that they are undesirable visitors near the home and that they might perchance make a meal of a newly born young if opportunity offered, though we have no direct evidence in favor of such a supposition.

On June 10th, 1912, a family of skunks was located beneath the foundations of an old building and as we wished to study their habits the junior writer set to work in the endeavor to catch them. He commenced operations by placing a shallow tin of bread and milk close to the burrow, to which the skunks proved very partial, and ate readily. It was but a short time before they appeared in his presence, and within ten days they had become sufficiently tame to readily partake of the milk while under observation. Did he get too close however, the mother angrily demonstrated her displeasure, and with hair erect and tail well over her back made short jumps towards him hitting the ground a sounding blow with her fore feet.

On June 23rd a trap was devised consisting of an apple barrel sunken in the ground, with a collapsible top, this latter being level with the surface and covered sufficiently to look natural. At dark some bread and milk was placed on the opposite side from the burrow, while the trapper waited events close at hand. As was their nightly custom, the young skunks soon appeared, and with that instinctiveness for which all wild mammals are celebrated, made a careful inspection of the trap. They would move carefully a little way on and then back off again, repeating the manœuvre a number of times, until finally they went round and soon had their noses in the milk. It was not long, however, before one, getting a little alarmed,

made a short cut for its home, forgetting the trap in its haste, and promptly fell in. The watcher then deliberately pushed in another with his foot. Meanwhile the mother, observing that all was not well, remained at the entrance of her burrow thumping the ground continuously with her feet. It being now dark, however, operations were suspended until next morning, when the mother and another baby were found secured, the parent having evidently been trying over night to release her children and fallen in in the attempt. The old one was not, however, a desirable acquisition, so she was helped out by means of a board and at once made her way to the remaining young, and finding them safe brought them out in broad daylight to eat the freshly placed bread and milk, the night exertions having evidently made her hungry as well as fearless, as she showed no regard for the observer within reach, who taking advantage of his nearness picked up another small one and placed it with its captive companions, thus making four and leaving two for the mother.

To those not familiar with skunks and having regard only to the story-book tales, these proceedings will be thought somewhat risky, but as a matter of fact they were amply justified by the results, the captures and all connected with them being accomplished with no more fuss than if the captives had been kittens and as if the celebrated odor had formed no part of them.

While the mother continued for a time to reside beneath the building, the young were placed in a box within which they remained until the end of August when, becoming pugnacious, or too rough in their play, they were transferred to a room some twelve feet square, in which they were able to romp with impunity. They soon became extremely tame, and apart from always being at the door at meal-times, would race round and round the visitors feet in their eagerness to get at the food. Nor did they hesitate to rear and set their front feet upon an outstretched hand to secure the titbit offered. They would also permit being taken up without protest, though this practice was never to their liking. In the morning they were often in a playful mood and would jump and thump the floor in pretended anger, but it was at night when they were seen to full advantage. Then, quite regardless of a lantern, they would run about, frisk and climb eagerly up to shove their noses greedily into the bread and milk-pail before we had even time to place it upon the floor. There was a resemblance to a pig in these actions, particularly in the habit of shoving each other with their shoulders to retain the dish for themselves, but otherwise they lapped up milk much as a cat does. With bread they either grabbed it with their teeth, or putting both feet in the pail made quick jerks backwards,

usually upsetting the contents, when they would draw a lump into a corner, always with the same characteristic backward movements.

Grasshoppers invariably proved a great treat, and being abundant, were sometimes collected in large quantities with the aid of a sweeping net, but never in sufficient numbers to appease the appetite of our hungry pets. It was particularly interesting to watch them catch the living ones. Moving slowly forward they sniffed about until one was located, when they immediately pounced upon it with their fore paws, and speedily took it within. Moths too were relished and were often chased round the lantern and not infrequently knocked down with the feet as they fluttered past. Twice the senior writer discovered a prowling Lion Beetle (*Calosoma calidum*) which, in spite of the strong odor peculiar to this species, was greedily devoured. Rabbits, when divided, were partaken of with relish, so were gophers and mice, and many a fight was witnessed over them, as our friends invariably desired the same portion, and in their endeavors to secure it would pull, snap, squeak and whistle, as well as shove with all their might, but eventually each was provided with a portion and would retire to a separate locality to devour it. Their hunger being thus appeased, they would curl themselves up together on their bed of hay until the shades of night produced renewed animation and activity.

Repeated experiments demonstrated that insects formed the most palatable food, next came meat in its various forms, and after this vegetable matter such as cherries (*Prunus pennsylvanica* and *P. virginica*), also carrots, raspberries, strawberries, acorns, broad beans (green), wheat heads, wild buckwheat (*Polygonum*), lamb's-quarters, peas, grass and various other vegetable substances too numerous to mention.

Our pets continued to flourish and grow until the end of September, when they were almost fully developed. At this time one became unwell with what appeared to be a sort of distemper, and in spite of every care, got rapidly worse and died without a struggle. A few weeks later another took sick and shortly after all had died. Two of these were magnificent creatures at the time of their death and but a few days previous had been at the height of activity and health as well as extremely fat. The senior writer had at that time held two of them up in his arms while they, with a total disregard for what was going on, were both ardently engaged in a battle to see which should get its head in the bread and milk can first. The very next day they were ill, and a few days afterwards were dead, from a cold that seemed to lead to sleep and from sleep to death. We were all very sorry to lose our pets, particularly our sister, who had

tended them almost daily and given them various titbits. All the horror which the name skunk implied had vanished and in its place we found a pretty, attractive animal, surpassed by few in cleanliness. When they were attended to and their house kept thoroughly clean, little, if any, of that odor for which they are famous was discernible.

The mother remained about for some time, but eventually acquired a habit of visiting the poultry house and stealing the chickens. She was trapped by the junior writer, but given her liberty again in the hope that the lesson would prove sufficient. She remained perfectly quiet while being released, and only by persistent chasing could be made to leave the premises, which she did at last without any reminder that would suggest a skunk. Returning a few days later she encountered the dogs, much to their discomfort and ours, but even this did not restrain her from her nightly raids, so eventually necessity obliged us to make away with her. As a parting, she left a by no means desirable legacy, which remained in evidence for at least a couple of months afterwards.

Of the two remaining young little is known, but from the fact that a dog met with a somewhat hasty check near the old home late in the season we have reason for hoping that at least one has survived.

SCARCITY OF BUMBLE-BEE NESTS IN THE VICINITY OF OTTAWA.

Queens of *Bombus terricola*, *ternarius*, *fervidus* and *borealis* were common on the Experimental Farm in the spring, and those of seven other species, *pennsylvanicus*, *perplexus*, *vagans*, *impatiens*, *rufocinctus*, *affinis* (only one) and *separatus* (one only) were observed. During July and early August, however, very few workers were seen and no nests could be discovered. The trial plots of red clover, a plant that never fails to attract large numbers of *Bombi* in Europe, were seldom visited by bumble-bees, though in a red clover field at Danford Lake, Que., numerous workers of *B. borealis*, an uncommon species in the United States, were noticed. Why are bumble-bee colonies so rare around Ottawa? Is it because the queens cannot find suitable nests? Or are they destroyed by parasites or larger enemies, such as skunks? Observations on the nests that have survived might reveal the main cause of the scarcity, and the writer would be very pleased to hear of any nests that may be found in the district or elsewhere, in order that he may make a careful investigation.

F. W. L. SLADEN, Asst. Entomologist for Apiculture, Division of Entomology, Central Experimental Farm, Ottawa.

CORRESPONDENCE.

EDITOR, The OTTAWA NATURALIST:

It is with pleasure that I am able to report that for the fourth year in succession "*Tyrannus verticalis*" has migrated hither. A pair are now (May 26) looking over last year's nest with a view to re-occupation. Probably they are the original pair. In any case, they are far more welcome than their cousins, *T tyrannus*.

H. M. SPEECHLY, Pilot Mound, Man.

NEST OF BELTED KINGFISHER.

A nest of this species with the eggs and parent bird has been acquired by the Canadian Fisheries Museum. The nest is from Meach Lake, Gatineau District, P.Q., and was found by Mr. Alex. C. Finlayson, Inspector of Fish Hatcheries, and his son, on 24th May. It was situated in a sand-pit about 10 feet from the ground and about 3 feet from the top of the pit. An excavated tunnel about 8 feet in length led from the entrance to the nest—the diameter of the entrance being about 2½ inches, and the extremity of the tunnel, where the nest was, was dome-shaped, and about 8 inches across and some 6 inches high. The nest was placed on the sand of the pit, and was merely composed of clean fish-bones and scales, upon which was the full complement of eggs—7 in number, fresh, semi-spherical, and pure white, only that their contents before being blown gave them a pinkish hue. The parent bird, which was found in the burrow, is the male, which lacks the chestnut band across the breast characteristic of the female. The nest, eggs and bird, when together exhibited in the museum, will form a graceful object.

BELTED KINGFISHER (*Ceryle alcyon*). "This is the familiar bird whose loud, coarse, rattling notes are heard along our streams. It may be seen perched upon the lower branches of a tree overhanging the water or on the top of a dead stump; these places furnish a favorite outlook, from which it plunges beneath the water to secure its prey, which is chiefly fish. It is a curious fact that Mr. W. E. D. Scott frequently met with this bird in the desert region of Southern Arizona, far from water, feeding on the large insects and lizards." (Oliver Daire, in "*Nests and Eggs of North American Birds.*")

ANDREW HALKETT.

OCCURRENCE OF THE COTTON MOTH IN ONTARIO IN 1912.

BY ARTHUR GIBSON.

The first record I have of the occurrence of the Cotton Moth (*Alabama argillacea* Hubn.) in Canada, in 1912, is its abundance at Woodstock, Ont., where the moths appeared on the evening of October 9th, or morning of the 10th. Mr. James Dunlop, who reported the flight, stated that he first saw them on an electric light pole near the Canadian Pacific Railway Station, soon after 8 a.m. Many specimens were on the pole and on the ground nearby. Visits were then made to other electric light poles in the vicinity. An immense number of the moths were seen on and near the second pole. "The pole was on one side of the sidewalk and on the other side under some trees among the grass, the moths were covering everything. They could have been literally shovelled up. There was a large flock of hens that had also discovered them, but they did not seem to make the least impression in their numbers. Next morning very few were to be seen, just an odd one here and there."

In the Canadian Entomologist, April, 1913, a short note was published, chiefly to accompany an illustration made from a photograph of a flight taken at London, Ont., by Mr. J. F. Calvert. With the photograph, Mr. Calvert sent the following note: "Late Thursday night, or early Friday morning (October 10th-11th), there appeared in London, great numbers of the Cotton Moth. They were most noticeable around the Canadian Pacific Railway Station, the Grand Trunk Railway Station, the Grand Trunk Railway Round House, and at a few other points where powerful arc-lights were located. In some places there were heaps several inches deep under these lights. By the following Sunday (October 13th) very few were to be seen."

At Dunnville, Ont., a flight was observed in the morning of October 11th. Mr. J. C. Payne, who reported the occurrence, stated that the moths "covered, thickly, the windows and store fronts, and lay on the ground like autumn leaves. There was a rain storm during the night (10th-11th), and the moths were here in the morning, after the rain."

On the evening of October 12th, I saw numbers of the moths in New York City, particularly in store windows and in restaurants.

At Ottawa few specimens were seen, and only during one evening, viz., October 15th, when seven were observed.

EXCURSIONS.

BRITANNIA, May 17th. After a brief address from the President, Mr. Newman, as to plans of excursion, place of meeting for the discussion of specimens collected, etc., the party divided themselves into two groups: botanists and zoologists. The former, with several leaders, went towards Britannia Highlands. The zoologists took the opposite direction, judging the lowlands better suited for the aquatic life which they were seeking.

Notwithstanding the sounds of the woodman's axe and the carpenter's hammer, in clearing for and erecting homes, the denizens of the woods have not yet learned (here at least) to fear the advance of civilization. The squirrels seemed to enjoy the luxury of boarded sidewalks, which form the avenues of the future village.

Not expecting to find many of the early spring flowers, we were surprised to see the trilliums in such profusion, whose beautiful white wax-like petals adorn and beautify any landscape.

The following is a list of the flowers collected: Trillium (*Trillium grandiflorum*), Jack-in-the-Pulpit (*Arisaema triphyllum*), Toothwort (*Dentaria diphylla*), Bellwort (*Oakesia sessilifolia*), Ground-nut (*Aralia trifolia*), Sarsaparilla (*Aralia nudicaulis*), Clintonia (*Clintonia borealis*), Squirrel-corn (*Dicentra canadensis*), Starflower (*Grientalis americana*), Mitrewort (*Mitella diphylla*), Goldthread (*Coptis trifolia*), Corydalis (*C. glauca*), Liverwort (*Hepatica triloba*), Twisted-stalk (*Streptopus roseus*), Maianthemum (*M. canadense*,) Marsh Marigold (*Caltha palustris*), also four species of violets.

The birds seen or heard were as follows: Swallows, robins, red-and-buff-shouldered black-birds, bronzed grackles, a crow, certain sparrows, and a flicker. A burrow of some mammal, perhaps that of a wood-chuck, was seen. The pools contained numerous insects, such as aquatic beetles and hemipterons, a scarlet-coloured arachnid, and an isopod (*Asellus aquaticus*), besides different kinds of pulmonate water snails, such as *Limnæa stagnalis* and *Planorbis*. An interesting insect found was a specimen of *Meloe*, which is related to the blister beetle of commerce. Facts concerning its structure, such as the rudimentary elytræ etc.; life-history, such as how the adult insect feeds on the leaves of the buttercup; the fate of the young larvæ, which are conveyed by bees to their nests, etc., were stated. A few tadpoles, upon one of which the larva of a neuropterous insect was preying ,were shown in a glass jar.

After a most delightful afternoon we returned to the Pavilion, where "Talks" were given by Dr. Blackader, Mr. J. W. Eastham, Mr. A. Halkett, Mr. Newman and others.

A. L. M.

AYLMER. The district around Queen's Park, Aylmer, was the locality chosen for the excursion of the club, held Saturday afternoon, May 31st. It was necessary to change the place of meeting from Ironsides, owing to wrong information having been received about the train service; this caused several to miss the outing. The excursionists left the electric railway landing about 3.30, and after walking through the park, along the railway track and through woods for an hour and a half, they took possession of one of the vacant cottages along the lake to discuss the finds of the day. The specimens most frequently encountered, and one which nature seems to have been making a specialty of for two years, was the forest tent caterpillar. These creatures were everywhere, on leaves, in the grass, on the railroad rails, as well, in fact, as on most of the people, but the other works of nature more than compensated.

Mr. L. H. Newman, president of the club, presided, and also presented the botanical specimens. The district is not especially rich in wild flowers, although a fair number of specimens were collected. A few lady's slippers were found, a number of violet species, the beach pea, bishop's cap, lousewort, shepherd's purse, pennycress and the fruit of poison ivy.

A very interesting talk on the wild fruits of the district was given by Mr. W. T. Macoun, Dominion Horticulturist. Mention was made that in this district there is only one native species of wild plum, the Canada plum, which is hardy, but for many years has not porduced fruit because of the severe attacks of a fungus disease. Some transplanted trees, grown under good orchard culture, are now producing paying crops. This is a striking illustration of the benefits of spraying for the prevention of disease in fruit trees. The native varieties of cherries here are the choke, pin and black. A specimen of the native prickly gooseberry was collected. This species is being used in crossing to breed hardiness into the larger cultivated sorts. Specimens of the common wild black currant and the common wild red raspberry were found. The latter is the species from which most varieties of cultivated red raspberries have been developed. Most of these have been produced in southern districts and are, therefore, not hardy in cold climates. At the Experimental Farm work is being done on the plants found in the locality to produce hardier varieties. Nearly all the cultivated varieties of strawberries too have come from one of the two wild species found here; many of them are tender because grown in a southern district and hardier strains are being developed.

The geology of the district was discussed by Dr. Williams of the Geological Survey. The three distinct types of rock found were blue limestone, sandy shale and 'sandstone. It was ex-

plained how the limestone, found along the lake shore, formed in deep water, and the sandstone, further back on higher land, in shallow water with the shale intermediate. An exceptionally fine specimen of sandstone, made of tiny round pebbles cemented together by pressure, was found, and an interesting piece of fossil rock composed almost entirely of snails.

The birds, insects and snails were looked after by Mr. A. Halkett of the Fisheries Museum and Mr. Winterberg of the Geological Survey. Among the birds Mr. Halkett noted the oriole, kingbird, bobolink and song sparrow. The yellow swallow-tail butterfly was seen and a number of small insects and larvæ collected, including the destructive cutworm.

E. D. E.

STITTSVILLE. The excursion to Stittsville on June 14th was the last arranged for by the council for the summer season, and the afternoon's outing was much enjoyed by the goodly number of excursionists. The locality proved to be a rich field for the collector and observer.

Various species of plants were collected under the leadership of the botanists, observations were made of rock formations, and a winding stream visited by some of the members proved to be a regular natural aquarium for the general zoologist.

Mr. L. H. Newman, president of the club, named most of the plants which had been collected during the outing. Among these he showed the tall meadow-rue, bunch-berry, mouse-ear chickweed, silvery cinquefoil, small-flowered crowfoot, star-flower, lady's slipper, clintonia, dwarf raspberry, mitre-wort, twin-flower, cleavers, anemone, and a number of different sedges. He referred to the abundance of silvery cinquefoil and mouse-ear chickweed on the knolls and ridges, where the soil was lighter and inclined to be sandy. This was a good illustration of plant adaptation.

Referring to specimens of *Viola selkirkii* collected during the afternoon, Dr. Malte gave a brief account of the seed formation in the stemless violets. It was pointed out that, as a rule, the showy spring flowers are not able to produce seed, this function being taken over by so-called cleistogamous flowers, *i.e.* insignificant bird-like flowers which are self-fertilized automatically without being opened. These cleistogamous flowers behave very differently in different species, and offer very good characters for their identification. Only occasionally the spring flowers are fertilized, either by pollen from the same species or from other ones. In the latter case the result will be the production of hybrids, characterized by a large per cent. of un-

developed pollen unfit for fertilization. In the vicinity of Ottawa four hybrids between different *Viola* species have been found this spring.

The occurrence of *Antennaria canadensis* (Everlasting) in the district visited induced Dr. Malte to deal briefly with the phenomenon called parthenogenesis, *i.e.* the faculty of egg-cells of certain genera and species to develop the new normal individuals without the assistance of male organs. He pointed out that parthenogenesis in plants was in fact first discovered in a species of *Antennaria*, it having been observed that in this genus, which is diœcious, the male plants generally are extremely rare; and he also referred to a number of other parthenogenetic genera, such as *Taraxacum* and *Hieracium*, and finished his remarks by calling attention to the remarkable investigations on the parthenogenetic development of eggs of sea-urchins and star-fishes, which, during recent years, have been carried out by scientists in the United States and France.

Mr. McGillivray collected specimens of gneiss of a typical gray colour, and also in a decayed state; samples of limestone, red granite, sandstone and a kremoloid; and he also had with him to show specimens of different kinds of minerals which he had previously collected on the island at Chelsea and at the Ironsides mine.

Except in stagnant pools, there has been for years past at the localities which the naturalists have visited, little opportunity for the study of aquatic forms of life, but the stream at Stittsville afforded excellent facilities for such study. The brook is full of small cyprinoids and other kinds of small fishes, besides a great variety of aquatic invertebrates. The fishes netted or observed were these: specimens of Red-bellied Dace (*Chrosomus erythrogaster*), a Minnow (*Leuciscus neogæus*), a small specimen of the Common Sucker (*Catostomus commersonii*), a few specimens of the Brook Stickleback (*Eucalia inconstans*), a specimen of a Darter presumably the Johnny Darter (*Boleosoma nigrum*) or perhaps its variety, the Tessellated Darter (*Boleosoma nigrum olmstedi*), but the specimen was lost before it could be examined; and numerous specimens of a Miller's Thumb (a cottoid) were seen in the stream, but none were netted. One or two specimens of a Crayfish (*Cambarus*), larvæ of a Caddis-fly with their tubes made of broken pieces of wood, one or two tiny fresh-water mussels, and various other aquatic invertebrates were also found in the brook.

The excursions of the season have been a great success, every Saturday has been fair, and the last held, at Stittsville, proved to be one of the most enjoyable and instructive.

A. H.

THE WESTERN GREBE IN ONTARIO.

There have been a good many records of the occurrence of this bird in the province, but probably not one is capable of being substantiated. All those that have been investigated have proved to be the Red-necked Grebe, which is a regular and frequent migrant through all of Ontario, and the uncertified remainder are doubtless of the same class. It is a pleasure, therefore, to put in print a genuine record for which the skin is in evidence.

Some months ago in examining the collection of Mr. J. E. Keays, of London, Ontario, I found an immature specimen of the Western Grebe which had been obtained from Mr. H. D. Carman, about 1892, and which was taken at Sarnia. The date of capture is unknown, but it was in the neighbourhood of 1888.

There is little doubt but that this species, so common in the west, strays into the regions of Lakes Superior and Huron each year, but its numbers would probably be few and only rarely would one be seen or captured by anyone competent to identify it.

W. E. SAUNDERS.

BIRD NOTES.

The following notes were given to me by Mr. I Turner, who has spent the past winter near the "end of steel" on the Transcontinental Railway, about fifty miles east of Cochrane.

WILLOW PTARMIGAN (*Lagopus l. lagopus*). Abundant during the greater part of the winter, from about the middle of December, 1912, to March 20th, 1913. The birds were very tame, and would seldom take wing on the approach of a human being; more likely one of the males would strut ahead of the flock and with trailing wings advance, as if to challenge the intruder.

CANADA SPRUCE PARTRIDGE (*Canachites canadensis canace*). Common, and like the preceding species, very tame.

NORTHERN RAVEN (*Corvus corax principalis*). Common; usually to be found in vicinity of the camps, where they fed on offal and other refuse.

CANADA JAY (*Perisoreus c. canadensis*). Common; another camp-follower.

L. McI. TERRILL.

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DOES THE TYPE OF PROTOPALÆASTER NARRAWAYI PRESENT AN ORAL OR ABORAL ASPECT.

(Plates VIII-IX, Figure 1).

By George H. Hudson.

During my first study of this type, careful search was made for items of evidence for both sides of this question and these items were classified and recorded. The evidence was so long and so overwhelmingly in favor of an oral aspect that it was decided not to burden my paper [A]* with it. In the last paragraph, however, I mentioned three of the most important adverse items, anticipated criticism, and promised a defence of my position. Dr. Raymond uses these items, with others, in favor of an aboral aspect [B]. I propose here to weigh carefully his evidence and present some items which are decidedly against his view.

Infero-Marginals.

I. The vertical radial outlines of the interradial shown in [A] plate II, fig. 4, and in our present text figure 1; together with the transverse vertical outlines seen in [A] plate III, fig. 5; show a markedly convex surface without the slightest degree of summit flattening and such outlines prove conclusively that no interradial supero-marginal ever developed in contact with the exposed surface of these plates.

II. On the orad margins of each of these plates there are three concavities—the central one the most pronounced. They suggest comparison with the hollows or depressions in the plates of Goniasteridae and Linckiidae into which the jaws of the pedicellariae rest when open. Dr. W. K. Fisher writes me that he believes "The impressions are intended to receive the epineural plates," and that they are, therefore, oral surface features.

*Papers to which reference is made are indicated by capital letters in brackets. A list of these is placed at end of this article.

III. The absence of granular ornamentation on the exposed faces of the arm marginals is about equal in transverse width to the area which would be covered with the opened epineurals. Dr. Raymond, [B] p. 106, lines 42-43, cites this peculiarity as evidence that supero-marginals must have rested over these. In [C] I have published stereograms of three different regions from the undoubted oral surface of Palæaster niagarensis, Hall, which show the same smooth surfaces, and Prof. Fisher writes me that naked areas on these plates "are especially numerous in the Goniasteridae, in the genera Tosia, Goniaster, Pseudarchaster, Plinthaster." The evidence here is at least no stronger for an aboral than an oral surface.

IV. Dr. Raymond, [B] p. 106, lines 38 and 42, calls the exposed surface of the marginals "truncated" and "flat." We have seen that this is far from being the condition of the interradials and in [A] plate II, figures 3 and 4, we may see that it does not accurately describe the arm marginals. The first of these has a fairly well rounded surface, while the second to the fifth possess well marked angles a little orad of the centre of the plates. That these plates were convex on transverse vertical section is also seen in figures 5 and 7 of this plate—note particularly the right-hand side of figure 7.

Photomicrographs made under gum possess a flat lighting that is sometimes very deceptive. My study of such, like the one used in figure 2 of the plate just referred to, led me also to call these plates flat and deny them re-entrant angles for the oral longitudinal muscles. If now we will examine in [A] plate III, fig. 4, the marginals numbered from 2 to 7, we shall see these plates in normal lighting and their appearance is very decidedly that of original free surfaces and against both Dr. Raymond's descriptive terms and his deduction therefrom—that these surfaces were produced by intimate contact with a series of supero-marginals. Many forms, both living and fossil, show a more decided oral flattening of these plates than that revealed in this figure.

V. In our present plate IX, fig. 1, the right hand marginals 5 and 6 are fairly well preserved and the fields of their common flexor clearly outlined both by form and also by the blackened remains of some of their muscle fibers. Such large bundles of flexors would occur only on arm surfaces.

Of the five items given by the marginals the third is of little value and is only included because it formed a part of Dr. Raymond's evidence against an "oral side up" decision. Item IV, when the real facts are given, is for such a decision, and items I, II and V are of a most positive and unequivocal character.

ADAMBULACRALS.

VI. The exposed flat faces of the first adambulacra (mouth plates) dip strongly inward. The true oral surfaces of these plates in Palæaster parviusculus have similar flat faces which also dip inward. See stereogram in [C] plate III.

VII. Prof. Fisher says of the angular ridge towards the furrow, which is shown by all the adambulacrals, "This strongly suggests the attachment area of the 'furrow comb' of spines * * * * such a ridge is quite characteristic of many species. It is well seen in Astropecten, Psilaster, Persephonaster, etc."

VIII. Dr. Raymond says of these adambulacrals [B] p. 105, lines 9-11, "And each plate was provided with a cup-like pit into which the proximal end of a covering plate fitted." He then says of the Urasterella which he figures, [B] 106, lines 1-2; plate VI, fig. 1; that its apparent "Covering pieces" (ambulacra) "are supported by small plates with a pit on top, just as in Protopalæaster narrawayi." Now, in the first place, ambulacra never have their adambulacral ends fitting into cup-like pits to form ball and socket joints. There is, however, a pit or depression between each pair of plates, and this is occupied by the ambulacro-adambulacral muscle. In the second place, the adambulacra now in question do not possess "cup-like pits," but they show angular, flat or slightly depressed muscle fields. In the third place, the proximal ends of the epineurals in P. narrawayi not only do not "fit" these muscle fields, but they *are in every case placed alternately with them.* This is the only evidence that Dr. Raymond deduces from the adambulacrals, and it is too widely at variance with the facts to have been carefully considered. The alternate arrangement just specified is strong evidence against Dr. Raymond's interpretation.

On giving these adambulacrals additional study by means of new stereograms, I am inclined to abandon my idea that the muscle fields in question were for attachment of epineural adductors. The muscle fibers, which remain attached to them, are small and more probably served to open the "furrow combs." In our plate IX, fig. 2, much heavier bundles of muscle fibers are to be seen next the marginals and between adambulacra—note particularly the remains of the bundle between the last two adambulacra on the left. In addition to the evidence given, [A] p. 46, lines 32-37, to show that the epineurals were arranged alternately with the adambulacra, I here present fig. 1 of plate IX. There maining ends of several epineurals are to be seen in place in the left-hand row of this figure, but probably crushed in a little by the force that displaced the epineural below. In figure 2 of this plate it will be seen that the median bosses

projecting inwardly from the last preserved marginals do not extend through to the aboral surfaces of the plates, but they served for attachment of the epineurals. We may still see that the 3rd and 4th marginals on the left each possessed two of these bosses though the corner ones have been nearly lost by weathering.

IX. Where adambulacra possess long vertical axes these are usually somewhat imbricated, the oral ends being tipped toward the mouth, never away from it. The broken ends of rays II to V all show this inclination. See stereogram in [C] ray V and our plate IX, figures 1 and 2. The angle of inclination is about 25°. The slight imbrication is an adaptation to secure greater flexibility in the arms and to help in thrusting the food content of the furrow toward the mouth. Such evidence cannot be lightly set aside.

EPINEURALS.

Although asserting that the "covering pieces" had their origins in the pits of the *oppositely* placed adambulacra, Dr. Raymond calls them "alternating plates" (p. 105, line 6). A study of their distal ends is of interest. The younger pieces, plate VIII, fig. 2, meet, though very irregularly, by their end faces. The furrow here is in a contracted condition, and this should have *opened* the end faces, were these ambulacra, and displayed the muscle fields of the transverse dorsal ambulacral muscles. Not the least trace of such muscles is anywhere to be seen.

The older epineurals, following the law of biogenesis, are less like primitive covering pieces and meet only by their inner edges, plate VIII, fig. 1. The fallen 8th, the covered 5th and the two shifted 3rds in this figure indicate that the meeting ends were free.

The varied imbrication of the *sides* of these pieces and the absence of traces of longitudinal muscles is also evidence against their being ambulacra.

The epineurals marked as first could by no possible means have had their distal ends bound to their opposite neighbors. To conceive these first members of a series as ambulacra is therefore wholly out of the question.

The evidence of plate IX, fig. 2, is that the epineurals were borne by the marginals. The latter plates have lost much of their original surface, but there is here and there a suggestion that they also bore large spines outside of the epineurals. For one instance note the structure of the raised central portion of the more perfectly preserved fifth marginal in plate IX, fig. 2. The only spine fragment preserved in the matrix, however, is in

interradius 1, but this when magnified about 20 diameters reveals a striated surface as if belonging to a sea-urchin.

VERTICAL SECTION.

XI. The last item of evidence to be here given from the oral skeleton is derived from the sequence and form of outline of the vertical section given in text figure 1.

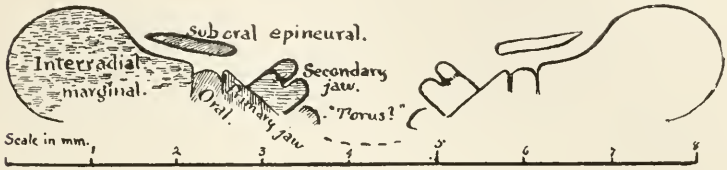

FIG. 1. Outlines from vertical section of P. narrawayi passing in through one interradius to center and out by one of the interradii next the opposite radius. Slight offsets have been made to include suboral epineurals and secondary jaws.

It is not a difficult matter to account for these plates, their form and position, if the outline is that of the true oral surface. If, however, this outline is of the aboral surface of the oral skeleton, we are face to face with an apparently insuperable difficulty. How are we to explain the presence of the deep concavity on the now aboral inner face of the marginal—the large paired plates which now become *supra-orals*—the beveled *interior* faces of the mouth plates—and the function of the "secondary jaws." Are we to suppose that the circumgastric ring of ten *radially situated* pieces (our first epineurals) rested against or over the borders of the stomach and served for "internal massage" or for a compress to aid in the emptying of the stomach cavity? Was the ring of ten double-headed internal "crushers of the oesophagus" an essential adjunct of this new and wonderful mechanism? Those against an oral aspect must explain this apparently senseless arrangement of heretofore wholly unknown plates. Should further study establish their view we may properly expect that the biological story told by these plates will be one of intense interest.

THE ABORAL SKELETON.

The balance of Dr. Raymond's evidence is contained in the paragraph commencing on p. 106, line 44, of his criticism and is derived from the plates marked (x) and (y) in our plate VIII, fig. 1. I agree with him that for these "a place cannot be found in the structure of the specimen" (p. 106, lines 45-46). He

finds, however, that "they are not far from their original position" (p. 107, lines 18-19). That they were thrust to their present position after the burial of the specimen is made manifest, not only by the plates in the immediate vicinity, but plates now lost must have communicated this thrust to interradius 1, and there not only turned the secondary jaws, but displaced one of the mouth plates and the oral. Dr. Raymond's assertion that "if these were plates foreign to this specimen, they would not maintain their natural position in relation to each other, but would be separated," is evidently meant to indicate that the overriding movement was not of great magnitude. He must have frequently found forms buried serially over each other, without necessarily finding all the plates of the upper specimens "separated." An examination of our plate VIII, fig. 1, with a stereoscope leads me to doubt if (y) belongs to (x) any more than (z) does. I find plate (y) depressed; the meeting faces neither parallel nor of the same form; and if the plate really belonged to (x) shifted a little toward radius I, though I should have expected the thrust to have made it slip in an opposite direction. The movement instead of *separating* these plates has thrust them together. Dr. Raymond asserts that (y) cannot be an adambulacral of another specimen (p. 107, lines 12-14) because it "is larger and of different shape." It has two diameters perpendicular to its sides of about 0.8 mm each, which is a little less than the transverse diameter of the adambulacral just back of the undisturbed mouth plate in radius II. Turn this adambulacral on its side and you will have a plate displaying an area greater than that now shown by (y). Plate (x) "is pointed at the wider end" (p. 107, line 6), but I cannot be positive that the faces on each side of the angle are either true sutural faces or that this is the original orad end of the plate. The smaller face seems to possess the granular ornamentation of the aborad end of a marginal and the lines of blackened organic fragments buried in the plate run parallel to the long face while in the stereograms (photographs) these lines are distinctly subparallel with the sides next the first arm marginals. If plate (y) belonged to the aboral skeleton it is sheltered enough to have retained some ornamentation, but it is as smooth as a sutural face of an adambulacral. As all other plates have been completely weathered away we must credit the remaining big plate with a serious loss of its original surface. I would not like to assert of this plate, which shows rotation on both its long and short axes in addition to great loss of surface, that it has the "same form" (p. 107, line 19-21) as an interradial superomarginal of Palæaster matutina, Hall.

XII. Mr. Narraway's very kind second loan of the type has enabled me to make a number of stereograms of it, and since returning the specimen to him, I have found three among them that offer more important evidence concerning the nature of the aboral skelcton than I had before noted. In plate VIII, fig. 1, the present floor of the oral cavity shows a number of very small ossicles having diameters of between 0.10 and 0.15 mm. These are most clearly seen around the inner margin of the "torus," in interradius 1. To the right of the whiter of these ossicles there are a number of darker molds or thinly covered ossicles having similar diameters and an alternate arrangement. The half tone process will hardly allow these to be seen, but in plate IX, fig. 2, thin, angled plates with a diameter of 0.2 mm should be visible on the dark background of the upper part of the figure. A transverse row of three of these will be found just above the last adambulacral and marginal at the right. There is also one quite clearly revealed two centimeters (measured on the stereogram) above the right-hand marginal and on a line with its inner face. These plates are very regularly arranged and each has a small central projection about 0.03 mm in diameter. Twenty-five or more of these plates can be recognized in the photographs from which this figure is produced. There is a median row of slightly larger plates, and on each side of this at least five other rows arranged in regular alternation. A number of the same plates may also be seen near the end of ray IV. As P. narrawayi can hardly have had its oral skeleton sandwiched between two aboral skeletons, I think this case does not need further argument.

Dr. Raymond in his criticism has kindly sought to share a responsibility for my errors and to make Mr. Narraway assist him in this, by frequently using the pronouns "we" and "our" to represent an offending trio who persisted in their error even though (p. 105, line 24) "it must be confessed, all dissented from our view." This use of these pronouns is misleading. Dr. Raymond had a manuscript copy of my paper before its publication and duplicates of some of my photomicrographs. My experience with "paleontologists and students of recent echinoderms" was not as he unwittingly represents it. On p. 106, lines 28-32, he states: "The chief reason that Narraway, Hudson and myself had for thinking that *Protopalæaster narrawayi* was exposed from the actinal side was that the covering pieces did not look like ambulacral plates, * * * *". Here again I believe the statement would have gained in accuracy had the first two names been omitted. It must be evident at least that Dr. Raymond did not know my reasons. To Mr. Narraway is due the credit of recognizing the true character of the "covering pieces." Aside from agreeing with him in this,

my study of his specimen was wholly my own, and neither he nor Dr. Raymond are in any manner responsible for errors in my paper.

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EXCURSIONS.

BILLINGS' BRIDGE, Sept. 20, 1913.—A most delightful fall excursion of the Club was held near Billings' Bridge on the above date. About 25 members were in attendance. The chief object of the excursion was to study the aquatic plants which grow in such profusion near the Islands, a short distance from Bank Street. A sufficient number of boats had been arranged for, and under the guidance of Miss F. Fyles, Assistant Botanist of the Experimental Farm, observations were made and collections gathered of many of the water plants of the vicinity.

In midsummer the beauty of our Canadian water gardens is so apparent as to attract the attention of even the unobservant: masses of waxen arrowheads, gayly bright-blue pickerel weed and water lilies, yellow, pink and white, bladderworts, or yellow sunbonnets and water arums all in flower at once. But, in the autumn, when the flowers have shed their bright petals, the interest is in the fruiting heads of the reeds and rushes and in the less conspicuous submerged plants; of the latter class, the water-weed (*Elodea canadensis*), which becomes a great pest in shallow canals, almost completely filling the passage with its dense growth. Belonging to the same family is the ribbon grass

(*Vallisneria spiralis*). This plant, which might better be called water ribbon, as it does not belong to the grass family, was still blooming. Some of the white pollen of the staminate flowers was seen on the surface of the water floating to meet the pistillate flowers, which had arisen with sudden growth to receive it. Several species of the pondweed were found, one of the most abundant being the clasping-leaved pondweed (*Potamogeton perfoliatus*), and entangled with these was the mud plantain (*Heteranthera dubia*), which earlier in the season raises its pale yellow flowers just above the water; and in the same company, the hornwort (*Ceratophyllum demersum*) and water milfoil (*Myriophyllum* sp.). These two last-named plants somewhat resemble one another in general appearance, but on closer examination we find a readily remembered distinction in the feather-like leaves of the latter. Closer to the shore, where the Cat-tails (*Typha latifola*) and the Wild Rice (*Zizania* sp.) are always in evidence, were seen the artistic globular heads of the bur-reeds (*Sparganium eurycarpum* and *S. americanum* var. *androcladum*) with many members of the Sedge family, chiefly the club-rush (*Scirpus validus*), nut-grass (*Cyperus esculentus*), the dark green bulrush (*Scirpus atrovirens*), and the *Dulichium arundinaceum*. Floating among the stalks of these plants was the vivid green of the little duck-weed (*Lemna minor*), and the greater duck-weed (*Spirodela polyrhiza*) and the large lily pads. The different species of water lilies were distinguished, apart from the shape of the leaves, which is rather uncertain, by the seed vessels. The fruit of the yellow pond lily (*Nymphaea* sp.) remains above the water to ripen its seeds, while the pink and white water lilies (*Castalia* sp.) complete their maturity beneath the surface. On the edge of the shore, as a graceful background to the straight lines of the reeds and rushes, the trees were noticed to be festooned with the orange-berried bitter-sweet (*Celastrus scandens*) and the rich, blue, grape-like clusters of the Moonseed (*Menispermum canadense*) and bending over into the water, the long, red-leaved stems of the water-willow (*Decodon verticillatus*).

Several of the members proceeded direct to one of the islands to examine land plants and collect insects, and other zoological specimens. Unfortunately, however, the collections made were small. At 4.30 the whole party met on the Island and short addresses were given by several of the leaders. Miss Fyles spoke of many of the plants which are mentioned above, and answered questions regarding them.

Mr. H. McGillivray referred to the geological formation of the district, it being of the Utica rock formation. A specimen of

a fresh water shell of the genus *Unio*, collected on the Island, was discussed, and the statement made that a large number of specimens of rocks and shells secured in the Ottawa district had been collected during the summer. These he hoped to exhibit to members of the Club at a later date.

Mr. J. R. Dymond, of the Seed Branch, Department of Agriculture, discussed many of the plants which had been found growing on the Island. A number of species were shown and identified. None of these were of uncommon occurrence, but their names were asked for by some of the members present.

The common leopard frog, which frequents the damp places of the Island, was shown by Mr. Andrew Halkett, and remarks made upon its life-history. A tadpole of another species of frog was also shown, and explanations given as to how the gill apertures become closed as the frog assumes its lung-breathing function, and how the paired limbs develop. Specimens of land-mollusks, viz.: juveniles of a helicoid, snails with their shells of the genus *Succinea*, and two small shells of a gastropod, requiring determination, were exhibited.

Mr. F. W. L. Sladen, Assistant Entomologist for Apiculture at the Experimental Farm, showed some males of *Vespa diabolica* captured at raspberry flowers, in which the markings varied. He called attention to the neglected field of the study of wasps and wild bees, viz.: the superfamilies, *Vespoidea*, *Sphecoidea* and *Apoidea*. During the past season he had taken two or three thousand specimens of these in the Ottawa district, consisting of over 300 different species, not a few of which are probably new to science.

Mr. Arthur Gibson, First Vice-President of the Club, who had charge of the excursion, spoke in conclusion on certain insects which were noted, mentioning particularly the Burdock Gelechiid (*Metzneria lapella*), the larvæ of which are so useful in destroying the seeds of burdocks and which hibernate in the heads, and the galls of *Pontania pomum*, known as the Willow Apple Gall, which had been found abundantly on the leaves of *Salix discolor*. Freshly emerged specimens of the beautiful large dragon fly, *Anax junius*, were also shown.

EXPERIMENTAL FARM, September 27th, 1913.—Thirty members of the Club met at the end of the car line at 3 o'clock. A visit was first made to the memorial erected to the memory of the late Dr. James Fletcher, one of the founders of the Club. The party then, under the guidance of Mr. Arthur Gibson,

First Vice-President, and Mr. F. E. Buck, of the Horticultural Division, examined the climbing vines on certain of the Farm buildings, the remarkable collection of hedges, undoubtedly one of the best to be found anywhere, and afterwards many of the groups of trees and shrubs in the arboretum. The flowering plants were later visited and information given as to those most worthy of cultivation. The Insectary of the Division of Entomology was shown, and the method of studying the life-histories of destructive insects described.

BEAVER MEADOW.—The last of the fall excursions for 1913 was held on the afternoon of October 4th to the Beaver Meadow, near Hull. Since the previous excursion to Beaver Meadow, the lower end of this locality has changed considerably owing to ts having been divided into building lots, on which already a fair sprinkling of homes have been established. The beautiful wood to the right of the stream, on entering the meadow, is a "thing of the past," but fortunately, as yet, from the naturalists' point of view, the upper end is unchanged, and it is sincerely hoped that this may be left as it is for very many years. The locality has always been a favourite haunt of the Club, and many happy hours have there been spent by its members.

After wandering about for nearly two hours, the party reassembled and listened to brief remarks by leaders present. Mr. Andrew Halkett spoke of batrachians which had been collected, viz.: the Leopard Frog, the Wood Frog and the Common Toad. A fine specimen of the Garter Snake was shown and remarks made on snakes in general and their habits.

Mr. Arthur Gibson spoke on certain insects and showed specimens of the large Water-strider, which skates over the surface of the stream; the Hedge-hog Caterpillar, which was crawling about in search of a convenient place to hibernate; and the Lesser Migratory Locust, which this year has been very destructive near Ottawa in fields of barley, oats, potatoes and corn.

Mr. E. C. Wight showed specimens of Meadow Rue, Joe-Pie Weed, Butternuts, etc., confining his remarks chiefly to their medicinal properties. He also referred to several bad weeds, particularly the Blueweed, aften called Blue Devil, which is so common in Ontario and the eastern provinces and which is much enquired about by farmers.

Mr. H. McGillivray exhibited specimens of rocks and shells which he had found in the district. A most interesting specimen was a nodule on which there was the impression of a petrified capelin, a specimen of fish which is yet extant.

THE JUBILEE MEETING OF THE ENTOMOLOGICAL SOCIETY OF ONTARIO.

One of the most important gatherings of entomologists which has ever taken place in Canada was that which met at the Ontario Agricultural College, Guelph, on August 26th, 27th and 28th, 1913, to celebrate the Jubilee Meeting of the Entomological Society of Ontario. Among the distinguished entomologists from outside of Canada who were in attendance were: Professor J. H. and Mrs. Comstock, of Cornell University, Ithaca, N.Y.; Dr. E. P. Felt, Albany, N.Y.; Prof. T. J. Headlee, New Brunswick, N.J.; Prof. P. J. Parrott, Geneva, N.Y.; Dr. A. D. MacGillivray, Urbana, Ill.; Dr. R. Stewart MacDougall, Edinburgh, Scotland; Mr. Geoffrey Meade-Waldo, London, England; Prof. F. M. Webster, Washington, D.C., and Dr. W. M. Wheeler, Boston, Mass. The following entomologists from Canada were present: Rev. Prof. C. J. S. Bethune, Guelph, Ont.; Rev. Dr. T. W. Fyles, Ottawa; Mr. H. H. Lyman, Montreal; Prof. W. Lochhead, Macdonald College, Que.; Dr. C. Gordon Hewitt, Messrs. Arthur Gibson, F. W. L. Sladen, Ottawa; Dr. E. M. Walker, Dr. A. Cosens, Mr. J. B. Williams, Toronto; Prof. T. D. Jarvis, Messrs. L. Caesar, A. W. Baker, G. J. Spencer, Guelph; Prof. John Dearness, W. E. Saunders, London, Ont.; John D. Evans, Trenton, Ont.; F. J. A. Morris, Peterboro, Ont.; R. S. Hamilton, Galt, Ont.; R. C. Treherne, Agassiz, B.C.; J. D. Tothill, L. S. McLaine, Fredericton, N.B.; G. E. Sanders, Bridgetown, N.S.; C. E. Petch, Covey Hill, Que.; J. C. Chapais, St. Denis (En bas), Que.; W. A. Ross, Vineland Station, Ont.; H. F. Hudson, Strathroy, Ont.

In the afternoon of August 27th, President Creelman, of the Ontario Agricultural College, welcomed the entomologists to the College and in a bright, happy speech, spoke of the value of the practical side of the study of insects to the agriculturist and the community at large. Addresses to the Society on its having attained fifty years of service were presented by delegates, representing a large number of Universities, Colleges of Agriculture, Societies, etc., the world over. Greetings from the Ottawa Field-Naturalists' Club were presented by Mr. Arthur Gibson.

During the two days' session at Guelph important papers were presented by Rev. Dr. Fyles, Rev. Dr. Bethune, Dr. A. D. MacGillivray, Dr. A. Cosens, Dr. R. Stewart MacDougall, Prof. F. M. Webster and Mr. F. J. A. Morris.

On the evening of August 27th the delegates and members were entertained by Dr. and Mrs. Creelman, and on the following

evening Dr. W. M. Wheeler delivered a most delightful and instructive lecture on "Ants." This was illustrated by a collection of exceptionally good lantern slides. All of the papers, etc., presented at the meeting will be published in full in the Annual Report of the Society.

On August 29th the Society entertained the members and delegates to an excursion to the Grimsby district, where collections of insects were made and several orchards visited, which showed full well the value of spraying ,etc., to control injurious insects.

Dr. C. Gordon Hewitt, Dominion Entomologist, Ottawa, was elected President of the Society for 1913-1914. The City of Toronto was decided as the place of the next meeting.

POPULARITY AND ROLE OF THE ROSE.*

By F. E. BUCK, Experimental Farm, Ottawa.

The popularity of the rose is rapidly increasing. To such an extent is this true that quantities of beautiful roses belonging to the Hybrid Tea class are now being planted in sections of country where up till recently it was thought impossible to grow with safety roses of this class at all. For instance, several rose lovers in Canada have recently planted large quantities, of the best varieties that it was possible to import, of these roses. With slight winter protection many of them are apparently quite adapted to conditions of climate as far north as Montreal and Ottawa.

In connection with the spread of this flower, it may be apropos to ask why it is that it has always held the premier position amongst flowers?

In the spread of culture and the aesthetic spirit throughout the world the role which the rose has played has been an important one, and in this paper it is the intention to briefly discuss that role.

The fact that somewhere during every hour of every day and night the sun is shining somewhere in that vast empire called British is often emphasized. Another fact equally significant to us perhaps in another way is that that same sun every day of the 365 of every year calls into fragrance and beauty somewhere in that same vast empire blossoms of one of the most perfect of flowers, the rose. Although this statement may perhaps sound exaggerated, it is nevertheless true. Roses

*—Paper presented at meeting of O.F.N.C., Dec. 10,1912.

to-day are in bloom in some parts of the same country for about nine months out of every twelve of the year.

The wealth of bloom in some of the Rose Gardens of Europe is magnificent and the variety wonderful.

At the Central Experimental Farm, Ottawa, a new Rose Garden has been recently planted with the object of testing most of the best of these modern roses, for hardiness and suitability for Canadian conditions.

Is the popularity of the rose likely to go on increasing and to what cause or causes is its popularity to be ascribed? These are two questions similar to the one already asked and it is hoped that an answer will be at least suggested in what follows.

In the first place it may be mentioned that the esteem in which the rose is held is by no means of modern growth. The following account of the birth of the rose will show how the Ancients prized it:

"Of the birth of the rose, the queen of flowers, it is related in fable that Flora, having found the corpse of a favorite nymph, whose beauty of person was only surpassed by the purity of her heart and chastity of mind, resolved to raise a plant from the precious remains of this daughter of the Dryads, for which purpose she begged the assistance of Venus and the Graces, as well as all the deities that preside over gardens, to assist in the transformation of the nymph into a flower that was to be by them proclaimed queen of all the vegetable beauties. The ceremony was attended by all the Zephyrs, who cleared the atmosphere, in order that Apollo might bless the new created progeny with his beams. Bacchus supplied rivers of nectar to nourish it, and Vertumnus poured his choicest perfumes over the plant. When the metamorphosis was complete Pomona strewed her fruit over the young branches which were then crowned by Flora with a diadem that had been purposely prepared by the Celestials to distinguish this Empress of flowers."

This fable suggests the place which the wild or native roses held in the world of floriculture. The modern rose, with the co-operation of man, is a much more perfect creation than the rose alluded to in the foregoing, and through it nature has called into exercise the highest qualities of mankind. For this reason the rose has played and is still playing a role which is immensely potent in influencing the ethical history of the human race.

The role which each great man plays in life does not always influence the race for good. The role played by the Emperor Nero can scarcely be said to have influenced the world for good, and even that played by such as Napoleon is questionable. Indeed the role played by most men and women affects hardly

at all the destinies of the race; but the role played by the rose, if we may consider the good influences exerted by it, in this way, has always been beneficent or interesting, and to such an extent is this true that it is quite easy to divide this influence into various phases.

One of the very pleasing minor duties of the rose has been to hand on to us, as it were, a little series of biographical or historical notes on those personages who have had their names immortalized through association with the "queen of flowers." One instance will be sufficient perhaps to indicate what is meant. It may be best given in the form of a story of one of the most prized of the older roses; it is a dainty story of a notable rose from France. "When Niel, a brave French general, was returning from the scene of his victories in the war between France and Austria, he received from a peasant, who wished to honor the hero, a basket of beautiful pale yellow roses. One of the stems, which happened to have a root clinging to it, the general took to a florist in Paris, in whose care it remained until it became a thriving bush covered with blossoms. Niel then took the plant as a gift to the Empress Eugenie. She expressed great admiration for the exquisite flowers and on learning that the rose was nameless said significantly "Then I will name it. It shall be 'The Marechal Niel' and at the same moment she bestowed upon the astonished general the jeweled baton that betokened his promotion to the high office of Marechal of France."

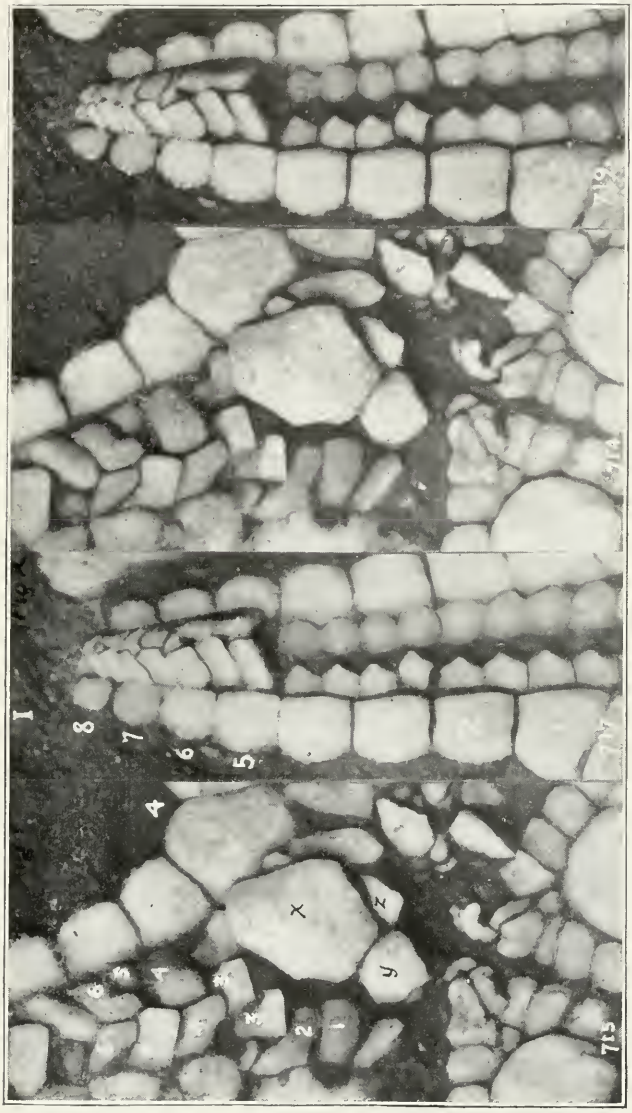
Lord Penzance, who has given us some beautiful brier roses, will be remembered as a great lawyer, but much as law may do to carry his name down the pages of history, his rose creations will do much more. William Allen Richardson is an unknown entity, but known in literature because his name became that of a rose, and Dorothy Perkins, Mrs. John Laing, and many others are names which will be household words for many years at least because their possessors loved the rose.

The only other minor role of the rose which we shall mention is one which is of greater interest to those interested in it from the botanical and historical standpoints than it is to the average grower. Botanists well know that the rose is native only to the temperate parts of this world; they also know that we have about nine species native to this country. The genus Rosa is not large, Gray mentions only fifteen species. Great Britain and Denmark claim about twenty species. The interesting part about these native species is that in working with them the hybridist found that they responded in a remarkable way to cross-fertilization. Until the year 1867 new roses other than the original species were few in number and mostly plants of chance. When, however, about that date a Mr. Bennett, in

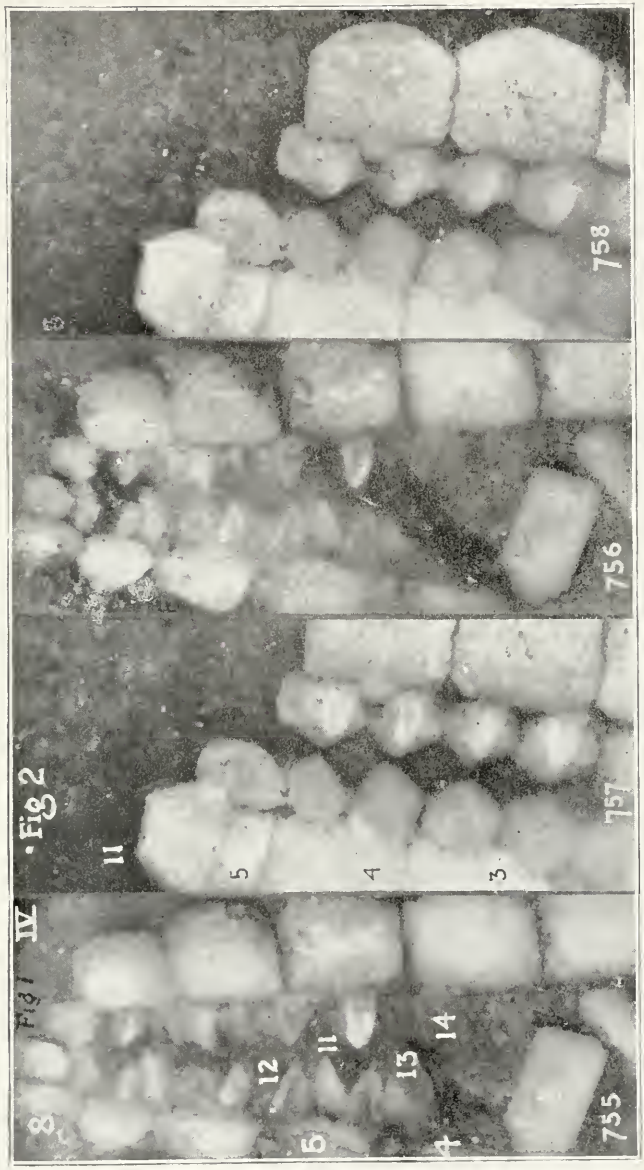
England, and other men in France, began some pioneer work in cross-fertilization of roses, a new era began in the world of floriculture, and the role which the rose has played in the efficient development and understanding of the art of plant improvement is only realized when we compare a modern plant catalogue, and especially a rose catalogue, with one printed less than fifty years ago, and then, few, we suppose, really grasp the meaning of the difference in such lists.

But let these few last words be for the consideration of the real role of the rose. One has said "What muse has been able or language sufficient, to do justice to a plant that has been denominated the Daughter of Heaven, the Glory of the Spring, and the Ornament of the Earth. . . . To paint this universal emblem of delicate splendor in its own hues, the pencil should be dipped in the tints of Aurora when arising amidst her aerial glory. Human art can neither colour nor describe so fair a flower. Venus herself finds a rival in the rose, whose beauty is composed of all that is exquisite and graceful." And it may be justly concluded that to possess such a flower and to grow it for its fragrance and beauty has been a potent desire which has led to the creation of many of those beautiful gardens not only around the "Stately Homes of England," but in ever increasing number on this continent also, and standing in one of these gardens and beholding the roses, or sitting in the doorway of one of the humblest cottages of the land, and scenting the fragrance of roses climbing around tiny windows, can any being revel in gross selfishness or remain unconscious to the fact that such flowers would win him to magnanimous conduct and invite him to be their messengers to carry fragrance and cheer to the sick and afflicted of mankind? And is there a man who can sell himself to pure utilitarianism when around him are examples of a type of beauty which has won multitudes of mankind to taste through the joys of the aesthetic life the real fulness of living? And surely none can be mere animal only in passions when forms so perfect in symmetry and shape appeal to him to witness their perfect modesty and grace?

The rose, Queen of Flowers, has a true role in this world, and that role no mortal may dare make light of. To take chief part in shaping the aesthetic taste in man, to encourage the love of the garden, the love of fragrance, of beauty of form, of exquisite color is a task of no mean order, and yet the modern rose is encouraging, more than ever before, a more clamorous appetite, a truer aesthetic thirst for these things, a true indication, surely, that her supremacy is secure and her role a beneficient one.



Details of *Protopalæcastor marrauayi*, Hudson, under gum and enlarged about 9.5 diameters. The numbers next lower margin are those of the original negatives. Examine with a stereoscope to study in relief.



Details of *Protopalæaster narragansi*, Hudson, under gum and enlarged about 19.5 diameters. Numbers 13 and 14 are wrongly placed. The former is at the position of the *tenth* epineural.

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THE HAUNTS OF SOME OF OUR NATIVE FERNS.

By A. Cosens, M.A., Ph.D., Toronto.

A plant is dependent on its surroundings for the raw materials of the food necessary for its nutrition, also the energy required to manufacture this food is supplied from agents that are without the body of the plant. Even the important functions of pollination and seed dispersal are left very largely to the care of external forces.

A consideration of these facts leads us to see that each plant has definite and vital relations to the various components of its environment. These life relations are often so numerous and complicated as to be only partially understood. As the component factors of any environment are never stable for any considerable length of time, the welfare of the individual plant is dependent on the fact that it exhibits a certain degree of plasticity in relation to its surroundings. If a plant is to exist it cannot present an unyielding front to the forces surrounding it. A certain structure is transmitted to a plant by its ancestors; an ever changing environment tends to vary this transmitted form. This feature of plant life is of such universal application that we may consider a pathological condition as a variation from the normal to such an extent that the life of the plant is endangered.

The study of the habitats of our native ferns presents several points of interest and opens up many avenues for investigation. As a rule these plants do not exhibit plasticity of structure to nearly the same extent as our ordinary flowering plants. As a consequence of this the conditions under which the various ferns can flourish are much more restricted.

The chief factors of the environment of these plants, arranged in the order of their importance, are: light, water, drainage, soil; of less importance are heat and wind. Their relations to other plants will be considered in connection with light, as many of the plants with which they are associated have important shade producing qualities.

In some cases a fern is so restricted in distribution that it is a matter of little difficulty to decide upon its natural habitat. In others, certain species are found in various locations presenting different conditions, and a comparison has to be made of plants and stations before a conclusion can be arrived at. As a general rule, a fern of normal size, of a healthy color and spore producing is growing in its natural location.

The conclusions of the writer are based on investigations made chiefly in the counties of York, Peel, Waterloo, Huron, Grey and Bruce.

PTERIS AQUILINA L. (Common Brake or Bracken). Is so widely distributed that we may say it is found almost throughout this hemisphere. In some localities the specimens are gigantic in comparison with ours. In Oregon it attains a height of six to seven feet; in the Andes of fourteen feet. It is found also in Great Britain. In the Journal of the Linnaean Society, Boodle gives its height in England as seven to eight feet. Its occurence in the Highlands of Scotland is evident, as Sir Walter Scott mentions it several times in "The Lady of the Lake":

> "From shingles gray their lances start,
> The bracken brush sends forth the dart."
>
> .....
>
> "Each warrior vanished where he stood,
> In broom or bracken, heath or wood."
>
> .....
>
> "The next all unreflected shone
> On bracken green or cold gray stone."

A plant of such wide distribution must be capable of an extended range of variation without endangering its life processes. But as it often occurs in large patches extending over localities that introduce different ecological factors, a conclusion can be arrived at with a fair amount of confidence by a comparison of specimens from different parts of the station.

The preferred habitat of *Pteris* is the top or slope of a dry hill covered with sandy loam. The shade producing plants almost invariably present are poplars, paper birch, sumach, pin cherry and hemlock. It is found near Credit Forks on sandstone strata covered by only a few inches of loam; in this locality it is associated with *Aspidium spinulosum* and shaded chiefly by pin cherry and paper birch. On passing in from the face of the cliff the loam becomes of greater depth and the timber consequently larger and of greater variety. The additional shade producing plants are hard and soft maple and beech. This shade dwarfs the *Pteris* in spite of the increased depth of loam.

In the denser shaded stations the fern was in company with *Asplenium Filix-femina* and *Cystopteris fragilis*.

Before proceeding to a consideration of the cliff ferns, it will be necessary to give a short description of a station already mentioned, namely, Credit Forks. This location is situated in the northern part of Peel County; there the Credit River has cut through the Niagara escarpment, leaving an exposure of clay and rock of about 345 feet in height. Commencing below the level of the Credit River a slope of red clay extends upward for 175 feet; overlying this is about 20 feet of Medina sandstone, while the top of the section furnishes an outcrop of 150 feet of almost vertical limestone of the Niagara formation. The clay clope is covered with a talus of blocks of sandstone and limestone fallen from the cliff above, and in the crevices of these rocks many ferns find roothold.

CRYPTOGRAMMA STELLERI (Gmel.) Prantl. (Slender Cliff Brake). Found usually on narrow, moist, shaded ledges of limestone cliffs. It roots, in company with moss, in detritus derived from the weathering of the rock. It is a frail and delicate species, very sensitive to sun and to lack of moisture.

PELLAEA ATROPURPUREA (L.) Link. (Purple Cliff Brake). In crevices of limestone cliffs; not nearly so sensitive to lack of shade and moisture as the former species. It is often found in dry situations under full illumination. It thus shows closer affinities with *Pteris*.

The two cliff brakes we have just considered are both found in the vertical limestone section of the Credit Forks' escarpment. It is worthy of note that they are entirely absent from the blocks of rock which cover the clay slope.

SCOLOPENDRIUM VULGARE Sm. (Hart's Tongue). This fern is found abundantly in Europe; in England it is reported as hanging from old ruins and even drooping from the stone curbs of wells. In America, however, it is exceedingly rare; it is found in Tennessee and New York, while in Ontario it is confined to the district between Collingwood and Owen Sound. At Woodford, near Owen Sound, it is found rooting in soil on the top of limestone rocks and cliffs; there it is associated with *Polystichum Lonchitis* and *Polypodium vulgare*. The ferns are shaded by paper birch, small maple and beech, with an occasional hemlock. It grows at Owen Sound from crevices in the walls of fissures in limestone rocks; but under these conditions, however, it does not thrive as well.

POLYSTICHUM LONCHITIS (L.) Roth. (Holly Fern). Has nearly the same distribution in Ontario as *Scolopendrium* and its habitat is practically the same.

POLYPODIUM VULGARE L. (Common Polypody). Found on the tops and upper ledges of rocks where the soil is well drained; the usual shade-producing plants associated with it in this habitat are poplar, paper birch, small hard maple and hemlock. Also found rarely on clay banks where the soil contained a little sand; in this habitat it was practically unshaded as the slopes were typical hemlock ridges. The plants under the latter conditions were dwarfed, probably from lack of shade rather than from the nature of the soil.

CAMPTOSORUS RHIZOPHYLLUS (L.) Link. (Walking Fern). Is found usually in crevices in limestone and sandstone rocks, but sometimes rooting in moss on narrow ledges. Appears to prefer the shady side of the rocks, but thrives fairly well in the sun. It is found in abundance on the rocks that cover the clay slope at Credit Forks.

ASPLENIUM TRICHOMANES L. (Maidenhair Spleenwort), and ASPLENIUM VIRIDE Huds. (Green Spleenwort) are found rooting in the crevices of shady rocks and cliffs; usually limestone or sandstone. They are not sensitive to lack of moisture, but *A. viride* does not stand exposure to the sun so well as the other species. Both the ferns are associated at Credit Forks among the talus on the clay slope.

ASPIDIUM THELYPTERIS (L.) Sw. (Marsh Fern). The ideal habitat of this fern is decidedly wet, as it is found growing usually with cat-tails. Shade is not an indispensable factor, but the fern is sheltered when thriving best. The shade producers are commonly cedar, black ash, soft elm, hemlock and occasionally basswood. In moist situations, under full illumination, the fern thrives and it will grow in a fairly dry situation until crowded out by grasses and sedges. It shows a high degree of plasticity in relation to the environment, more so than any of our native ferns, unless perhaps *Pteris*.

ASPIDIUM NOVEBORACENSE (L.) Sw. (New York Fern) In direct contrast to the preceding species, this fern is found in dry soil, but always under dense shade in the typical "cool woods." It is very abundant in a woods near Lake Huron; there it is associated with partridge berry, pyrolas, and shaded by birch, hemlock and maple. Maple and beech underbrush were also important factors in shade production. As only a few inches of humus was covering a somewhat impervious substratum of sandy loam, sufficient moisture was ensured. The rootstocks of the ferns did not penetrate below the humus. In mucky parts of the same woods *Polystichum acrostichoides* and *Adiantum pedatum* were associated with this fern.

ASPIDIUM SPINULOSUM var. INTERMEDIUM (Muhl.) D. C. Eaton (Spinulose Wood Fern), and ASPIDIUM MARGINALE (L.) Sw. (Evergreen Wood Fern). Both of these ferns thrive well in a moist, typical "cedar swamp," with a mucky soil. They are usually shaded in such a habitat by cedar, hemlock, black ash and mountain maple. The latter species is impatient of too dense shade and will thrive in a fairly open situation. The former will also stand exposure, but as a rule thrives better if the shade is fairly dense. The glandular character of the indusium of this fern varies with the environment. These ferns also thrive well in clay loam, especially on the face of slopes. In this location they are shaded by hard maple, beech and ironwood, with cedars and an occasional hemlock.

ASPIDIUM CRISTATUM (L.) Sw. (Crested Shield Fern). This fern prefers a mucky soil; its locations overlap those of *Aspidium Thelypteris* and *Onoclea*. Trees peculiar to such a situation, such as ash, cedar and mountain maple furnish the necessary shade. In comparison with its associates, however, it appears always to select a somewhat higher station and is found growing on logs and around stumps. It stands exposure fairly well; this may be due to the fact that the sun exercises a directive influence on the position of the pinnae.

POLYSTICHUM ACROSTICHOIDES (Michx.) Schott. (Christmas Fern), and ADIANTUM PEDATUM L. (Maidenhair). These ferns are both very sensitive to exposure and are found only where the shade is very dense. Their habitat seldom overlaps with *Aspidium spinulosum* and *A. marginale* in their cedar swamp location, but often does in the hardwood station. Thus on a slope where the humus overlies a clay loam the four ferns may often be found. A dense shade is produced in a typical location by maple and beech, while an occasional hemlock and basswood may also be present. In such a habitat, *P. acrostichoides* will almost invariably be found towards the top of the slope, while *A. pedatum* selects the rather more moist and sheltered location at the foot.

ASPLENIUM FILIX-FEMINA (L.) Bernh, (Lady Fern). This fern is found at its best when growing at the edge of a mucky soil location. Under these circumstances it will be shaded by cedars and hemlocks, but trees peculiar to the transition zone, such as birch, soft elm and basswood, will also be found. It stands exposure to the sun very well. Sometimes it is found associated with *Aspidium cristatum*, but, in general, it prefers a habitat that is wetter.

ASPLENIUM ANGUSTIFOLIUM Michx. (Narrow-leaved Spleenwort). In a station examined in Peel County this fern was growing

in a shaded ravine through which water flowed in the spring. It was rooted in clay loam and shaded densely by beech and maple. It was associated with *Adiantum* and *Aspidium spinulosum* var. *intermedium*. In Huron County the fern was found in abundance in rather mucky soil at the bottom of a ravine, which served as a water course during a part of the year. A dense shade was given by maple and beech, with an occasional hemlock. The ferns associated with it were those mentioned above and *Polystichum acrostichoides*. With the exception of the soil, the two stations are identical. The fact of the water course underlying the habitat in each case is important in the facilities it gives for drainage.

ASPLENIUM ACROSTICHOIDES Sw. (Silvery Spleenwort). This fern requires a mucky, springy situation, but dense shade does not appear to be a necessity. The fern is found associated with *Impatiens* and fraternizing with *Onoclea Struthiopteris* and *Cystopteris bulbifera*. The station has usually scattered trees of beech, maple, ash and birch.

PHEGOPTERIS DRYOPTERIS (L.) Fee. (Oak Fern). The favorite habitat of this fern is at the edge of mucky soil, especially where it is shaded by maple and beech. It is found growing, also, in cedar swamps, on knolls, in mucky soil. Shade in this case is produced by pines and cedars. In this station the fern is sometimes associated with *A. marginale*. This fern is able to do well under decidedly dry conditions if it is not exposed to the sun. Growing in the open it becomes invariably infested with a blight that shrivels the fronds.

PHEGOPTERIS POLYPODIOIDES Fee. (Long Beech Fern). In most cases this fern and the preceding are associated, but the Beech Fern is much more sensitive to lack of moisture and requires shade that is extremely dense. A typical locality noted was one in which the fern was found growing in a slightly mucky, reddish clay loam, where the soil was overlying a sandstone stratum and was of little depth. The timber, in consequence of this lack of soil, was small, but so close together as to produce a very dense shade. Shade producing plants present were beech, maple and hemlock, but occasionally also birch and basswood. The location described is situated at Inglewood, in Peel County, about three miles south of Credit Forks. The same escarpment is found there as at the Forks, but the overlying limestone is absent.

DICKSONIA PUNCTILOBULA (Mich.) Gray. (Hay-scented Fern). This fern was found in the same locality as the preceding but the soil, while slightly mucky, was less so than in the habitat of that species.

ONOCLEA STRUTHIOPTERIS (L.) Hoffm. (Ostrich Fern), and ONOCLEA SENSIBILIS L. (Sensitive Fern). The well known Ostrich and Sensitive Ferns are almost invariably found together, and it seems impossible to differentiate between their habitats. Their typical station is a moist clay or sandy loam in a locality that is overflowed by spring freshets. Shade is not an important factor if other conditions are favorable. The most luxuriant growth of these ferns that the writer has found was in Huron County. Here they were shaded by only a few straggling willows. The ferns were associated with Virginia creeper, Impatiens, wood nettle and turtle head. A spring creek nearby would overflow the station in flood time. In "Ferns and their haunts" W. N. Clute gives *O. Struthiopteris* as, "at its best in the wet, sandy soil of a half-shaded island or river shore."

WOODWARDIA VIRGINICA (L.) Sm. (Chain Fern), and OSMUNDA CINNAMOMEA L. (Cinnamon Fern). May be considered the peat bog ferns. *Woodwardia* is found growing in sphagnum moss and extending out nearly to the edge of the lake that often occupies the centre of the bog. It is associated with pitcher plants and orchids, such as *Calopogon*, and only slightly shaded by *Ledum*, *Kalmia* and *Cassandra*, with an occasional small black spruce. In fact, shade is almost a negative factor.

In a typical location examined the *Osmunda* formed an outer zone in immediate contact with the preceding fern. Its location, however, was drier and better shaded than that of *Woodwardia*. The shade producing plants were hemlock, larger black spruce and tamarack. *Ledum*, *Cassandra* and *Kalmia* were also present, but these were not thriving as well as in the inner zone. Occasional specimens of this fern are found also in the moist, mucky soil of cedar swamps, but locations that furnish peaty materials seem to be its natural habitat.

CYSTOPTERIS BULBIFERA (L.) Bernh. (Bulblet Bladder Fern), and CYSTOPTERIS FRAGILIS (L.) Bernh. (Fragile Bladder Fern) have well differentiated habitats. *C. bulbifera* is sharply marked out by the fact that spring water is an essential component of its environment. As long as this factor is present, others are not so important. As a consequence, it is found on dripping rock ledges or springy clay in cedar swamps bordering spring creeks, and in other habitats which present springy conditions of soil. Drainage is here a very important factor, as stagnant water does not present the proper conditions. *Aspidium Thelypteris* and *Onoclea* are not nearly so sensitive in this respect. One typical station examined presented the fern associated with Indian turnip and enchanter's nightshade near the base of a ridge with a decidedly springy soil. Another station

selected by this fern is a mucky, springy soil, shaded by hemlocks and cedars, with an occasional mountain maple. In this same locality the fern was found near the edge of a spring creek or on mossy logs overhanging the water. When growing under these conditions it is often the most convenient vegetation that can be found to line a trout basket. The bulblet loaded tips of this fern often approach so close to the water of the creek that it almost seems a legitimate conclusion that the running water is an important factor in the dispersion of these bulblets. At Credit Forks it grows along the base of the limestone cliff wherever springs issue.

C. fragilis is found associated with *C. bulbifera* along the base of springy clay banks and cliffs. It is found, also where that species will not grow, in crevices of shaded limestone and sandstone rocks, where spring water is not present. It does not stand exposure to the sun. It is found growing in mucky loam, shaded by cedars and basswood, often associated with *C. bulbifera*, if the station is springy. In this case it selects the drier locations around stumps and logs.

AN UNUSUAL COLOURED RUDBECKIA.

It is well known that plants are liable to produce progeny unlike the parents, in some striking particular, such as those with additional petals, odd shapes or variations in colour. A well known example of the latter is found in the brown-blotched *Lepachys*, which occasionally turns up among the yellow ones, and though a mere colour variety has been given the name *pulcherrima*. An homologous example, which I have not observed recorded, was discovered this summer near here and consists of a blotched form of *Rudbeckia hirta*, in which the rays had about a third of their basal portion rich brown, being in fact almost identical to the *Lepachys* in that respect. The plant consisted of seven heads, all alike, which I had marked with the idea of securing seeds, but being close to a roadway they were unfortunately destroyed before reaching maturity. Fortunately, however, the species is perennial, and so, if all goes well, will flower again next year.

NORMAN CRIDDLE, Treesbank, Man.

ON THE GENERA OF THE EODISCIDAE.

BY PERCY E. RAYMOND.

It has long been known that the name *Microdiscus*, in common use for small trilobites of Lower and Middle Cambrian age, is untenable, the genus *Microdiscus* having been founded by Emmons on a young specimen of *Cryptolithus* (*Trinucleus*). The name *Eodiscus* was suggested in manuscript by Professor Hartt when he was describing the Middle Cambrian fossils found near St. John, New Brunswick, for Dawson's Acadian Geology, but on the advice of Billings, he replaced it by *Microdiscus* at the time of publication. This name was, however, mentioned in Walcott's paper on the fauna of the Middle Cambrian (1884), and in 1896 Matthew used the name for a section of the genus *Microdiscus*.[1] Recently the writer proposed to raise the section name *Eodiscus* to generic rank, replacing *Microdiscus*. The type suggested was *Microdiscus schucherti* Matthew, which was the first species listed by Matthew under his section *Eodiscus*.[2] It seems wise, however, not to apply the term *Eodiscus* in too broad a sense, but to use it in much the same way in which Matthew did.

In reviewing the various species which have been referred to *Microdiscus*, omitting the *M. quadricostatus* of Emmons, we find three distinct types of shields. The first and most common is that typified by *Eodiscus schucherti* or *E. punctatus*, in which the glabella and axial lobe of the pygidium are both definitely defined by the dorsal furrows, and the cheeks of the cephalon and the pleural lobes of the pygidium are smooth. A second type of shield is seen in forms like *Microdiscus lobatus* or *M. dawsoni*, where the dorsal furrows are strong on both shields, and the pygidium has well defined ribs on the pleural lobes. To a part of this second section Matthew gave the name *Dawsonia*, a name which had been used in manuscript by Hartt for his *Microdiscus dawsoni*, and which had appeared in print in the Second Edition of the Acadian Geology, though not used as a generic name. This section name of Matthew's would also be raised to generic rank were it not for the fact that the name is no longer available, having been applied by Nicholson in 1872 to certain bodies found associated with graptolites. I therefore propose *Goniodiscus* for this section, with *Agnostus lobatus* Hall as the type.

1. Amer. Geologist, 1896, vol. 18, p. 29, and Trans. N.Y. Acad. Sci. vol. 15, p. 237, 1896.

2. Ottawa Naturalist, 1913, vol. 26, p. 139.

The third group contains but a single species, the *Agnostus? nobilis* of Ford. This form differs from all other known Eodiscidae in lacking the dorsal furrows on both cephalon and pygidium, and has thus the appearance of an *Agnostus* of the *laevigati* group. A nearly complete specimen of this species was recently found at the Lower Cambrian exposure on Pearl Street, North Weymouth, Mass., by Mr. T. H. Clark, and the specimen is now in the Museum of Comparative Zoology at Harvard University. The species has previously been known only by the single specimen which served Ford as a type. That specimen was poorly preserved, and has been lost since its description, so that the rediscovery of the species is of considerable interest, and it adds a new species to the rather scanty fauna of the Paleozoic of Massachusetts. Mr. Clark's specimen shows nearly all the dorsal shield, though the head is displaced from the body, and a part of one side of the thorax is missing. The presence of three segments in the thorax shows conclusively that this species belongs to the Eodiscidae and not to the Agnostidae. Both cephalon and pygidium are nearly circular, both have a narrow flattened border, and this border on the cephalon shows the row of small tubercles so often seen in this family. Neither cephalon nor pygidium shows the dorsal furrows or other markings, though by holding the specimen at a certain angle it is possible to make out the outline of a wide median lobe on the pygidium. The specimen is 7.5 mm. long. Since the type of *Agnostus? nobilis* is lost, this specimen may now take its place, and it becomes the type of the third group of the Eodiscidae, to which the name *Weymouthia* may be applied.

FAMILY EODISCIDAE, RAYMOND.

Hypoparia of small size, cephalon and pygidium sub-equal, free cheeks absent from the dorsal side, thorax of three segments. Pygidium annulated or smooth. Lower and Middle Cambrian. Northern Europe and Eastern North America.

GENUS EODISCUS, MATTHEW.

Eodiscidae with short glabella, and long or blunt neck spine, pygidium with a long ringed axial lobe and smooth side lobes. Type, *Eodiscus schucherti*, Matthew. Lower and Middle Cambrian. Europe and North America.

GENUS GONIODISCUS, NOV.

Eodiscidae with long glabella, usually blunt neck spine, and pygidium with rings on the axial lobe and ribs on the pleural lobes. Type, *Microdiscus lobatus*, Hall. Lower and Middle Cambrian. England and Eastern North America.

GENUS WEYMOUTHIA, NOV.

Eodiscidae without dorsal furrows on cephalon or pygidium,

both shields being smooth. Type, *Agnostus? nobilis*, Ford. Lower Cambrian. Eastern North America.

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E. punctatus praecursor (Matthew). Trans. Roy. Soc. Can., 1885, 3, sect. 4, p. 75, pl. 7, fig. 13.—*E. praecursor.*

E. punctatus pulchellus (Matthew). Trans. Roy. Soc. Can., 1885, 3, sect. 4, p. 74, pl. 7, figs. 12a-c.—*E. pulchellus.*

E. scanius (Linnarsson). Sveriges Geologiska Undersokning, 1883, ser. C, No. 54, p. 29, pl. 4, figs. 17, 18.—Groenwald, Bornholms Paradoxideslag, p. 79, 1902. (Referred by Lake to *E. punctatus*).

E. scanius eucentrus (Linnarsson). Groenwald, Bornholms Paradoxideslag, 1902, p. 79, pl. 1, fig. 20. (Referred by Lake to *E. punctatus*).

E. schucherti Matthew. Amer. Geol., 1896, 18, p. 30.—Trans. N. Y. Acad. Sci., 1896, 15, p. 238, pl. 17, figs. 4a-b.

E. speciosus (Ford). Am. Jour. Sci., 1873, 6, ser. 3, p. 137, figs. 2, a, b.; Ibidem, 1877, 13, p. 147.—Walcott, Bull. 30, U. S. G. S., 1886, p. 154, pl. 16, figs. 3a-c; 10th Ann. Rept. U. S. G. S., 1891, p. 632, pl. 81, figs. 5, 5a-c.—Matthew, Trans. N. Y. Acad. Sci., 1896, 15, p. 236, pl. 17, fig. 6.—Lake, Brit. Camb. Trilobites, 1907, p. 33, pl. 3, fig. 7.—Cobbold, Quart. Jour. Geol. Soc. London, 1910, 66, p. 23.

GENUS GONIODISCUS.

G. dawsoni (Hartt). Acadian Geology, 2d Ed. 1868, p. 654, p. 228.—Whiteaves, Am. Jour. Sci., 1878, 16, ser. 3, p. 225.—Walcott, Bull. 10, U. S. G. S., 1884, p. 23, pl. 2, figs. 3, 3a.—Matthew, Trans. Roy. Soc. Can., 1885, 3, sect. 4, p. 75, pl. 7, figs. 11a-c; Trans. N. Y. Acad. Sci., 1896, 15, p. 240, pl. 17, figs. 5a-e. (? 5a, 5b).

G. lobatus (Hall). *Agnostus lobatus* Hall. Pal. N. Y., 1847, 1, p. 258, pl. 67, figs. 5a-f.—Rogers, Geol. Penna., 1858, 2, p. 820, fig 614 (1-4).—*Microdiscus lobatus.* Ford, Am. Jour Sci., 1873, 6, ser. 3, p. 135 footnote.—Walcott, Bull. 30, U. S. G. S., 1886, p. 156, pl. 16, figs. 1a, b; 10th Ann. Rept. U. S. G. S., 1891, p. 632, pl. 81, figs. 4a, b.—Shaler and Foerste, Bull. Mus. Comp. Zool., 1888, 16, p. 36, pl. 2, fig. 13.—Matthew, Amer. Geol., 1896, 18, p. 30.—Grabau, Occ. Papers Bos. Soc., 1900, 4, p. 671.—Lake, Mon. Brit. Camb. Tril., 1907, p. 32, pl. 3, figs. 4-6.—Cobbold, Quart. Jour. Geol. Soc. London, 1910, 66, p. 22, pl. 3, figs. 17, 18.

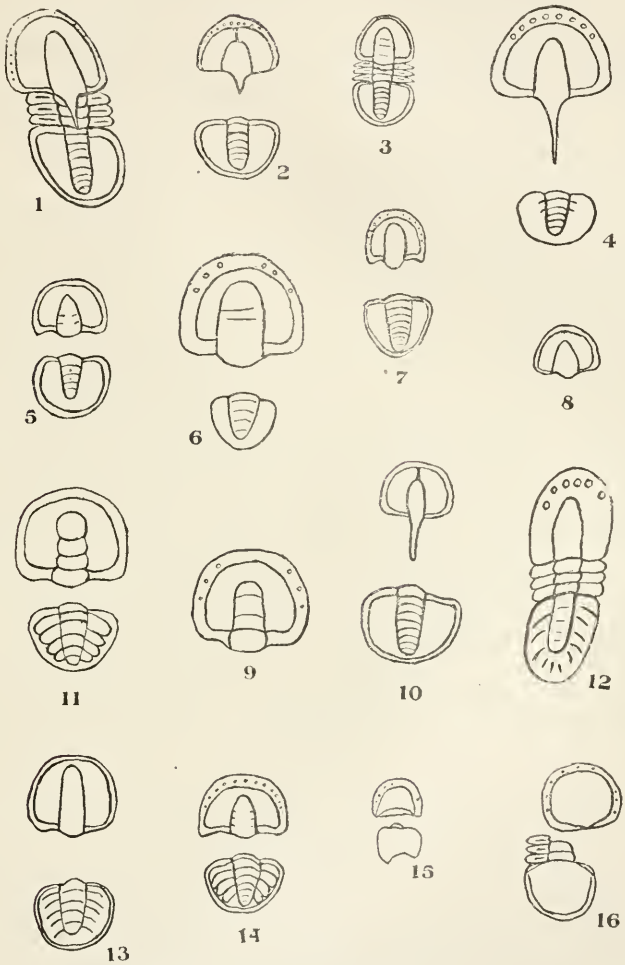
G. parkeri (Walcott). Bull. 30, U. S. G. S., 1886, p. 157, pl. 16, figs. 2, 2a; 10th Ann. Rept. U. S. G. S., 1891, p. 632, pl. 80, figs. 7, 7a.

G. sculptus (Hicks). Quart. Jour. Geol. Soc. London, 1871, 27, p. 400, pl. 16, figs. 9, 9a, 10, 10a.—Lake, Brit. Camb. Tril., 1907, p. 35, pl. 3, figs. 9, 10.

GENUS WEYMOUTHIA.

W. nobilis (Ford). *Agnostus? nobilis* Ford. Am. Jour. Sci., 1872, 3, ser. 3, p. 419, figs. 1, 2.—Walcott, Bull. 30, U. S. G. S.,

1886, p. 150, pl. 16, fig. 7; 10th Ann. Rept. U. S. G. S., 1891, p. 629, pl. 80, fig. 7, 7a.—*Microdiscus? nobilis.* Vogdes, Am. Geol., 1892, 4, p. 383.



EXPLANATION OF FIGURES.

1. *Eodiscus punctatus* (Salter). Middle Cambrian, Wales. After Lake.

2. *E. pulchellus* (Walcott). Middle Cambrian, New Brunswick. After Walcott.

3. *E. speciosus* (Ford). Lower Cambrian, Eastern New York. After Walcott.

4. *E. connexus* (Walcott). Lower Cambrian, Eastern New York. After Walcott.

5. *E. schucherti* (Matthew). Lower Cambrian, Eastern New York. After Matthew.

6. *E. helena* (Walcott). Lower Cambrian, Eastern New York. After Walcott.

7. *E. belli-marginatus* (Shaler and Foerste). Lower Cambrian, Eastern Massachusetts. After Walcott.

8. *E. praecursor* (Matthew). Middle Cambrian, New Brunswick. After Matthew.

9. *E. meeki* (Ford). Lower Cambrian, Eastern New York. After Walcott.

10. *E. scanius* (Linnarsson). Middle Cambrian, Sweden. After Linnarsson.

11. *Goniodiscus lobatus* (Hall). Lower Cambrian, Eastern New York. After Walcott.

12. *G. sculptus* (Hicks). Middle Cambrian, Wales. After Lake.

13. *G. parkeri* (Walcott). Lower Cambrian, Vermont. After Walcott.

14. *G. dawsoni* (Hartt). Middle Cambrian. New Brunswick. After Matthew.

15. *Weymouthia nobilis* (Ford). Lower Cambrian. Near Troy, New York. After Ford.

16. *W. nobilis* (Ford). Lower Cambrian, Pearl Street, North Weymouth, Mass. Original.

NOTES ON A CATERPILLAR.

By ANNIE G. H. WHITE, Toronto.

September 22nd, 1912—Found a large green caterpillar of the Cecropia Moth on a lilac bush. Brought it in and put a branch of the lilac with caterpillar under a large battery jar.
Sept. 24—Caterpillar commenced spinning about 10 o'clock a.m.
" 25—Outer wall of cocoon finished; looks like a transparent silk basket.
" 26—Cocoon almost opaque; looks like an airship; egg-

shaped, $3\frac{3}{4}$ in. long, $1\frac{7}{8}$ in. at widest part; caterpillar can still be faintly seen moving.

Sept. 28—Cocoon complete; caterpillar quiet.

Oct. 8—7 o'clock p.m.: heard a scratching noise like tearing of silk, continued all the evening and next day.

" 9—8 o'clock p.m.: must see what is going on, cannot resist.

" 10—The caterpillar life is over and the pupa lies within its silken case, not to move again till June awakens it.

How to tell what I saw! Words can scarcely express its wonder.

I carefully clipped the cocoon with a scissors, making two incisions, to a point at the top, so that I could bend down the section like a door.

The caterpillar lay within the smooth inner wall. It did not look any different than when last seen. Using a large lens, so as not to lose a single item of its proceedings, I set myself to watch. Presently it rose and fell as if heaving a deep sigh; then it began swaying round and round, then from side to side, very much like the motion of a bear.

After some time of this a crack appeared in the skin at the back of its neck. The motion became more violent. Extending itself, it raised its first pair of legs upward as if "throwing high hands to Heaven" in appeal for help. Then drawing back and down it crouched as if in depths of humility or despair. Looking more deeply into the cocoon I saw the object of these movements and also why a caterpillar wears spines and knobs.

In moving, the spines on the segments rubbed against the wall of the cocoon, and assisted in the removal of the caterpillar-skin, which was the object worked for. The crack in the skin had gradually lengthened down the back. Then the head parts and legs seemed to slide downward, just like a child's dress comes off after it is unbuttoned.

Now the new form of the insect appeared. Soft and of a velvety, indescribably beautiful, yellow, the heavy antennæ and legs looking as if made of gelatine. This new creature kept up the swaying till the whole caterpillar-skin was neatly packed beneath it like a concave cushion in which it rested in the bottom of the cocoon.

After this the pupa kept on moving slightly for some time. Then from around the legs and antennæ (which were now folded flat and close) and from the segments a yellowish glassy fluid seemed to ooze, which hardened and turned brown as it covered the pupa till it became as if varnished. All movement now

ceased, and I closed the opening with adhesive plaster, leaving the place at the top as near to nature as possible, so that I might see the moth emerge in its full beauty and thus will have watched a part of the life cycle of one of Nature's little children.

PROGRAMME OF WINTER LECTURES.

NOVEMBER 25TH, 1913, (Tuesday). Open Meeting.
Exhibits and Addresses by members.
(Normal School Assembly Hall).

DECEMBER 9TH, 1913, (Tuesday).
"The Old Iroquoian Religion and the Handsome Lake Reform." (Illustrated)
Dr. C. M. Barbeau, Assistant Ethnologist, Geological Survey.
(Normal School Assembly Hall).

JANUARY 13TH, 1914, (Tuesday).
"Forestry and Conservation." (Illustrated)
Dr. Clyde Leavitt, Commission of Conservation, Ottawa.
(Normal School Assembly Hall).

JANUARY 27TH, 1914, (Tuesday).
"The Shedding of Leaves, Flowers and Fruits." (Illustrated)
Dr. Francis E. Lloyd, Department of Botany, McGill University, Montreal.
(Normal School Assembly Hall).

FEBRUARY 10TH, 1914, (Tuesday).
"Protection of Birds in and around Ottawa." (Illustrated)
Dr. C. Gordon Hewitt, Dominion Entomologist, Central Experimental Farm, Ottawa.
(Collegiate Institute Assembly Hall).

FEBRUARY 24TH, 1914, (Tuesday).
"Views in the Dominion Parks." (Illustrated)
Mr. A. Knechtel, Chief Forester, Dominion Parks.
(Carnegie Library)

MARCH 10TH, 1914, (Tuesday).
"The Mackenzie River Region." (Illustrated).
Mr. Charles Camsell, Geologist, Geological Survey, Ottawa.
(Carnegie Library)

MARCH 24TH, 1914, (Tuesday). Annual Meeting and Presidential Address. "The Breeding of Economic Plants."
L. H. Newman, B.S.A., Secretary, Canadian Seed Growers' Association, Ottawa.
(Carnegie Library)

STYRACOSAURUS ALBERTENSIS.

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THE OTTAWA NATURALIST

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A NEW GENUS AND SPECIES OF CERATOPSIA FROM THE BELLY RIVER FORMATION OF ALBERTA.*

By Lawrence M. Lambe, F.G.S., F.R.S.C., F.G.S.A.
Vertebrate Palæontologist to the Geological Survey, Canada.

Styracosaurus, gen. nov.

Skull massive, elongate, pointed in front, and greatly extended behind to form a neck-frill with long, robust, tapering outgrowths projecting obliquely backward and outward from its posterior border. Fontanelles of moderate size within the coalesced parietals. Squamosals somewhat quadrangular and entering largely into the formation of the front part of the frill. Postfrontal fontanelle large. Supratemporal fossæ opening widely behind. Nasal horn-core large, upright, straight, rising from the back of the nasals. Supraorbital horn-core incipient.

Styracosaurus albertensis, sp. nov.

The skull of this species is remarkable for the largeness of the nasal horn-core, the remoteness of the same from the acute rostral apex, and for the great development of backwardly directed spike-shaped processes on the posterior margin of the coalesced parietals.

The horned dinosaur above named is represented by the skull only, which is the type of the proposed new genus and species. This magnificent specimen was discovered last summer in the Belly River formation on Red Deer river, Alberta, by the vertebrate palæontological expedition of the Geological Survey under Charles H. Sternberg. It is almost perfect on the left side and is in a splendid state of preservation. It occurred imbedded horizontally, in a natural position, in a thick layer of light grey clayey sandstone with the neck-frill and the upper surface as far forward as the anterior part of the nasals exposed to view. Later it was found that the lower jaw and the rostral bone were not present. At the time of the discovery of the skull the nasal horn-core had been broken off a little below its mid-height, and the foremost and last of the

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

large posterior processes of the frill on the left side had lost about three and six inches respectively from off their pointed ends. These parts were not found. On the right side, the jugal had fallen to pieces and the lateral border of the frill had suffered some damage from exposure. The posterior processes had been broken off and fractured, but, with the exception of a few fragments, they were recovered and have been restored and replaced in position.

The front part of the skull has been crushed down to some extent. This has caused an overlapping of some of the bones, notably at the junction of the nasals with the premaxillæ and maxillæ, and along an irregular line through the lachrymal foramen, the lower rim of the orbit and the lower edge of the postfrontal. The orbits and the lateral temporal fossæ have been reduced in vertical diameter and the left jugal has been squeezed slightly outward below.

This specimen brings to light an entirely new phase of frill development, which is unique among the horned dinosaurs. It may be regarded as one of the most complete and best preserved of the Ceratopsian skulls hitherto discovered in Cretaceous deposits of this continent.

The name selected for this genus has reference to the shape of the large processes on the frill, which resemble spikes, and must have made this bristling reptile in life a veritable moving chevaux de frise.

Viewed from above, the skull presents a facial wedge-shaped portion from the orbits forward, a middle section which broadens abruptly into a somewhat circular expansion and includes the anterior half of the neck-frill, and a hindermost part formed of the widely divergent posterior processes which add so greatly to the length and breadth of the frill.

In lateral aspect the skull is depressed and very long in contrast with its height. The spike-shaped processes double the length of the frill, which, without them, would compare favourably in relative size with the corresponding expansion in later forms of the Ceratopsia, such as Triceratops, in which the orbit is but slightly in advance of the mid-length of the skull. Behind the nasal horn the upper outline is straight, then somewhat depressed near the middle of the crest, finally rising to its highest point at the termination of the hindermost process. The orbital rim rises above and breaks the continuity of the superior outline of the head. Midway between the posterior rim of the orbit and the anterior end of the nasal the straight nasal horn rises abruptly, with a slight inclination forward, and is the most conspicuous feature of the anterior part of the head.

The nasal outline in advance of the horn is highly arched and descends rapidly in front to the premaxilla. The sinuous border of the squamosal slopes upward and backward, and its general direction is continued behind by the anterior free margin of the parietal. From this aspect the processes are given off one above the other in an ascending series. The inferior outline of the premaxilla is obtusely angular and drops to a point considerably lower than the alveolar border of the maxilla. In general terms the skull's greatest depth, without considering the nasal horn-core, is at the orbit, whence it is reduced to some extent forward, and very conspicuously so backward.

At the time of writing, the upper and side surfaces only of the skull had been freed from the matrix. Some of the sutures are distinct and can be traced, others, where coossification has taken place, are not seen with certainty or are entirely obliterated.

The neck-frill or crest is formed of the squamosals and the immense expanse of the coalesced parietals. The main part of the squamosal is slightly broader than long and has its lateral free edge regularly sinuous. Behind this, for a short distance, the anterior, lateral border of the parietal is conspicuously tortuous. The massive, tapering projections or outgrowths are given off postero-laterally from the frill, three on each side. These processes conform to the general slope of the part of the frill from which they spring. The two forming the hindermost pair are the largest and are directed backward and slightly outward. Those of the next pair in advance are nearly as large and point more outward than backward. The two anterior ones are the smallest, are nearly parallel to the middle ones and spring partly from beneath them. The processes have a perceptible curve outward. The central part of the posterior border of the frill, between the hindermost processes, is thick and rounded, its outline, as seen from above, being regularly concave with a decided convexity at the base of the processes.

The intraparietal fontanelles are irregularly oval in outline, with the longer diameter from back to front. They are set obliquely in the frill, being slightly divergent forward. They are more distant from each other than from either the central concavity of the posterior border, or the lateral sinuous margin of the frill. Their anterior end approaches closely to the squamoso-parietal suture.

The nasals are greatly enlarged posteriorly for the support of the nasal horn-core, whose anterior basal surface is slightly behind their mid-length. In advance of their union with the

maxillæ they send down a short, stout process to meet an ascending process from the premaxillæ. This process is displaced upward and forward on each side of the skull. The one on the left side is seen, in the figure of the lateral aspect of the skull, as a triangular projection silhouetted against the back part of the nasal opening. In advance of the horn the nasals contract rapidly and continue forward as a vertically narrow, laterally compressed arch, which descends anteriorly in a sweeping curve to join the premaxillæ. A vertical nasal septum, contributed to by each nasal, descends from their longitudinal junction to form the upper margin of the nasal opening and in front to join the premaxillæ. This septum supplies to the nasals anteriorly a large vertical surface of contact and greatly strengthens them. An admirable provision for the support of the nasal horn-core is seen in the formation of the nasal bones, which, under the horn, form a massive, transverse arch, and in front a longitudinal arch braced beneath by the septum, the whole wonderfully adapted to withstand heavy strains transmitted from the horn above.

The maxilla narrows rapidly to the front, where it reaches the premaxilla. Its upper half, which is overlapped behind by the jugal, overhangs the lower half, whose concave hinder end is covered by the triangular transverse bone.

The premaxilla has a smooth surface, is narrow in front and flares outward below. In lateral aspect it is obtusely angular in front and beneath. It consists of a well defined marginal strip of nearly the same breadth as, and in continuation downward and backward of, the arched portion of the nasal, standing out from and circumscribing below a sunken, inflected area, which rises as a thin plate to meet the nasal septum anteriorly and to form the lower free edge of the nasal opening behind. It is overlapped at its front angle by the rostral bone, which fits into a sutural groove between the premaxillæ in front and is closely applied to them as far back as the lower angulation. Posteriorly an ascending process reaches the descending process of the nasals.

The exact boundaries between the frontals, prefrontals, postfrontals and lachrymals have not been determined, as these bones were coossified and the sutures between them are for the most part obliterated. The frontals were not large and met in the midline for a short distance only, as indicated seemingly by impressed markings, which appear to be the remains of a fronto-postfrontal suture. The postfrontals, however, were extensively developed. In the midline anteriorly they met for some distance in sutural contact, but posteriorly they were widely separated by a long postfrontal fontanelle. They

formed the posterior border of the orbit and met the jugal and the squamosal below and the parietal behind. The upper orbital rim is thickened and overhangs the orbit, and rises conspicuously above the level of the flat postfrontal surface between the orbits. The lachrymal probably forms the anterior rim of the orbit and the prefrontal the overhanging upper margin of the same. Set well back posteriorly on the raised ridge above the eye-opening is a small, shallow, smooth depression, irregularly oval in outline, which indicates the position of an extremely small, or incipient, supraorbital horn-core, which appears to have been present as a separate ossification and to have become detached.

The jugal had much the same shape as in Triceratops; it was pointed below, and, in its upper part, extended to either side, anteriorly to overlap the maxilla and posteriorly to meet the squamosal. It formed the lower rim of the orbit and the whole of the upper margin of the lateral temporal fossa, which was enclosed below by a forwardly directed process from the squamosal. The thin upper end of the quadratojugal is wedged between this process and the quadrate, which is seen in the lateral aspect of the skull, passing beyond the quadratojugal to effect a union with the under surface of the squamosal.

The squamosal is well developed, of a fair size, roughly quadrangular in shape, and a little broader than long on its main outer surface. At the middle of its anterior breadth it sends forward an outwardly flat process, which encloses the lateral temporal fossa below and behind. Its lateral free margin is smooth, rounded, and regularly undulating with five somewhat vertically compressed convexities to the outline.

The neck-frill in its anterior half is saddle-shaped. The surface of the coalesced parietals between the fontanelles is equal to their transverse diameter and is flatly convex across and slightly concave longitudinally. The bone surrounding the fontanelles is very thin at the edge. Between these openings it remains moderately thin, but toward the lateral free edges and posteriorly it becomes thickened, especially so at the bases of the large processes and along the posterior border. Behind each fontanelle the surface of the bone rises into a rough, obliquely placed short ridge or keeled boss. Proximally the posterior processes are somewhat vertically compressed, but outwardly they become more nearly circular in transverse section. The median portion of the coalesced parietals is continued forward, in advance of the fontanelles, as a distinct raised surface with parallel sides, to meet the postfrontals, where it probably formed the hinder margin of the postfrontal fontanelle. This anterior part of the parietal is damaged, but on

each side of the posterior end of the postfrontal fontanelle and between it and the supratemporal fossa a small part of it remains, shewing its sutural contact with the postfrontal. Where the upper median portion of the parietal has been broken there is a short transverse bar across the midline, which appears to mark the posterior limit below of the postfrontal fontanelle. Behind this bar is a small, shallow, oblong depression. The very large excavations beneath the postfrontals, the supratemporal fossæ, debouch widely backward with a smooth, lower surface, or floor, formed of the parietal and the squamosal. Although mainly beneath the postfrontal, this fossa extends laterally at its exit beneath the squamosal on the outer side, and the anterior end of the parietal inwardly, these three bones together composing the roof of the excavation at its mouth where they come to a sharp, overhanging, free edge, which slopes upward from about the middle of the back part of the squamosal, obliquely forward and inward and then descends backward, apparently without interruption, if the specimen were perfect, as the lateral edge of the median portion of the parietal. The smooth floor of the supratemporal fossa extends backward beyond its main opening toward the anterior end of the parietal fontanelle and inward beneath the median portion of the parietal, which it undercuts, leaving a free, overhanging edge, and at a higher level enters a subsidiary fossa, which is directed obliquely inward and backward and terminates next to the midline of the skull, where it is separated only by a thin bony partition from the corresponding excavation on the other side. These subsidiary fossæ, one on each side of the midline, beneath the parietal, are behind the transverse bar already mentioned,

The parietal crest evidently rose behind at a rather steep angle during the life of the animal. In the specimen now described the crest has been crushed and bent downward, with the result that the parietal has been broken across behind the postfrontal fontanelle and pulled back, leaving the gap in the upper surface, as seen in the two photographic reproductions of the skull accompanying this paper.

The bone forming the margin of the postfrontal fontanelle comes to a thin rounded edge and within the fontanelle near its anterior end is another transverse bar not so stout as, but longer than, the one behind.

The lachrymal foramen is seen between the maxilla and the nasal in advance of the back end of the former bone. It has been reduced in vertical diameter by the downward pressure to which the skull has been subjected.

As with most Ceratopsia, the outer and upper surfaces of the skull are marked by vascular grooves, notably so on the horn-core, the postfrontal above, and the posterior processes.

The magnificent specimen here described has been skillfully prepared for study by Mr. Charles H. Sternberg, who discovered it last summer on Red Deer river, Alberta, on the south-west side of the river, about twelve miles below the mouth of Berry creek. The plates are reproductions from excellent photographs taken by Mr. Geo. G. Clarke.

The genus Styracosaurus is distinguished from Ceratops, Marsh, by having incipient instead of well developed supra-orbital horn-cores, by the shorter squamosals, and by the intraparietal fontanelles of moderate size, instead of greatly enlarged ones enclosed by the squamosals and parietals together.

From Monoclonius, Cope, it differs in its greater size, the smaller fontanelles of the frill, the larger squamosals, and in having a straight, upright nasal horn instead of one which curves backward.

In Styracosaurus the shape and position of the nasal horn-core, the spike-shaped outgrowths from the back of the frill, the long postfrontal fontanelle, and the great size of the supra-temporal fossæ are additional characters separating this from all other known genera of Ceratopsia.

It is not possible to arrive at a definite conclusion regarding the generic and specific affinities of *Monoclonius sphenocerus*, Cope, from Montana, on account of the fragmentary condition of the material on which this species is based, and the very small part of the skull represented. The general resemblance of Cope's specimen, which includes the nasals, the nasal horn-core and the left premaxilla, to the corresponding parts of *Styracosaurus albertensis* suggests the advisability of referring the Montana species to the genus Styracosaurus. It is likely, however, that the species are not the same. In so far as a comparison can be made between *M. sphenocerus* and *Styracosaurus albertensis* it is seen that in Cope's species the nasal horn-core is farther forward on the nasals, is proportionately shorter, and more laterally compressed, with a much greater antero-posterior diameter at the base. The nasals in front of the horn descend rapidly instead of rising conspicuously before they curve downward, and the nasal opening is larger and placed more under the horn. These differences are regarded as probably indicating a specific but not a generic distinctness.

MEASUREMENTS.	Feet.	Inches.
Maximum length of specimen from midway between the points of the back processes..	6	$1\frac{1}{4}$
Greatest breadth of same across the processes..	4	$8\frac{1}{2}$

	Feet.	Inches.
Length of squamosal from the posterior termination of its free edge to the back margin of the jugal	1	$3\frac{5}{8}$
Breadth of same from its lowest point to the top of the squamoso-postfrontal suture		$12\frac{2}{8}$
Length of nasal horn-core as found		$9\frac{7}{8}$
Transverse diameter of same, at break		$2\frac{6}{8}$
Longitudinal " " " " "		$3\frac{7}{8}$
Transverse diameter of same, at base		$4\frac{3}{8}$
Longitudinal " " " " "		$6\frac{3}{8}$
Length of nasal horn-core as restored	1	$9\frac{6}{8}$

NOTE—Since the above was written, a specimen collected last summer and consisting of the squamosal, jugal and postfronal of the right side, with the front margin of the orbit completing the circumference of the eye-opening, proves to be referable to *S. albertensis*. This specimen was obtained from the Belly River formation, about four miles up stream from where the type was discovered. In it a narrow, flat process is seen to proceed backward from the jugal below the lateral temporal fossa and to overlap the forwardly directed process of the squamosal as far as the middle of the lower margin of this opening. This process was not at first recognized in the type, but is now clearly seen. It has been broken from the main portion of the jugal, but is in place between the posterior termination of the quadratojugal and the lateral temporal fossa. In all particulars this second specimen fully agrees with the type. Above the eye a similar smooth surfaced depression marks the position of the supraorbital horn-core and the free margin of the postfrontal fontanelle and supratemporal fossa is present

EXPLANATION OF PLATES.

PLATE X.—Lateral aspect of type of *Styracosaurus albertensis*, one-twelfth the natural size.

PLATE XI.—The same specimen viewed from above and similarly reduced.

PLATE XII.—Restored outline of the same specimen, viewed from the side and similarly reduced.

Abbreviations.—*F*, frontal; *J*, jugal; *L*, lachrymal; *MX*, maxilla; *N*, nasal; *NO*, nasal opening; *P*, parietal; *PF*, postfrontal; *Q*, quadrate; *QJ*, quadratojugal; *S*, squamosal; *SH*, surface for supraorbital horn-core; *SR*, surface for overlap of rostral; *T*, transverse; *A*, parietal fontanelle; *B*, postfrontal fontanelle; *C*, supratemporal fossa; *D*, lateral temporal fossa.

BIRD NOTE.

PILOT MOUND, MAN., Sept. 18.—My opposite neighbour has a nest of *Spinus tristris*, the goldfinch, with two half-fledged nestlings out of a clutch of four eggs. Two of the eggs did not hatch out. I wonder whether Mr. Norman Criddle can beat this for a record of late nesting in Manitoba. Usually we have frost enough by Sept. 15th to kill all half-hardy plants in the garden, but this year we have escaped frost entirely, up to date.

H. M. SPEECHLY.

NEW AND OTHERWISE INTERESTING LICHENS FROM VANCOUVER ISLAND AND THE ROCKY MOUNTAINS.

By G. K. MERRILL.

Parmelia olivacea var. multisporum (Schneid.) Merl. Bryologist XII, 4, 1909, p. 73.

Alder trunks. Sidney, Vancouver Island; Prof. J. Macoun. Asci containing from eight to forty spores. The eight-spored conditions absolutely inseparable from *P. olivacea*, and no reason appears for giving the polysporous anomaly other than a varietal rank.

Lecanora (*Callopisma*) **atrosanguinea** sp. nov.

Thallus effuse, thin, whitish or ashy, smooth or roughened, K—, C—. Apothecia sessile, small (less than 1 mm.), at first plane, then convex, opaque or shining, rounded or lobed, sometimes connate or composite, often proliferous, margin persistent, slightly elevated, concolorous with the blackened-crimson disk. Spores 8, ellipsoid, the terminations acute, polar-bilocular, 15–18 x 10-11μ, hypothecium reddish, asci ventricose, paraphyses distinct, slender, coherent, tips dark or reddish-black, hymenium in section gives a violet or purple reaction with K.

Trunks of willows, alders and birches. Sidney, Vancouver Island; Prof. J. Macoun. Type in herbarium Merrill. Differs from *L. ferrugineum Pollinii*, for which it might be mistaken in the color of the apothecia, epruinose disk, and the persistent and concolorous margin.

Lecanora epibryon Ach. Syn. p. 155 (1814).

L. subfusca b. *hypnorum* Schaer, of Tuckerman's Synopsis. Humus and decayed mosses. Yoho Valley, British Columbia; and mosses, Jumping Pound Creek, Athabasca; Prof. J. Macoun.

The specimen from Yoho Valley is remarkable from affording a hymenial reaction with Iodine like that of *L. subfusca*. The apothecia are medium, disk somewhat convex, blackish, with an inconspicuous fuscescent exciple. The apothecia of the Athabascan plant are concave with an elevated exciple similar in color to the thallus.

Lecanora (*Rinodina*) exigua (Ach.) Nyl. Flora 1873, p. 197.

Rinodina sophodes e. *exigua* Fr. of Tuckerman's Synopsis. Trunks of willows, maples, alders and Douglas fir. Sidney, Vancouver Island; Prof. J. Macoun.

The various specimens present a great diversity of coloration and conditioning for the thallus. The colors, white, whitish-ashy, ashy to sordid-glaucous, and the thallus from smooth and continuous to verruculose or rugged and more or less rimulose. The spores are variable in size and shape, ranging from 10-26 x 7-14μ, either bilocular with approximate sporoblasts, the cells without nuclei, or more or less nucleolate with a connecting canal visible. In the greater part of the material the thalline margin of the apothecia is perfectly to be made out, and is variously entire or crenulate, but a condition occurs in which the margin is obliterated, and the plant may then be correlated with:—

Lecanora exigua forma **lecideoides** (Crom.) comb. nov.

L. exigua var. *lecideoides* Cromb. Grevillea XVIII, p. 46 (1889).

Apothecia black, convex, and the magrin wholly excluded. Found on willows with the species.

When found unassociated with the normal forms of the species, the present may easily be mistaken for a *Lecidea* of the section *Buellia*. The hypothecium is destitute of color, however, and in thin section algae are always to be found in the envelope.

Lecanora exigua forma **pruinosa** f. nov.

Entirely like the species in thallus, apothecia and spores, and differing only in that the disk of the apothecia becomes gray-pruinose. The pruina does not extend to the exciple. The very dubious *Rinodina Hallii* Tuck. Synopsis, Pt. I, p. 208, in some of its exhibits is no different from the present. On the same trees with the species.

Sidney, Vancouver Island; Prof. J. Macoun. Type in herbarium Merrill.

Lecanora (*Rinodina*) colobina Ach. Lich. Univ. p. 358 (1810).

Thallus effuse or sub-limited, thin, granulate, the predominent color blackish. Apothecia small (0.05 mm.), adnate, plane, the disk black with a conspicuous thickened entire margin. Spores 8, ellipsoid, bilocular, nucleolate, with a connecting canal, 20–25 x 10–12μ, paraphyses distinct. Willows. Sidney, Vancouver Island; Prof. J. Macoun. Previously unrecorded from America.

Phlyctis speirea sp. nov.

Thallus effuse, tartareous, granulate, cinereo-glaucous, K + red. Apothecia small, difform, erumpent, the thalline margin irregular, lacerate-dehiscent, margin white, nucleus depressed, darker. Spores 2, ellipsoid or oblong-ellipsoid, muriform, hyaline, or yellowish, 100–120 x 25–40μ, hymen-

ium and hypothecium without color, paraphyses distinct, slender, discrete, asci inflated, hymenial gel. with I+ faint blue.

Bark of willows. Sidney, Vancouver Island; Prof. J. Macoun. Near to *Phlyctis argena* (Ach.) Koerb, but differing in the color of the thallus and aspect of the apothecia. The whole appearance of the plant is that of a *Pertusaria*. Type in herbarium Merrill.

Biatora (*Biatorina*) **Griffithii** var. **Pacifica** (Tuck.) comb. nov.
Biatora mixta Pacifica Tuck. Syn. Pt. 88, p. 30.
Thallus thin, ashy for the most part, limited and decussated by black hypothalline lines. Apothecia small to minute, depressed, plane or convex, from waxy, through various shades of brown, or finally blackening, sometimes pruinose, margin persistent or sub-persistent, but not conspicuous, not showing the color mutation of the disk and commonly brown. Spores 8, fusiform or oblong-ellipsoid, straight or curved, one-septate or rarely with two septa, 12–15 x 4–5μ, hymenium and hypothecium without color, asci ventricose-clavate, paraphyses distinct, coherent, epithecium fuscescent downward, hymenial gel., with I + intense blue.

Bark of alders, willows, oaks and other trees. Sidney, Vancouver Island; Prof. J. Macoun.

Apothecia sometimes strongly convex, blackening, and excluding the margin. When the disk is pruinose or light colored the margin is conspicuous from its darker hue.

Biatora (*Biatorina*) **Columbiana** sp. nov.
Thallus effuse, thin and granulate, or thicker and areolate, cinerous or greenish-cinereous. Apothecia small or moderate (1–2 mm.), at first concave with a relatively thick margin, but ultimately strongly convex and immarginate, brownish-black or black, the margin concolorous. Spores 8, ellipsoid or fusiform-ellipsoid colorless, 16–18 x 4.5–6μ, hymenium hyaline or suffused with purple, hypothecium blue or green, asci clavate or ventricose-clavate, paraphyses distinct, slender, discrete, tips purple, hymenial gel., with I + blue. Bark of alders, maples and Douglas fir. Sidney, Vancouver Island; Prof. J. Macoun.

The affinities of the plant are with *B. Laureri*, and *B. atropurpurea*.

The hypothecium is often imposed on a stratum of confused hyphema of a distinctly purple color. Under the microscope the hymenium is a beautiful object.

Biatora (*Bilimbia*) sabuletorum forma simplicior Nyl. Scand. p. 205 (1861).

Thallus not differing from that of the species. Apothecia within brownish-yellow. Spores variable in form and size, oblong or fusiform-oblong or somewhat cymbiform, usually one, sometimes two or three septate, 11–18 x 4–5μ, asci inflated-clavate with a thick apical wall, hypothecium sometimes fuscescent, hymenial gel. with I + blue.

Over mosses. Pipestone Pass, Rocky Mountains; Prof. J. Macoun.

Not heretofore recorded from a Continental North American station.

Biatora (*Bilimbia*) **syncomista** (Flk.) comb. nov.

B. artyta (Ach.) Tuck. Gen. p. 162 (1872).

Mosses over rocks. Pipestone Pass, Athabasca; Prof. J. Macoun.

Th. M. Fries in Lich. Scand., Pt. II, p. 336, states that the original specimens of *Lecidea artyta* Ach., as designated in the Acharian herbarium, are to be referred to *Stereocaulon tomentosum* b. *alpinum* and *S. denudatum* b. *pulvinatum*. Acharius in Synopsis p. 20, cites *Lecidea sabuletorum* b. *syncomista* Flk. in Berol. Mag. 1808, p. 310, as equivalent to his own *L. sabuletorum* b. *geochroa*. On page 33 of the Synopsis he defines *Lecidea artyta*. This may only be construed as a definite opinion of the distinctness of the two plants. Schaerer in Spiclg., p. 151, cites *L. artyta*, *L. sabuletorum geochroa* of Acharius and *L. sabuletorum* b. *syncomista* of Floerke as synonymous with his own *L. sabuletorum* b. *muscorum*. Tuckerman asserts that Schaerer knew *Lecidea artyta*, as sent to Acharius by Schleicher, and there is evidence that he was acquainted with the Floerkeian plant, for it is cited with a mark of emphasis. There seems to be a total lack of definite knowledge regarding *L. artyta*, and Tuckerman's effort to save the name is merely an example of ingenious inference. While in most of the essentials the authors agree in their descriptions of the species, there are discordances that prove perplexing. The hypothecium is noted to be extremely variable in color, ranging from yellowish to deep black, and the hymenial reaction is given as blue, deep-blue, violet, blue followed by violet and sordid-violet, sordid-yellow or wine-red. The following description of our specimen is inserted for purposes of comparison.

Thallus indeterminate, granulose-squamulose, the squamules small, thickened, crenate-lobulate, more or less contiguous, grayish-white K—, C—. Apothecia sessile, aggregated,

often 3–7 connate, plane and thinly margined when young, at length strongly convex and immarginate, disk blackish-brown with the epithecium roughened. Spores ellipsoid, oblong-ellipsoid or cymbiform, one to three septate, 14–34 x 3–6μ, paraphyses distinct, concrete or somewhat lax, bluish-green at the apices, hypothecium reddish-brown, hymenial gel., with I + blue, the color persisting.

The species is reported from Port Clarence, Alaska, Greenland and Newfoundland, under the generic synonym of *Lecidea* of its section *Toninia*, and from Lake Nipigon, Ontario, Arctic America, Islands of Behring Straits, and from the Canadian Rockies under the name of *Biatora artyta*.

Lecidea sublatypea Leight. Lich. Flora G. Brit. ed. I, p. 271 (1871).

Thallus effuse or sub-determinate, granulate, ashy-fuscous, K—, C—, Apothecia small (0.5 mm.), sessile, scattered or connate, plane or concave, with a persistent or evanescent, opaque or shining entire margin, disk black. Spores 8, ellipsoid, simple, 12 x 6.5μ, hypothecium brown, asci ventricose, paraphyses distinct, compacted, tips blackish-green, hymenial gel., with I + deep-blue.

Granite rocks. Sidney, Vancouver Island; Prof. J. Macoun. Previously unreported from America.

Xylographa micrographa sp. nov.

Thallus hypophlaeous, the hyphema ramifying through the superficial fibers of the substratum, algae Palmella, few and scattered, K—, C—, Apothecia innate, scattered, parallel with the fibers, small (less than 1 mm. in length), lirelliform or fusiform, accuminate, typically concave, but sometimes plane, with a prominent slightly inflexed margin, or the margin reduced and the disk nearly plane, black. Spores 8, ellipsoid, simple, nebulous, filled with granular protoplasm or developing nucleoli, 11–13 x 7μ, hymenium and hypothecium colorless, asci inflated-clavate, paraphyses distinct, slender, lax, abundant.

Old decorticated log. Sidney, Vancouver Island; Prof. J. Macoun.

The thallus visibly whitens the wood, and is effuse. The internal characters ally the plant with *X. parallela* (Ach.) Fr., the external with *X. hians* Tuck.. Type specimen in herbarium Merrill.

Rockland, Maine.

SOME RARE CASES OF ALBINISM IN ANIMALS.

By PROFESSOR EDWARD E. PRINCE, LL.D., D.Sc., F.R.S.C.
Dominion Commissioner of Fisheries, Ottawa.

In a paper which I contributed to THE OTTAWA NATURALIST, Nov., 1906, I summarized my views upon the large subject of Animal Coloration, and I dealt with the evolution of the colors of living creatures, attempting to classify exhaustively a large variety of examples known to me. In referring to "Physiological Coloration" I made mention of a closely allied phenomenon, which I regarded as "Pathological," and due to abnormal or diseased conditions, grouping thereunder albinos, such as white crows, hawks, peacocks, moles, etc. I mentioned, as a likely cause, a diseased or defective peripheral nerve supply; a white hedgehog (*Erinaceus*) being found to have an abnormal condition of the peripheral nerve twigs ending in the skin, and resulting in a lack of the usual color or pigment in the integument, or rather in the spines and hairs developed from the skin. I stated that, according to Darwin, white cats have blue eyes, are, as a rule, deaf, and, if Dr. Lawson's statement be correct, are always tom-cats. The eyes of most animals are dark or colored, owing to pigment massed in the retina, and in the iris; but in albinos, color being absent, the retina is without it and the rich blood-supply renders the eyes red or pink, as well as the nose and tips of the ears, as in albino rabbits and white rats and mice.

All white animals are not albinos, because the absence of color in the fur or plumage may be due to seasonal and other normal causes Thus the grey harbour seal is snow white when very young, but its nose and eyes are jet black. The Polar bear, Arctic fox, the stoat or ermine, the varying hare, the ptarmigan, and other animals, are permanently or seasonally white, and thus resemble their wintry surroundings. Dr. Starr Jordan observes that the white color of Arctic animals may be useful not alone in rendering them inconspicuous, but may also serve a direct physiological function in preventing loss of heat from the body by radiation. He adds, "the dark colors of animals may be of value in absorbing heat rays and thus helping to keep them warm. But by far the most widespread use of color is to assist an animal in escaping from its enemies or in capturing its prey." Now, while cold and dryness tend to produce whiteness, damp and warm conditions result in darkening the fur or plumage and the external color of animals generally.

"Melanic varieties, as they are termed," says Beddard, "often occur on islands and other situations where the climate is moist as well as warm." On the other hand, in such a country as New Zealand, white, or what are called albino, varieties of birds, and many living forms, are said to be frequent owing to very dry seasons or periods of drought, and to the presence of snow on the lofty ranges of mountains, which for height and grand scenic features resemble our own Pacific coast mountains. The whitening process in our Northern Hare (*Lepus americanus*, Erxl.) has been carefully studied, and it has been proved that the summer coat actually bleaches, but the change is accompanied by a growth of new hair, so that the coat is thicker than in summer and the hairs are longer. The outer border of the ears remains black, but the rest of the fur becomes pure white, the blanching successively passing from the black tip of each hair down the reddish middle part to the basal leaden-colored part. The hairs of the forehead and shoulders are the last to change and a few long black hairs are always present above and below the eyes and extend backwards. One observer, Mr. Welch, tells us that the entire change occupies about three months, from early in October till late in December, but further north, in the latitude of Quebec, it is said to be, usually, early in November, and the whitening is also more rapidly accomplished. Sir John Ross observed a lemming on board his vessel change color in a week, in February. Whether the assumption of a white winter coat is due to Arctic environment, or to natural selection and heredity (the white examples surviving when other examples were more readily seen by enemies and exterminated), it is not necessary here to discuss. The brown musk-ox, the black raven, the sable and other northern animals do not change, and thus the matter is a complicated one. But the term albino should not be applied to forms which are white normally, or turn white seasonally as an established feature in their life; but should apply rather to the somewhat erratic and abnormal cases of whiteness and lack of normal coloration due to some congenital cause, apparently allied to a diseased or pathological condition.

An extremely rare and interesting case of this true albinism was discovered this season (1913) at the St. Andrew's Biological Station, New Brunswick. A specimen of the common sea-urchin (*Strongylocentrotus drobrachiensis*) of our Atlantic shores, over three inches in diameter, instead of exhibiting the reddish purple and variegated colors of typical specimens, was of the purest chalk-white, the plates of the somewhat depressed globular test or shell, as well as the crowded sharp-pointed moveable spines, being entirely destitute of color. Even the eye spots,

which are rudimentary colored visual organs on the five ocular plates, alternating with the five genital plates round the peri-proctal space at the aboral pole, did not show any pigment. It was a perfect albino, and, so far as I have been able to ascertain, the first albino sea-urchin ever seen. It was a beautiful object, appearing as though its characteristic apple-shaped form were delicately carved in white marble. It is now conspicuous in the faunal collection of fishes and invertebrates at the Dominion Biological Station, St. Andrews, N.B.

An interesting albino specimen of the lobster (*Homarus americanus*), from the Pictou shore, Nova Scotia, came into my possession some time ago. Pale tinted specimens of lobsters have long been known, some of which, in place of the dark blackish blue of the usual type, show reddish or yellowish coloration; but the specimen which I secured was dappled all over with irregular patches of yellowish white and the blue-black color was confined to small, irregular spots, chiefly on the upper parts of the tergum, or dorsal portion of the body and tail-segments. This very unusual specimen was only 8 inches in length and cannot have been more than three or four years old. It might be suggested that, instead of being an albino, the specimen merely retained some of the varied coloration of the infantile stages, for when half-an-inch long, at the stage when salts of lime and pigment first appear in the delicate shell, the general color is maroon, or sometimes pale brown with green intermingled, and especially prominent are some chalk-white spots, four or five in number, apparently marking the attachments of the tendons of the cephalo-thoracic muscles inside. These spots are even more distinct at the sixth stage, about the fifth week after hatching, when its length is three-fifths of an inch. At the seventh stage (seventh week), when three-quarters of an inch in length, a definite pigment layer appears below the external cuticle. In the adult lobster this pigment layer, called by Dr. W. B. Carpenter the areolar layer, is a canaliculated stratum crowded with lime salts, and is hypodermic in origin, and mainly constitutes the thick, dense shell. A tubular layer occurs beneath, likened by some authorities to dentine, being thick and dense, and forming the gleaming white part which is seen when the shell is broken. Lowest of all is a thin lamellar non-calcified layer. The color in the areolar layer is due to chromogens, which are converted by boiling, dehydration by alcohol, etc., and even by exposure to excessive light, into a red lipochrome. Every one is familiar with the change, by boiling, of a dark blue or blackish-green lobster into a bright scarlet one. The normal prevailing color of lobsters on the Atlantic coast is blackish-blue, sometimes of

a greenish cast, those on rocky bottoms being darkest, as off the western Nova Scotia shores, but on sandy, shallower areas, as off Prince Edward Island, the color is paler, and often greenish or even brownish.

Professor Herrick records a very black specimen, only 6 or 7 inches long, found among eel-grass in three-fathom shallows off the Maine coast, and the captor, a fisherman, thought at first that it was coated with coal-tar. It was regarded as a melanic specimen, and it may be mentioned that melanism has been noticed also in crabs. Abnormally colored lobsters have been reported of a red or reddish-yellow color, when alive; others are cream colored, i.e., color is practically absent, but mottled specimens, blue-green and yellow, are not rare, while pied examples, showing bold green and light yellow spots, are less common. The specimen secured by me was, in the main, of a yellowish-white, as already stated, but small blue-black spots occurred here and there, on the highest parts of the back. No doubt the example was a pathological or "abnormally physiological" specimen and a near approach to the typical albino.

The third case of albinism recently brought to my notice is that of an albino porpoise (*Phocæna phocæna, L.*), which was captured in Scotland, and a photograph of which was sent to me by my friend Professor McIntosh, F.R.S., of St. Andrews. The *London Globe*, some years ago, gave an account of an English specimen obtained near Ventnor, Isle of Wight, which was described as white, but of a reddish color on the under side. It was shipped alive to the famous Brighton aquarium and exhibited there, according to a correspondent, Mr. R. Blake, of Ventnor.

The normal color of the porpoise, as is well known, is a deep, shining black, but the breast and under surface is dirty white; but this albino specimen, studied at the Gatty Marine Biological Station, St. Andrews, Scotland, was a female of a dull yellowish color, with a faint longitudinal band, somewhat dusky, along the upper lateral region on each side, while a band of the same dusky appearance curved in a crescentic course round the front of each eye, reaching to the corner of the mouth. It measured 2 feet 10 inches in length and was rather more than half grown. Professor McIntosh notes that it seemed to retain the coloration of the very young porpoise, for a specimen 6 inches long, secured at St. Andrews, on Nov. 18th, 1911, was dusky over the dorso-lateral region, the head very dark above as far as the neck and the breast flippers, dorsal fin and horizontal tail-flukes were blackish, the under surface of the last being very

dark. An older specimen, also before birth, and obtained on Feb. 6th, 1912, was 17 inches long and the color of the young specimen was now replaced by deep black, but becoming paler down the sides. Adult specimens of various whales show at times increase in white coloration. Thus the Humpback (*Megaptera*) is black above, but white beneath, varied with black spots, but sometimes the black underneath decreases to an indefinite marbled arrangement, or, in some cases, the black disappears and the under surface is white. The huge rorquals or fin-back whales show similar variations, and Mr. Lyddeker surmises that age or special food causes this tendency to albinism. The Right whale of the Arctic is very black above, but white beneath and where the two tints meet there occur irregular patches of white extending into the black color. The Killer whale or Grampus is black above, but in one specimen I observed a white patch above each eye, or there may be a white patch below the eye and a transverse crescentic patch of white behind the huge erect dorsal fin.

It is hardly necessary to point out that the albino porpoise above described recalls the small beluga or white-whale (*Delphinapterus leucas*, Pallas), which is creamy white all over and abounds in the mouth of the River St. Lawrence and round Hudson's Straits into Hudson's Bay, and along Baffin's Land and as far north as Barrow Straits.*

Mr. A. P. Low expressed the view that the white-whale industry might become an important one in many places in Hudson Bay and Straits owing to its abundance, and the Hudson Bay Company, as well as the Eskimo, have long taken considerable numbers for oil and leather, while the boiled skin is a native dainty and the dark colored meat is also used as food.

It is impossible in this place to enter into the somewhat profound and complicated subject of the origin of albinos, and to define the essential differences which divide them from merely pale examples, or seasonal varieties. Melanism can be explained partly at any rate, as due to environment, but albinism is no doubt due to causes which are congenital, possibly pathological. Merely white varieties are not albinos, and the so-called albino skunk, reported as seen last year in Delaware Park, near Buffalo, was not an albino.

Curator Crandall, who saw it, described it as blue, with apparently no black or white hairs intermingled and it may be compared to the blue variety of Arctic fox, which is blue, or rather slate grey, all the year round, and less numerous in the more northerly regions than in the more southerly. In the

*Lilljeborg states that the young beluga is greyish-brown in color.

litters of this blue variety of the Arctic fox there frequently occur pure white specimens, but a whole litter of white cubs has not been recorded. Some interesting figures in a recent report of the Conservation Commission may be here referred to. Thus on St. George Island (Pribyloff Islands), in a total of 772 so-called blue foxes killed in 1897, no less than 40 were white. In 1898, 18 were white in a total of 885 foxes, but in 1903 only 15 were white, out of 1,061 foxes taken, and in 1907-8, out of a total of 1,005 only 8 were white, indeed, only 3 were pure white, the others were bluish white. These pale or white specimens are not valued, and every effort is made to exterminate them and prevent the increase of a white variety. The ordinary variety of dirty brownish colored Arctic fox, which turns pure snow-white in winter, though recently fashionable, was not many years ago regarded with contempt by fur dealers, and Indian trappers were usually "called down" severely for taking the trouble to bring such little-valued pelts to Edmonton and other fur-receiving centres in the North-west.

White deer, like white house-sparrows, have not unfrequently been reported, but whether such are true albinos with pink eyes is not recorded. A red deer of almost snowy whiteness was reported up the Gatineau region some years ago. A white form of the Scottish red deer has been established as a distinct variety, and in Welbeck Park, Langley Park, near Slough, Windsor, and Woburn Castle, in England, there are herds of cream-colored or white deer, believed to be originally of German origin, though the Duke of Portland has regarded them as a Danish variety. It is interesting to note that a creamy or white colored variety of the black bear was discovered not many years since in British Columbia, north of Rivers Inlet, and at the head-waters of the Skeena River and at other points. This small bear has been called "*Ursus Kermodei*" by Hornaday, who first described it.

The whole subject of albinism is deserving of investigation, but it may be clearly stated that white animals, whose eyes are dark, or the tips of the ears, the tail, tip of the nose, etc., are black, are really not albinos, for albinism in mammals involves pink eyes, pink nose, and a general absence of pigment.

MEETING OF THE BOTANICAL BRANCH.

November 8th, 1913, at the residence of Mr. R. B. Whyte. Owing to the rainy weather only a small number of members were present.

After a short discussion it was decided that, for the meetings of the approaching winter, the members should bring to each meeting specimens of botanical interest for exhibition and discussion. It was thought that the adoption of this suggestion would make the meetings more interesting and educative. It is hoped, therefore, that the members will respond heartily in bringing material for each meeting's discussion.

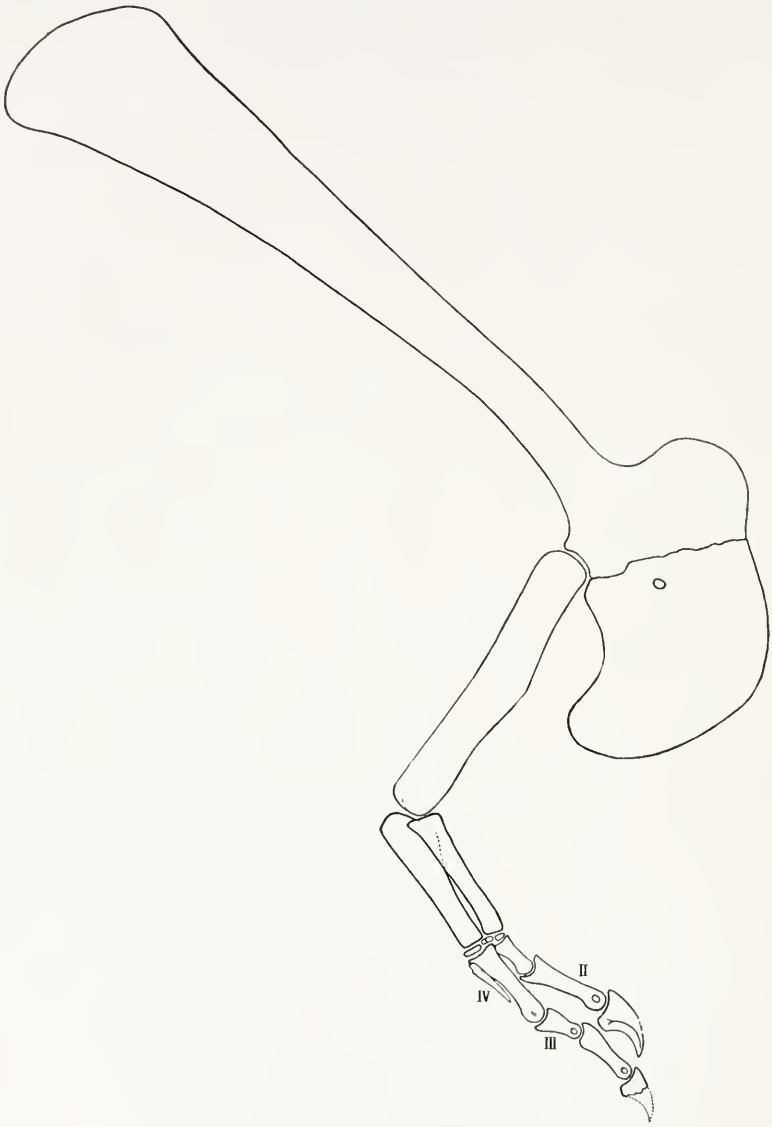
It was then decided that those present, who had made interesting observations during the summer, should give the others present brief accounts of them. Mr. H. T. Gussow very entertainingly described some broom-growths he had seen on trees in British Columbia and some experiences he has had with the seeds of a certain mistletoe growing in the same part of the country. A little later in the evening he also referred to bacteria of the soil in their relations to soil fertility, and to the disease potato scab. Mr. L. H. Newman gave a short account of the recent activities of the Canadian Seed Growers' Association, referring chiefly to the efforts which are being made to produce corn and potatoes of a high standard quality and in quantities large enough for wide distribution.

J.R.F.

BOOK NOTICE.

FORTY-THIRD ANNUAL REPORT OF THE ENTOMOLOGICAL SOCIETY OF ONTARIO. This publication has recently made its appearance and we are glad to see fully maintains its previous reputation. It contains no less than 23 papers contributed by the leading entomologists of Canada. These contributions cover a wide field of research and on account of their economic value should be in the hands of every Agriculturist and Horticulturist not alone in Ontario, but throughout the whole Dominion, for, while the papers deal more particularly with Ontario pests, the insects discussed recognize no boundaries and are often as injurious without as within. This, too, applies with equal reason to pests discussed from other provinces which, though comparatively harmless in Ontario to-day, may at any time become troublesome. Thus we find articles wisely included from various provinces, all of which add to the value of the report. It is, as usual, profusely illustrated, and contains as a frontispiece a portrait of the Society's President for 1912, Dr. E. M. Walker.

N. C.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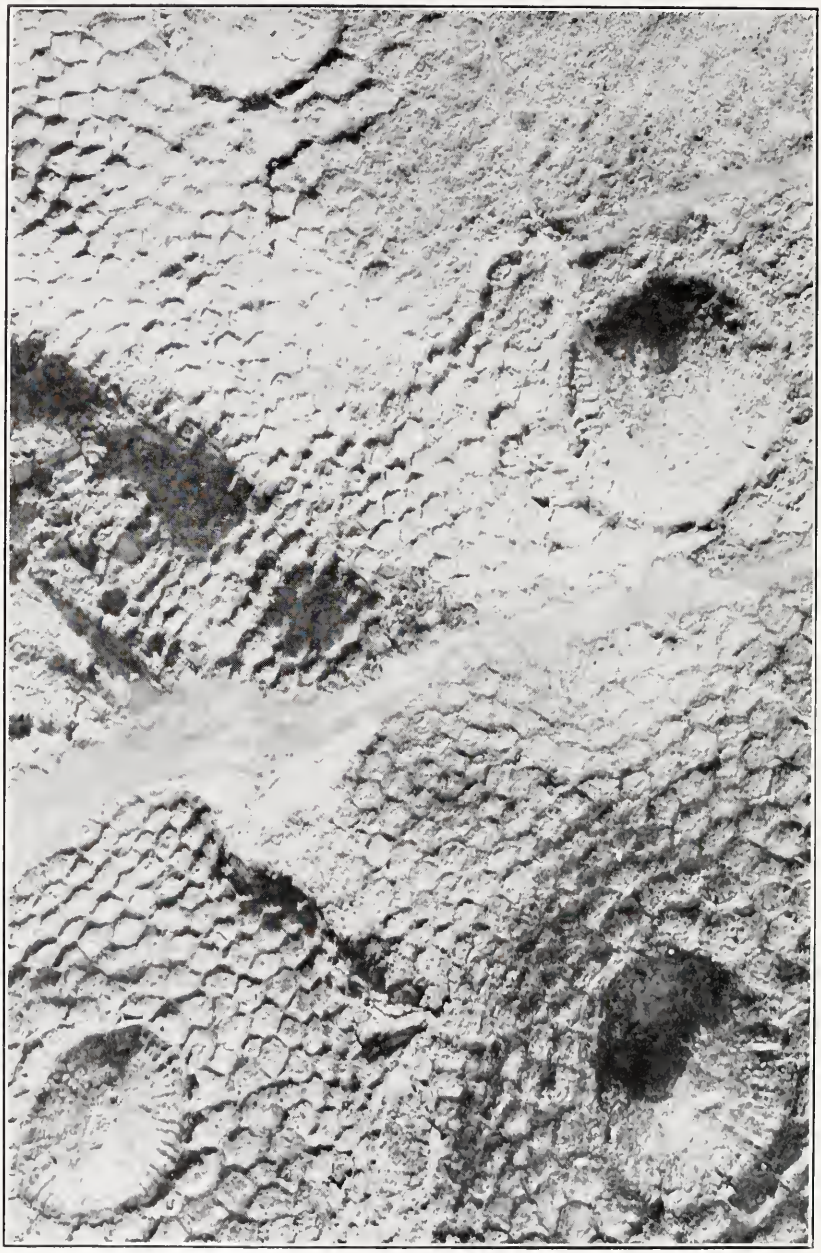

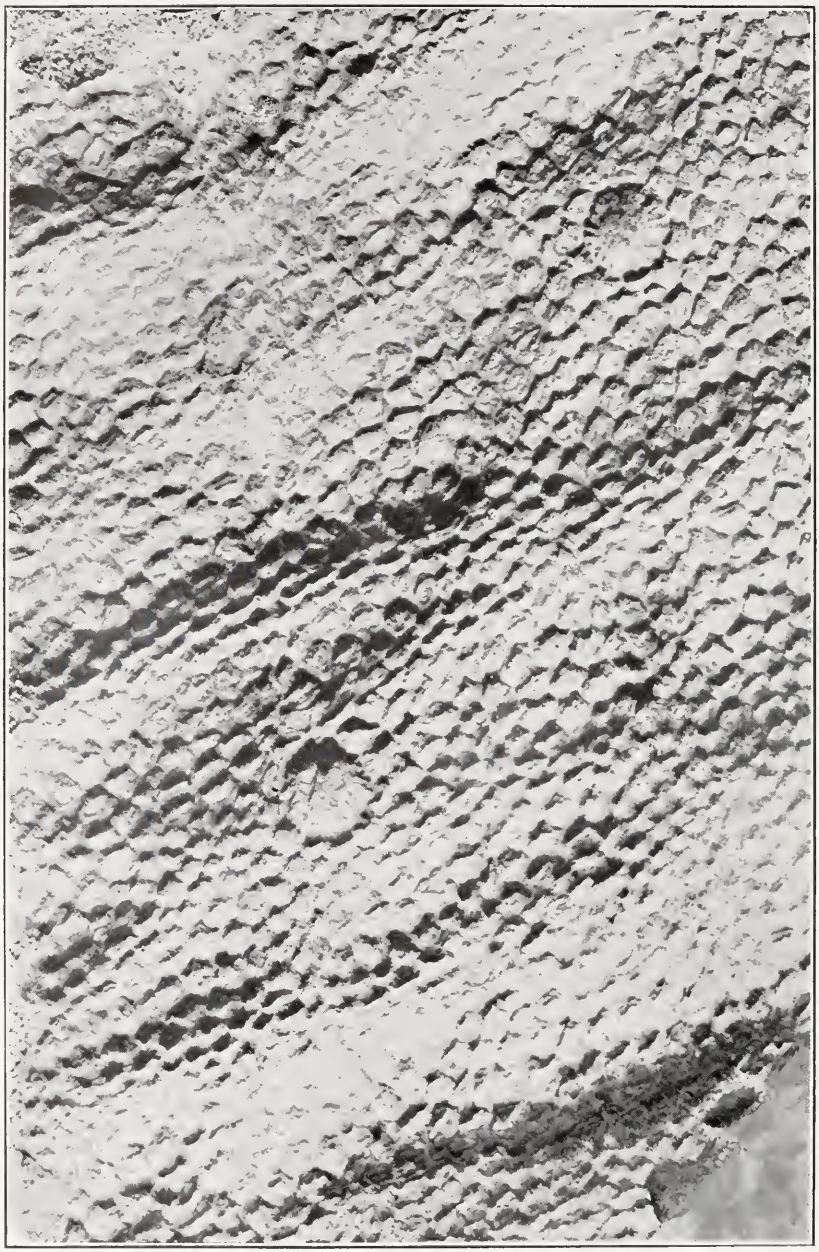

THE OTTAWA NATURALIST

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ON THE FORE-LIMB OF A CARNIVOROUS DINOSAUR FROM THE BELLY RIVER FORMATION OF ALBERTA, AND A NEW GENUS OF CERATOPSIA FROM THE SAME HORIZON, WITH REMARKS ON THE INTEGUMENT OF SOME CRETACEOUS HERBIVOROUS DINOSAURS.*

By Lawrence M. Lambe, F.G.S., F.R.S.C., F.G.S.A.
Vertebrate Palæontologist to the Geological Survey of Canada.

An unusually perfect skeleton of a carnivorous dinosaur, lately added to the collections of the Geological Survey, is of special interest on account of the preservation in it of one of the front legs. The specimen comes from the Belly River formation on Red Deer river, Alberta, and forms part of the very large collection of reptilian and other remains made last summer by the vertebrate palæontological party which explored the rich dinosaurian beds below Berry creek.

The structure of the fore-limb in the large carnivorous dinosaurs of the Cretaceous has been to a great extent conjectural. In this new specimen the right limb is preserved and it is hoped that the left one will be revealed as the work of removing the sandstone matrix proceeds.

The first impression received of the fore-limb is its extremely small size.

The arm has been pressed upward so that the humerus lies beside the back border of the blade of the scapula with its front face directed forward and its inner surface outward, its head remaining within the glenoid cavity.

The fore-arm is flexed downward and the manus is closed with the claw-bones uppermost. The ulna and radius lie together, and the digits, of which there are two, are in place. From the regular succession of the phalanges of the digits to each other it is presumed that none of them is missing. The digits are regarded as Nos. II and III, and there is a vestigial metacarpal IV, consisting of a short, slender bone, slightly curved and tapering to its distal end.

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

Metacarpal II is very short, being only about one-half the ength of metacarpal III. There are only two phalanges to digit II, an elongated one and a comparatively large, laterally compressed, curved and sharply pointed ungual. In digit III the first phalanx is short, the second long, and the distal one claw-shaped but smaller than that of digit II. In the ungual phalanx of digit II there is a decided claw-groove. The first phalanx of digit II and the first and second of digit III have a deep pit on each side of the distal end. In the corresponding part of the metacarpals there is only a slight irregular depression.

Four carpal bones are preserved between the ulna and radius and the metacarpals, but they are slightly displaced. One is roughly discoidal and larger than the others, which are compressed ovoid in shape. The largest one occurs at the proximal end of metacarpal III, the other three lie together at the distal end of the radius. The ulna and radius are solid except for a small axial area of cancellous bone.

As already mentioned, the elements of the manus follow each other in regular succession and are apparently all in place with none of the phalanges missing. The phalangeal formula revealed is therefore probably the correct one.

The figure accompanying this description shews the relative size of the fore-limb and the scapula with the coracoid. The limb is here shewn in lateral aspect, in a natural position below its articulation with the scapula, and with the digits only slightly curved.

Attention is drawn to the extreme shortness of metacarpal II and the elongation of the penultimate phalanx in each digit. A similar lengthening of the corresponding phalanges is seen in the manus of the small Jurassic *Ornitholestes hermanni*, Osborn,* in which also there are two digits, a vestigial metacarpal IV, and an enlarged ungual phalanx in digit II.

The estimated length of this dinosaur, which, for the present, is referred to the genus Deinodon, is between twenty-eight and thirty feet. Why its front limbs were so diminutive is difficult to explain. That they were of much use in feeding is improbable.

The discoverer of this splendid specimen was Charles Sternberg, Jr., who was one of the vertebrate palæontological field party of 1913.

MEASUREMENTS.	Feet.	Inches.
Length of humerus		$12\frac{6}{8}$
" " ulna		$6\frac{1}{8}$
" " radius		$6\frac{1}{8}$
" " metacarpal II		$1\frac{7}{8}$

* Bull. Am. Mus. Nat. Hist., New York, vol. xix, article xii, pp. 459-464, figs. 2 and 3.

MEASUREMENTS. [Continued]	Feet.	Inches.
Length of metacarpal III		$3\frac{7}{8}$
" " " IV		$2\frac{1}{2}$
" " first phalanx of digit II		$3\frac{7}{8}$
" " terminal " " " "		$3\frac{1}{8}$
" " first " " " III		$2\frac{1}{8}$
" " second " " " "		$3\frac{1}{8}$
" " scapula and coracoid together	3	6
Carpal bone with diameter of		$0\frac{7}{8}$
" " " length "		$0\frac{5}{8}$
Two carpal bones with length each of		$0\frac{5}{8}$

PROTOROSAURUS, gen. nov.

Skull large, broadly triangular in superior aspect, with an abbreviated facial portion and a greatly expanded posterior crest ending squarely behind. Coalesced parietals forming a slender frame-work enclosing large subtriangular fontanelles. Squamosals very long and narrow with a scalloped free border. Epoccipitals present. Supraorbital horn-core small, upright. Orbit small. Supratemporal fossæ not greatly developed. Body covered with non-imbricating plate-like, and tubercle-like scales.

This genus is proposed for the reception of the Belly River Cretaceous ceratopsian species originally described by the writer under the name *Monoclonius belli.*

The species was established in 1902* on a large portion of the coalesced parietals discovered by the writer in 1898 in the Belly River formation on Red Deer river, Alberta, below the mouth of Berry creek (Steveville). In the original description the opinion was expressed that the species represented was "probably ancestral to such later forms as *Torosaurus latus* and *T. gladius* of Marsh, from the Laramie of Wyoming." This belief is strengthened by the discovery during the past summer of a skull, with most of the skeleton, of one individual of this species at the type locality. It is now evident that this Belly River form is generically distinct from both Monoclonius, Cope and Ceratops, Marsh, and that its affinites are with Torosaurus, Marsh, to which it apparently leads in a direct line of descent, and from which it differs by well-marked primitive characters

The characters in Protorosaurus which are regarded as primitive in comparison with Torosaurus are its smaller size, the greater relative length of the skull in front of the orbits, the retention of the scalloped free margin in the squamosal, the greater size of the intraparietal fontanelles which have been

* Contributions to Canadian Palæontology, vol. iii (quarto), pl. ii, On vertebrata of the mid-cretaceous of the North-west Territory, 2. New genera and species from the Belly River series, p 66, pl. xx, figs 1 and 2.

reduced in Torosaurus by a broadening of the parietal framework, and the much smaller supraorbital horn-cores which are upright instead of being curved forward.

The finding of the skull of *Protorosaurus belli* completely does away with any idea as to the specific identity of this species with *Mono clonius canadensis*, Lambe, also from the Belly River Cretaceous of Alberta; a consideration at no time entertained by the writer.

With the skeleton of *P. belli* were found well preserved impressions of the integument.* These impressions seem to refute the hitherto generally accepted idea of the presence in the Ceratopsia of bony scutes such as are found in the Stegosauridæ, notably in *Euoplocephalus* (*Stereocephalus*) *tutus*, Lambe, from the Belly River formation. We now know that the integument of *P. belli* was of the same general character as that of the trachodonts, and probably the other horned dinosaurs were similarly covered.

The natural impressions of the integument of *P. belli* consist of smooth polygonal surfaces, ranging in diameter from about one-eighth of an inch up to one inch and one-eighth, indicative of the presence in the living animal of non-imbricating scales or plates, fitting closely to each other, and having generally five or six sides. The plates themselves are not preserved but they have impressed their shape in the sandstone (moulds) from which natural casts have been made by the matrix replacing the plates.

The larger plates have a flat or very slightly convex surface and are defined by a circumscribing groove. The smaller sized plates have the form of low or flattened tubercles and were apparently present over a large area. The larger plates are assembled and increase in size toward a somewhat central one which is the largest, and which may be polygonal or rounded in outline. There is evidence of polygonal plates at least two inches in diameter and of others with a nearly circular outline equally large. In the larger sized plates the sunken peripheral margin has a crinkled appearance due to the presence of short grooves at right angles to, and ending at the edge of the plate.

The impressions of the plates so far seen are mostly from the trunk region in the neighbourhood of the shoulder where the increase in size seems to be from below upward. Other impressions from lower down on the body are of the small tubercles apparently indicating an absence here of the larger sizes of plates.

The collection of 1913 from the Belly River formation on Red Deer river also includes natural moulds and casts of large

* This specimen, with skin impressions, was discovered by Mr. Charles H. Sternberg, in charge of the Geological Survey vertebrate palæontological expedition of 1913.

areas of the skin of the species described by the writer in 1902,* under the name *Trachodon marginatus*. A figure of the surface markings of a small portion of the skin of this species accompanied the writer's original description, but the new material brings to light with wonderful distinctness features additional to those already known, and discloses a tubercular pattern of surface ornamentation as unique as it is unexpected.

Trachodon marginatus was founded on an admirably preserved maxilla and lower mandibular ramus, with teeth in place having a definite marginal sculpture, and on many bones of one individual with skin impressions. Provisionally assigned to this species were slender ischia ending distally in a foot-shaped expansion, a pubic bone, a femur, tibiæ and other elements of the skeleton. That the association of the footed-ischium with *T. marginatus* was correct is borne out by the remains of two individuals** collected last summer with which the maxillæ and lower jaw are present in one, and the ischia in both. A comparison of the new material with that on which the species was based entirely establishes the correctness of the writer's original description. It is with one of these specimens of last summer's collection that the skin impressions are preserved. These impressions are from the side in the trunk region, and along the tail. In the former, depressed conical plates or scales, having an oval basal outline, occur at intervals with much smaller, polygonal, tubercle-like, non-imbricating plates filling the interspaces. The conical plates strongly resemble limpets in shape, and are about twice their diameter apart. They reach a size of about one and a half inches in length and one and a quarter inches in breadth, with a height of about five-sixteenths of an inch. The comparatively small, intervening plates resemble the smaller sized plates of *Protorosaurus belli*, and of *Trachodon annectens*, Marsh, as described by Osborn.‡ They range in diameter from about one-eighth up to two-eighths of an inch, an increase in size occurring toward the conical plates round which the largest ones form a ring. A marked feature of the conical scales is a radial crinkling which is most pronounced at the basal circumference and extends about half way up the sloping surface.

In the tail the same scale pattern is continued but in a less striking manner, its component parts being reduced in size. The conical plates are more nearly circular in basal outline, with a diameter of about half an inch, and a proportionately lower relief. They are relatively farther apart than those of the trunk,

* Op. cit., p. 71, pls. iii-x. **Expedition of 1913; found by Mr. Charles H. Sternberg.

‡ Memoirs of Amer. Mus. Nat. Hist., new series, vol. i, pl. ii; Integument of the Iguanodont dinosaur *Trachodon*, pls. vi and vii.

being about four to six times their diameter distant from each other. The polygonal ones have an average diameter of about three-sixteenths of an inch, and, as in the trunk, a slight increase in size is observed in those near the conical plates. Along the side of the body the conical plates have their long diameter in a fore and aft direction.

The scale patterns above described are probably distinctive of the species, and will no doubt, with the known ones of other Cretaceous herbivorous dinosaurs, prove a reliable aid in specific determination.

The skin impression of a third Cretaceous herbivorous dinosaur, shewn in plate XVII accompanying this paper, is part of a large area of epidermal markings, from above the hip, preserved with an almost complete skeleton of a trachodont obtained by the vertebrate palæontological expedition of 1912 from the Edmonton formation on Red Deer river, and now exhibited as a panel mount in the museum of the Geological Survey. This specimen was thought to be referable to *Trachodon marginatus* of the Belly River formation and was provisionally assigned to that species. As the scale pattern of the integument of *T. marginatus* is now definitely known and proves to be quite different from that of the Edmonton specimen it is clear that the latter is not referable. to *T. marginatus*. It is now known with certainty that *T. marginatus* had a footed-ischium but unfortunately in the Edmonton specimen the distal ends of the ischia are not preserved.

The epidermal markings found with the Edmonton specimen and already briefly described in a paper* by the writer, are natural moulds and casts of non-imbricating scales of which some are larger than others. The larger ones are flat or slightly convex, polygonal in outline, and average about a quarter of an inch in diameter; they are aggregated in irregularly oval clusters from two to three inches in greater diameter, and about three-quarters of an inch apart. Between the clusters are minute, tubercle-like scales averaging about one-tenth of an inch in diameter and forming the general ground-work of the pattern.

This scale pattern is of the same general character as that of *Trachodon annectens* (Marsh), as described and figured by Osborn‡ in a specimen from upper Cretaceous beds in Converse county, Wyoming, U.S.A., but is more pronounced; the oval clusters of plate-like scales are larger, and the scales composing them have a greater average diameter. The small sized tubercle-like scales are much the same as in the Wyoming specimen.

* The Ottawa Naturalist, May, 1913, The manus in a specimen of Trachodon from the Edmonton formation of Alberta.

‡ Op. cit.

EXPLANATION OF PLATES.

PLATE XIII.—Right fore-limb of carnivorous dinosaur; one-eighth the natural size.

PLATE XIV.—Fig. 1. Natural cast of integument of *Protorosaurus belli* shewing large, polygonal, plate-like scales; natural size.

Fig. 2. Cast of large scale with a rounded outline; natural size.

Fig. 3. Cast of large scale probably polygonal in outline; natural size.

Fig. 4. Cast shewing transition from small tuberele-like scales to larger polygonal ones; natural size.

Fig. 5. Cast of polygonal scales; natural size.

Fig. 6. Mould of the same; natural size.

PLATE XV.—Natural mould of integument of *Trachodon marginatus* from the side of the body; natural size.

PLATE XVI.—Natural mould of integument of the same individual from the side of the tail; natural size.

PLATE XVII.—Skin impression (mould) of traehodon from the Edmonton formation; natural size.

MEETING OF THE ENTOMOLOGICAL BRANCH.

Held at the home of Mr. Arthur Gibson, January 8th, 1913. Present: Rev. Dr. Fyles, W. H. Harrington, J. M. Swaine, V. Kitto, Bro. Germain, Bro. Martial, G. Beaulieu, N. Criddle, A. Halkett, F. W. L. Sladen, J. W. Baldwin, J. I. Beaulne, J. R. Fryer, E. H. Strickland and A. Gibson.

Dr. Fyles gave a charming account of his first visit to Gomin Swamp (near Quebec City), over fifty years ago, in search of the interesting butterfly *Œneis jutta*, a swamp-loving species. He also described the life-history of the insect. In a small case specimens of the adults were exhibited as well as specimens of *Œneis macounii* and *O. katahdin*. This latter is given varietal rank in Dyar's List of N. A. Lepidoptera. Attention was called to the large number of forms placed in this list under *norna*. Mr. Gibson spoke of his first experience with *O. jutta* at the Mer Bleue, near Ottawa, mentioning the habit of the butterfly of resting on dead branches and trunks of trees, where it is protected considerably owing to the resemblance of the under side of its wings to the bark.

By holding plates XV, XVI and XVII upside down the concave surfaces appear convex, giving a vivid representation of the scale pattern as it was in the living animal.

Mr. Harrington showed twigs of oak from Meach Lake, Que., from which he had reared the cerambycid, *Elaphidion parallelum*. The larva tunnels the twigs for several inches and pupates therein, finally emerging through the base of a broken twig. This beetle is a close relative of the well known Oak Twig Pruner, *Elaphidion villosum*, which was quite injurious to oaks on the St. Lawrence Island Parks in 1912 and 1913. The well known habit of these larvæ in girdling the twigs, causing them to drop and owing to which injury they are broken during wind storms, was discussed.

Mr. Swaine exhibited specimens and work of Ambrosia-beetles collected by him the past summer in British Columbia, and briefly discussed the habits of the genus *Gnathotrichus*, and of a new species of the genus *Platypus* from the West Coast. Tunnels of *G. sulcatus* Lec. were shown from Western Hemlock. Their black tunnels, about the size of a pencil lead, penetrate the wood for about six inches, and give off lateral branches parallel with the wood surface. Along the sides of the tunnels egg-niches are cut, in which eggs are laid. The grubs enlarge the niches to a length slightly greater than their own when mature, and pupate therein with the head towards the tunnel. These short larval tunnels are known as larval or pupal cradles. After transformation the young adults enter the egg-tunnel, and after remaining a longer or shorter time in the tunnels or in the cradles, they emerge in early summer through the entrance tunnel cut by the parent beetles to attack fresh logs and stumps or dying trees. The chief food of the larvæ, and an important food of the adults, is a species of fungus which grows in a dense glistening layer on the tunnel walls. Mr. Swaine has recently worked out the life-history of several of these interesting and little known fungi. The fungus is carried by the beetles to new tunnels and rapidly spreads over the fresh wood of the tunnel sides and upon the walls of the larval cradles. The fungus stains the walls of the tunnels black for several millimetres. The habits of the species of *Platypus* are somewhat similar to the above, but the eggs are deposited free in the tunnels.

Mr. Criddle spoke upon certain phases of his investigations into the habits and life-histories of the various species of June Beetles (*Lachnosterna*) which he had been studying as a field officer of the Division of Entomology. He related how the different species were often quite local in distribution owing to each having preferences in matters of soil and moisture as breeding places. Thus, *L. dubia* was taken in all its stages within an area of a few feet and the duration of its life cycle probably discovered in a single day. He also spoke upon the hibernating habits of the larvæ, instancing how some species remained

within a foot or two of the surface while one, viz., *L. rugosa*, was found at depths varying from 47 to 91 inches. Mention was also made of the remarkable manner in which skunks sought out the larvæ for food, thus doing much good. An interesting discussion followed on the habits and food of skunks in general.

Mr. Sladen exhibited twelve species of wasps of the genus *Odynerus* taken in the Ottawa district and described the habits of *O. spinipes*, a European species. It provisions its cell with small green caterpillars. The egg is attached to the roof of the cell by a thread so that it is not disturbed by the wriggling victims. He also showed a parasitic bee, *Coelioxys rufitarsus*, with its host, *Megachile latimanus*, a leaf-cutter bee, and explained how, according to Graenicher, the parasite pierces the leaves lining the cell of the *Megachile* by means of its conical sharp-pointed abdomen, and inserts its egg. The *Coelioxys* larva is at first provided with enormous mandibles with which it kills the *Megachile* larva, but after the first moult the mandibles are of the small size found in other bee larvæ, and thence forward it feeds entirely on the pollen that the *Megachile* has provided. Mr. Harrington remarked that in Ottawa, as in England, *Megachile* is very fond of cutting circles out of the leaves of the garden rose to line its cells. It also often chooses maple leaves. He had noticed that if the surroundings of a solitary bee's or wasp's nest were disarranged the insect could not find its way in. It seemed to have committed to memory every detail; this was done by circling round the spot many times. Mr. Sladen said that queen bumble bees he had got to lay eggs in captivity, when allowed to fly, never returned, though they marked the spot carefully, and he believed they lost the power to learn the position of their nest as soon as they began to lay.

Mr. Strickland spoke upon the subject of parasites in *Simulium* larvæ. After briefly describing the acquatic habits and structure of the early stages of the Black fly, and pointing out the interest that is centred upon this fly as the possible carrier of the human disease Pellagra, he gave an account of the parasites he had found infecting their larvæ in the streams in the vicinity of Boston, U.S. These consisted of a worm and various protozoa, all of which were fatal to their larval host, and occurred in sufficient numbers to be of considerable economic value. The worm is a species of *Mermis* that inhabits the abdominal region of the body cavity, where it lives coiled up and almost motionless absorbing the body fluids of its host, till the latter is full grown. It then ruptures the skin and escapes, killing the larva in the process. When the worm only is present it is 3 cm. long, or about three times the length of its host. As many as 12 were found in one larva, in which case they all

remained small. The most interesting effect of this parasite is that it stops all growth of the external adult organs (legs, wings, etc.) in the larva. In a normal larva these organs are well developed at the time of maturity and are readily seen through the transparent skin of the thoracic region. The parasitised larva grows to an abnormal size, as if at the expense of these organs. The protozoan parasites, with the exception of one, belong to the genus *Glugea* and are closely related to the Pébrine disease of silkworms. Several species were present in different larvæ. All of them form large masses of parasitic material in the body cavity, which, at maturity, are resolved into innumerable minute spores, which spread the disease in the water upon the death of the host. The other protozoan proved to be a *Gregarine* that formed a vast number of small cysts in the body cavity, from which, later, motile "spores" escaped.

Mr. Beaulieu, who is working on a monograph of Canadian Elateridæ, showed a collection in which there were representatives of the 25 genera found in our fauna. He also exhibited a specimen each of two new species, *Limonius venablesi* Wck., and *Corymbitis weidtii* Ang. The following figures, showing the distribution of the species of this interesting family, were given: Known species in the world fauna, about 5,500; American species, about 2,260; American species north of Mexico, about 500; Canadian species, about 190. Described genera, world fauna, 285; American genera, 129; American genera north of Mexico, 47; Canadian genera, 25.

Mr. Gibson exhibited his collection of Canadian arctiid moths of the genus *Apantesis*. These were shown in five large cases. Attention was directed to certain of the species which had been reared from the egg. In some of the series larvæ in all stages were present, and with many species adult larvæ and pupae. These moths, known popularly as "tiger moths," are very beautiful insects. The larvæ are clothed with dense clusters of hairs, usually black or reddish. In spring they may often be found under pieces of board, etc., along railway tracks. Species which occur in the Ottawa district are *virgo*, *virguncula*, *parthenice*, *arge*, *celia*, *figurata*, *nais* and *vittata*.

Other interesting exhibits which were brought to the meeting were: by Bro German, specimens of *Saperda concolor* and its work, and a hymenopterous parasite reared therefrom; also a rare beetle, *Carabus nemoralis*, taken at Montreal. This is supposed to be a European species, but Mr. Beaulieu stated that Dr. Lapouge, the French authority in the genus *Carabus*, considered that this was not the true *nemoralis*; by Mr. Kitto, a collection of Cerambycidæ and Elateridæ, taken in the Ottawa district, some interesting species were represented; by Mr.

Halkett, ants' nests from Germany, specimens of *Calosoma sycophanta*, and the Blind Worm, *Anguis fragilis*, also from Europe. A. G.

NOTE ON THE AMERICAN MAGPIE (*Pica pica hudsonica*).

This bird appears to be rare north of the 53rd degree of latitude in central Alberta, and even 50 miles south of that line it is not by any means common. I have never seen it north of Camrose, nor does Mr. Spreadborough mention having seen it in his travels north from Edmonton down the Athabasca or McKenzie Rivers. On the west side of the mountains along the coast it is found as far north as the Arctic Circle. During the past twenty-two years I have only seen it three times, as follows: one near the Big Bend of the Red Deer River in December, 1894; two near Wolf Creek, north of Lacombe, in October, 1912, and one on September 28th, 1913, six miles west of Camrose, near Bittern Lake. I have known of several colonies breeding on the Knee Hill Creek, about 30 miles east of Olds, and I believe this to be the northern limit for nesting.

F. L. FARLEY, CAMROSE, ALTA.

THE FOLLOWING BOOKS, WHICH WILL BE OF INTEREST TO MANY MEMBERS OF THE CLUB, HAVE RECENTLY BEEN PLACED ON THE SHELVES OF THE CARNEGIE PUBLIC LIBRARY.

Earth Features and Their Meaning, by W. H. Hobbs. An introduction to Geology. (Ample treatment, of interest to those who care to be able to read, in the landscape, the history of the vicissitudes which the region under observation has undergone).

Influences of Geographic Environment, by E. C. Semple. (Amplified presentation of Ratzel's theories that geographic conditions are the chief factor in the physical, intellectual and social development of man."

Climate—Considered Especially in Relation to Man, by R. D. Ward.

The Wanderings of Animals, by Hans Gadow. (Sketch of the distribution of the animals over the earth's surface. Cambridge Manual Series).

The Earth—Its Shape, Size, Weight and Spin, by J. H. Poynting.

The Non-Metallic Minerals, Their Occurrence and Uses, by G. P. Merrill. (Important work on minerals of value other than as ores of metals).

Natural Philosophy, by W. Ostwald. (Brief survey of the

sciences, their general import and unification of present knowledge concerning them. A general introduction to science and to one view of philosophy).

The Ways of Planets, by M. E. Martin. (Discusses in a simple, informal manner the origin, position and characteristics of the various planets).

The Solar System—A Study of Recent Observations, by C. L, Poor. ("Not too obstruse, thoroughly entertaining and timely"—Nation).

Darwinism and Human Life, by J. A. Thomson. ("Authoritative, interesting and easily comprehended statement of the history and present status of evolution"—A.L.A.)

The Origin and Nature of Life, by B. Moore. (Home University Series. Clear and concise statement of the problem from the chemical point of view"—A.L.A.)

College Zoology, by R. W. Hegner. (An excellent text designed for beginning college students).

Agriculture, by W. Somerville. (Makes the results of laboratory work at the university accessible to the practical farmer).

MEETINGS OF THE BOTANICAL BRANCH.

December 6th, 1913, at the home of Mr. R. B. Whyte, the following members being present: R. B. Whyte, Dr. M. O. Malte, G. H. Clark, L. H. Newman, J. M. Macoun, N. Criddle, W. T. Macoun, C. J. Tulley, A. E. Attwood and J. R. Fryer.

In response to the call for botanical specimens from members Mr. Criddle exhibited an interesting specimen of the genus *Neslia* (Ball Mustard) and one of the genus *Setaria* (Foxtail Grass), on the latter of which was an abnormal foliaceous development of the bracts. Mr. Newman exhibited a sample of wheat which took the world's prize at Tulsa, Oklahoma, in October, 1913. Mr. W. T. Macoun showed a couple of Peli nuts which were characterized by an exceedingly hard shell. They were somewhat larger than ordinary nutmegs and more angular in shape.

Dr. M. O. Malte spoke on "Some Results of the Summer's Work in Botany" and dealt especially with the species *Mentha*, *Viola* and *Juncus*. Specimens of true *Mentha arvensis* L., collected by him in Nova Scotia, were shown and the statement made that on account of the characters of the calyx the true *M. arvensis* L. can scarcely be grouped with other Canadian species of *Mentha* now regarded as varieties of it. Dr. Malte was of the opinion that the Menthas which now are called *M. arvensis* L., var. *canadensis* (L), Briquet, and var. *lanata* Piper, are specifically distinct from *M. arvensis*, and furthermore,

that the difference between *canadensis* and *lanata* are so great that both deserve specific rank. The latter supposition was borne out by Mr. J. M. Macoun, who stated that in British Columbia, where both are frequently growing together, the differentiating characters seem to be perfectly constant.

Dr. Malte also exhibited specimens of *Viola rostrata* Pursh, from Chats Falls, Ont., collected by Mr. J. M. Macoun and himself last spring, and explained that this was the second time the species had been found in the Ottawa district. It was growing with *V. conspersa* Rchb. Perfectly typical hybrids representing the combination *V. conspersa* x *rostrata*, found among the parents, were shown. They were intermediate in all respects as to morphological characters and had over 90% of the pollen undeveloped and unfit for fertilization. The speaker further exhibited a number of species of *Juncus* primarily with the object of demonstrating the ease with which many plant species which to the unexperienced student may seem difficult and puzzling, can be identified. With the use of a Zeiss binocular microscope, kindly placed at the Club's disposal by the Topley Company, characters on the seed only, sufficient for the correct identification of such species as *J. articulatus* L. *J. brevicaudatus* (Engelm) Fernald, *J. canadensis* J. Gay, etc., were explained. In this connection a completely sterile form, collected at Bridgetown, N.S., was exhibited. This form was found to represent the combination *J. articulatus* x *canadensis*.

Mr. Uhlemann, a visitor, spoke briefly on the Zeiss binocular microscope, stating that this instrument is probably one of the best of its kind in the world.

J. R. F.

December 20th, 1913, at the home of Mr. J. M. Macoun, the following members being present: W. T. Macoun, L. H. Newman, Geo. H. Clark, N. Criddle, Mr. Honeyman, Dr. Malte, Dr. Blackadar, A. Eastham, T. W. Dwight, A. E. Attwood, R. B. Whyte, J. M. Macoun, C. J. Tulley and J. R. Fryer.

Mr. C. J. Tulley and Dr. Malte were the speakers for the evening. Mr. Tulley first reviewed the evolutionary steps in reproductive processes in some of the lower plant forms. Commencing with the unicellular plant forms, the speaker briefly compared their cytological features with those of the simplest animal form, Amoeba, and explained that the reproductive method in unicellular plants is one of continuous cell multiplication, one individual becoming two by cell division. This method of reproduction was designated *Cell Division*, as distinguished from the other two methods, *Asexual* and *Sexual*. In plants

somewhat higher than the simplest of unicellular forms the reproductive method is slightly different. The products of cell division are dissimilar, certain daughter cells being specialized for reproductive purposes. These reproductive cells are called *spores*, and in cases where they are similar one to the others, the method of reproduction is known as the *Asexual method*. In forms still higher, some algae, for example, another method of reproduction is suggested. The spores produced are similar in appearance, but do not develop directly into new individuals. They first unite in pairs, forming in each case of union, a *zygote*, which develops into an adult individual. This method of reproduction is known as the *Sexual method*, and where the uniting cells are similar the fusing process is known as *Conjugation* or *Isogamy*. In other forms the fusing cells are dissimilar, in which case the type of sexual reproduction employed is termed *Heterogamy*. In such cases the gametangia (organs bearing the gametes) are also differentiated.

Mr. Tully referred especially to *Ulothrix*, an organism which bears two kinds of spores. One kind has two cilia on each spore, the other kind has four. The smaller two-ciliated spores unite in pairs, resulting in the development of a new filament. The speaker believed these similar gametes to be the beginning of the sexes.

These methods were illustrated by microscopic specimens, those of Spirogyra and Vaucheria being especially fine.

Mr. Tully then briefly described a method of preparing microscopic sections. Hard stems are first soaked in a mixture of glycerine, plus 95 per cent. alcohol, to soften the tissue for sectioning; tender stems are soaked in water and softer plant tissue, such as leaves, in a mixture of chromic acid, plus glacial acetic acid, plus water. The specimen is then cut with a microtome and the sections dropped into a little wire gauze basket, which may be immersed with the sections into the stain. The stains used are *methyl violet*, which brings out the ligneous tissues, and *congo red*, which colors the softer tissues. *Eosin* may also be used for the softer parts. After staining the sections are washed in water and then in alcohol. This method was beautifully illustrated by some sections of stems taken from Mr. Tulley's own collection.

Dr. Malte then said a few words on fixing and staining vegetable tissue. He referred to the fact that nuclei in life are irregular in shape, having ramifications which extend not only to the cell wall, but pass through it, thus establishing direct communication between the cell and its neighbors. Dr. Malte suggested the possibility of these nuclear ramifications being responsible for the conveyance of stimuli which pass from one

tissue to another in the leaf of *Mimosa* (Sensitive Plant) when this leaf responds by its phenomenal movement to the touch of a foreign object. He stated that under the ordinary method of fixing, these ramifications are dissolved by the alcohol and the nucleus is represented in a spherical form quite different from its shape in natural life. To overcome this difficulty and fix nuclei as in their natural state, Dr. Malte gave the following method: Treat the specimen from 10 seconds to 1½ minutes in fumes of *Osmic acid* (10 per cent.); then a few minutes in 10, 20, 30, 40, 50 per cent. alcohol respectively. Keep in 60 per cent, alcohol 24 hours and then proceed to absolute alcohol as usual.,

J. R. F.

January 3rd, 1914, at the home of Mr. G. H. Clark, the following members being present: G. H. Clark, R. B. Whyte, W. T. Macoun, J. M. Macoun, A. Eastham, J. Dickson; E. D. Eddy, H. A. Honeyman, J. H. Grisdale, T. W. Dwight, L. H. Newman, N. Criddle, A. E. Attwood, J. R. Fryer..

Mr. G. H. Clark led in a discussion of the clay belt of New Ontario. A large number of interesting photographs, showing the character of the country along the right of way of the National Transcontinental Railway, which had been made available for the evening by Mr. D. MacPherson, of the National Transcontinental Railway Commission Staff, and also a collection of photographs showing progress in clearing and cropping in the Temiskaming district and north, which had been loaned by G. A. Galbraith, district representative for agriculture of New Liskeard, proved to be of special interest. Mr. Clark, in company with the Director of the Dominion Experimental Farms, spent ten days traversing the clay belt along the new railway lines. Of the 275 miles covered, from Abitibi westward, only 14 per cent. was considered as useless for agriculture. An additional 26 per cent. was relatively flat, covered with black spruce and poorly drained naturally. The balance, 60 per cent., as viewed along the right of way, was rated 21 per cent. excellent, 39 good, from the viewpoint of the settler. Limitations as to kinds of crops, because of the northerly climate, formed a considerable part of the discussion. It was thought that the information at present available was not to be considered reliable, and that as the forest is cleared away the length of the season will be much extended, as was the case in Old Ontario. Particular mention was made of the luxurious growth of grasses and clovers, as seen under agricultural conditions in the few settled localities near Cochrane and south, and around the construction camps to the west.

Mr. Honeyman, who had visited Hearst, in New Ontario, spoke briefly on the climatic conditions of that district, with special reference to late spring and early fall frosts, and listed the following plants which he found growing there: Spruce, balsam, white birch, cedar, poplar, mountain ash, gooseberry, blueberry, dogwood, clintonia, anemone, buttercup, great willow-herb, labrador tea, pitcher plant, yellow pond lily, ferns and botrychium.

Mr. J. M. Macoun exhibited some English walnuts which had been produced by a Canadian grown tree. Members of the Club tested these nuts and found them to differ but little from the regular English walnut.

J. R. F.

BIRD NOTES FROM AWEME, MANITOBA.

An interesting instance of how lack of snow is largely instrumental in retarding the migratory movements of certain birds was brought prominently to our notice during the present winter, the details of which seem worthy of record.

The Lapland Longspur (*Calcarius Lapponicus*) is an early migrant, as well as a late one. In autumn its movements depend largely upon weather conditions, particularly snow, but, as a rule, it leaves us in Manitoba early in November. In 1913, all had left Aweme by November 16th, but soon after that date the weather turned mild again, causing the small amount of snow to vanish, thus exposing many seeds to view. On December 3rd, Longspurs began to arrive from the south in small flocks of from 15 to 20, and by the 17th were on the fields in hundreds, singing and flying about as if it were springtime. They remained common until the 24th, at which date the temperature dropped to 19 below zero, preceded by a light fall of snow, causing many of the birds to depart. A number remained, however, until the end of the year. On January 1st and 2nd, 1914, nearly 3 inches of snow fell, causing the last Longspur to depart.

This, I believe, constitutes a record for lateness of that species in Manitoba; at all events it does so in our parts. It also suggests that snow covering the food supply, possibly supplemented by cold, is the chief factor in driving the species south.

STUART CRIDDLE.


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ON *GRYPOSAURUS NOTABILIS*, A NEW GENUS AND SPECIES OF TRACHODONT DINOSAUR FROM THE BELLY RIVER FORMATION OF ALBERTA, WITH A DESCRIPTION OF THE SKULL OF *CHASMOSAURUS BELLI*.*

By Lawrence M. Lambe, F.G.S., F.R.S.C., F.G.S.A.,
Vertebrate Palæontologist to the Geological Survey, Canada.

In two papers lately published the writer has described some of the dinosaurian material included in the 1913 collection, made by the Geological Survey's vertebrate palæontological party in the Belly River formation on Red Deer river, Alberta, under Mr. Charles H. Sternberg.

The present paper is descriptive of a skull representing a new genus and species of trachodont, and of that of *Chasmosaurus belli*, both forming part of last summer's collection.

The skull of the trachodont is remarkable for its splendid state of preservation. The elements composing it are singularly free from breaks and displacement, there is little or no distortion, and the specimen is as close an approach to perfection as can be expected in a fossil vertebrate of large size.

With the skull were found about twenty feet of the vertebral column, most of the pectoral arch, about half of the ribs, the pelvic arch, one hind limb with part of the foot, and impressions of the skin from between the femur and the base of the tail. The discoverer of these remains was George F. Sternberg, who has also prepared the skull as shown in side view, on plate XVIII.

For the genus and species represented the name *Gryposaurus notabilis* is proposed, the generic term having reference to one of the most striking features of the skull, viz., the prominence attained by the upper marginal curve of the nasal bones.

The genus may be defined as follows:—Skull large, narrow and very deep, with highly arched nasals. The lower anterior border of the premaxillæ expanded laterally. Orbit much smaller than the lateral temporal fossa. Quadrate high, partially

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

separated from the jugal by a small quadrato-jugal. Mandible robust. Predentary expanded laterally and deflected in its hinder half, and posteriorly bifurcated below at the midline. Neural spines of the anterior dorsal vertebræ long. Ischia not expanded distally. Body covered with small, polygonal, non-imbricating, tuberculate scales of rather uniform size.

In no other member of the Trachodontidæ is the skull so deep anteriorly as in *Gryposaurus notabilis*. The nasals rise to an extraordinary height a short distance in advance of the orbits. The top of the curve of the nasals is as high as the highest point of the back of the skull, viz., the summit of the squamosal behind the supratemporal fossa. The depth of the head at the apex of the nasal bones is equal to about half the maximum length of the skull.

For the present, the characters of the species will be taken for the most part from the skull.

Viewed from the side, the superior outline of the head is most depressed above the front border of the orbit, rising abruptly forward by a short ascent to the summit of the nasals, whence it descends rapidly to the anterior end of the premaxilla in a long curve whose general convexity is broken by a slight dip at midlength. From above the orbit the outline slopes gradually upward to attain the highest posterior point of the dorsal surface of the head a little in advance of the upper end of the quadrate.

Seen from above, the broadest part of the head is along the surface of the jugal beneath the lateral temporal fossa, whence it contracts upward to the dorsal surface and forward to a point beneath the hinder end of the nasal opening, to expand again to a moderate extent in the lower premaxillary border.

In the dorsal surface of the skull there is a slight diminution in breadth from behind the orbits backward, a somewhat equal contraction forward above the orbits, continued in a much greater degree, in the front half of the skull, by the narrow median elevation of the nasals and premaxillæ.

The sutures in this skull are so distinct that the position, shape and connections of the various elements composing it can be readily understood by reference to its photographic representation in lateral aspect in plate XVIII.

The narial opening is extremely long and narrow. It is enclosed behind and mostly above by the nasal, and in front, and for the greater part below, by the premaxilla.

The orbital opening is higher than wide, somewhat quadrangular in outline, and narrower below than above. The upper rim is formed equally by the prefrontal and postfrontal, and has a rugose surface. In the rim between these bones is what appears

to be a small separate bone, which is regarded as a supraorbital. The slender postorbital bar is formed by a process sent down from the postfrontal to meet one rising from the jugal. The opening is bounded beneath by the jugal, and in front by the prefontal, lachrymal and jugal. In the upper anterior part of the opening there is a conspicuous emargination of the rim bounded in front and above by the prefontal and below by the lachrymal which sends up a short, stout process from its posterior border behind the emargination. What appears to be the opening of the lachrymal canal is here visible within the indentation.

The lateral temporal fossa is more than twice as high as wide and is narrowly rounded at its front lower termination. It is bounded in its lower half by the jugal, and in its upper half by the postfrontal anteriorly, by the postfrontal and squamosal above and by the squamosal and quadrate posteriorly. The jugal connects with the quadrate for some distance above the upper end of the quadrato-jugal.

Anteriorly, the jugal effects a strong union with the maxilla below and the lachrymal above. The lachrymal meets the maxilla below in advance of its union with the jugal and connects with the nasal for a short distance, separating the prefontal from the long, backwardly directed lower limb of the premaxilla.

The nasal extends back as far as the posterior end of the postfrontal and meets the frontal in a coarsely dentate, transverse suture. The frontal is about as broad as long and does not reach the orbital rim. Antero-laterally this bone connects with the postfrontal and supraorbital, postero-laterally it is met by the postfrontal and behind by the parietal. The naso-frontal surface between the eyes is flat and at a slightly lowel lever than the upper orbital rims.

The supratemporal fossa is angularly oval, with the greater diameter fore and aft. It is enclosed in front about equally by the parietal and postfrontal, and on the outside by the postfrontal and squamosal. The frontal does not quite reach the anterior margin of the fossa. The squamosal passes inward behind the opening to meet the parietal, but to what extent the latter bone contributes to the formation of the posterior border is not known, as the position of the squamoso-parietal suture has not yet been determined. The coalesced parietals form a narrow median bar, separating the two openings.

Viewing the skull from the side, the thin edge of the angular is visible for a short distance beneath the posterior end of the dentary, and the articular appears to a limited extent at the extreme end of the mandible above the surangular. This last

bone, which supplies the greater part of the cotylus for the articulation of the quadrate, is stout and ascends in front against the back surface of the coronoid process.

The teeth are of the usual trachodont type and are in from two to three rows in the grinding surface of the lower jaw. A satisfactory examination of the inner enamelled surface of the lower teeth has not been possible, but in two of the teeth seen from the inner side, the margin appears to be smooth, or nearly so.

The edentulous part of the dentary is short and decurved and is covered in front for a little more than half of its length by the predentary.

The front margin of the premaxillæ, for a distance of $2\frac{1}{4}$ inches on each side of their median sutural union, is notched in a regular manner. On each side of the dentate edge the margin curves concavely upward and then merges into the extensive, depressed, lateral expansion.

Superiorly, the predentary conforms to the shape of the premaxillaries. Its antero-lateral border rises on each side of a sunken median portion which would receive the notched end of the premaxillaries if the jaws were brought together. Postero-laterally, the predentary expands outward, producing a surface which is concave above and conforms to the shape of the lower surface of the lateral premaxillary expansion. This concave surface terminates outwardly behind in a short pointed process. Antero-laterally, the bone is excavated beneath the border of the upper surface. The retreating lower median surface ends posteriorly in two processes, one on each side of the symphysis, the anterior end of the dentaries being excavated to receive them. These processes are longer than broad and thin vertically. The predentary is one-third the length of the dentary and one-fourth that of the complete lower jaw.

The skin impressions found with the skeleton to which this skull belongs are natural moulds and casts from the hinder part of the body between the femur and the base of the tail. The impressions are of non-imbricating, polygonal scales, smooth and convex on the upper surface, and varying in diameter from $\frac{1}{8}$ up to $\frac{3}{8}$ of an inch, with an average breadth of about $\frac{3}{16}$ of an inch. In the considerable integumental area revealed, the scales vary in size between the above limits without any definite pattern arrangement.

It may be found by further study and comparison that the Belly River species *Trachodon selwyni*, established by the writer in 1902,* principally on the evidence of teeth, is the same as

*Contributions to Canadian Palæontololgy, vol. III (quarto), pt. II.

Gryposaurus notabilis, in which case the species would be known as *Gryposaurus selwyni*.

MEASUREMENTS.	Feet.	Inches.
Height of head from lower edge of dentary to highest point of nasal	1	7½
Height of same from lower edge of surangular to highest point of squamosal	1	8
Length of same from anterior end of premaxilla to posterior edge of squamosal	3	3
Breadth between upper rim of orbits		9⅜
Breadth between expanded lower anterior border of premaxillæ		9½
Length of lower jaw, including predentary	2	3⅜
Depth of lower jaw at midlength from outer alveolar border to lower edge of dentary		5½
Height of quadrate	1	4⅝
Length of dental grinding surface of lower jaw in advance of the anterior margin of the coronoid process	1	0
Breadth of same at midlength		1 5/16
Length of supratemporal fossa		6
Width of same		4
Height (oblique) of lateral temporal fossa		11⅝
Width (horizontal) of same at midheight		5½
Height (oblique) of orbital opening		8⅜
Width (horizontal) of same		5
Length of nasal opening	1	0½
Width of same at midlength		2½
Greatest length of premaxilla from front margin to termination above lachrymal	1	9⅛
Greatest length of predentary		8
Length of nasal, in a straight line	1	7⅞
Length of frontal at midline of head		3⅝
Max. breadth of same		4⅜
Length of coalesced parietals (approx.)		7¾

Last summer Mr. Sternberg's party on Red Deer river was fortunate in discovering also a fairly complete skeleton with the skull, including skin impressions, of *Chasmosaurus belli*, a species founded by the writer in 1902,* on part of the coalesced parietals, and at that time assigned by him to the genus Monoclonius. The characters of the skull have revealed a new generic type, for which the name Protorosaurus** has lately been proposed.***

*Contributions to Canadian Palæontology, vol. III (quarto), pt. II

**The Ottawa Naturalist, vol. XXVII, No. 10, January, 1914

***See foot-note. p. 155

The lower surface of the skull has not yet been freed from the matrix, and the remainder of the skeleton is also in the state in which it was brought from the field and awaits description, but the skin impressions found with the remains of this individual have been described and figured by the writer in the paper above mentioned, in which the genus Chasmosaurus is defined.

When found, the front part of the head above and in advance of the midlength of the maxillaries had gone to pieces through weathering, as had also the left side of the face as far back as the outer margin of the squamosal. The plane of weathering had not reached the rami of the lower jaw, which are present, but the predentary is missing. The large squamoso-parietal frill is in a particularly excellent state of preservation. On the right side the orbit and jugal are intact, and both supraorbital horn-cores are present. This specimen was found with the dorsal surface uppermost, in a bed of clayey sandstone impregnated with iron. It has apparently suffered little distortion. The right jugal is pressed outward to some extent, and the squamosals, particularly toward their outer border, appear to be less inclined downward than they should be. The mandibular rami, as also the right quadrate and quadrato-jugal, were slightly displaced, but without distortion.

The genus Chasmosaurus is regarded as ancestral to Torosaurus of Marsh from the Laramie of Wyoming, U.S.A. Its main characters, as already defined, are as follows:—Skull large, broadly triangular in superior aspect, with a narrow, abbreviated facial portion, and a broad and greatly extended posterior crest ending squarely behind. Coalesced parietals forming a slender framework enclosing large sub-triangular fontanelles. Squamosals very long and narrow with a scalloped free border. Epoccipitals present. Supraorbital horn-cores small, upright. Supratemporal fossæ of moderate size. Postfrontal fontanelle present. Jaws robust. Teeth large, of the ceratopsian type. Body covered with non-imbricating, small plate-like, and smaller tubercle-like scales.

In this skull of *C. belli*, discovered by Mr. Charles H. Sternberg, the length is $1\frac{1}{2}$ times the breadth, the distance forward of the anterior end being given with a fair degree of accuracy by the mandibular rami. The very great size of the crest or neck-frill, as compared with the rest of the head, is one of the most striking features of the skull, the length of the former to that of the latter being in the proportion of about $2\frac{1}{2}$ to 2. The frill is almost square, while the abbreviated facial portion narrows rapidly to the front.

The crest, composed of the coalesced parietals and the squamosals, is remarkably flat; it extends backward and

laterally in almost a horizontal plane. Its length is to its breadth in the proportion of about 7 to 8, with the maximum breadth near the posterior border. The parietal portion, which forms more than half of the frill, is broadly triangular in shape with the apex of the triangle in front. The squamosals are narrowly triangular, broadest in front, and extend backward to within a short distance of the crest's postero-lateral angulation.

Within the coalesced parietals are two sub-triangular fontanelles, longer than wide, and narrowing to the front, and so large as to reduce the posterior two-thirds of the parietals to a mere slender framework consisting of a median longitudinal shaft, separating the openings, a transverse posterior bar enclosing them behind, and narrow lateral bands forming their outer margins.

There are seven low, sub-conical epoccipitals on the lateral free border of the right squamosal, eight apparently on the left, and one, with a greater proportionate height, at each side of the parietal portion on its postero-lateral angle. These separate ossifications have a lengthened oval or lenticular basal outline, the greater diameter being fore and aft, and the under surface is excavated. They are in shape similar to the epoccipitals of Triceratops and are applied to and cover the convexities of the sinuous margin of the frill in a like manner. Of the series the parietal one is the largest and there is a gradual diminution in size forward. Of the five horned dinosaurs known from the Belly River formation of Alberta, the present species and *Centrosaurus apertus* only have epoccipitals.

The parietals in advance of the fontanelles form a broad surface, flat throughout, except along the median line, where there is a low, rounded ridge which, becoming more pronounced toward the front, terminates anteriorly in a small but well defined upwardly inclined platform which reaches the level of and effects a union with the postfrontals. This platform comes to a sharp edge laterally, where it is undercut by the supratemporal fossæ in a somewhat similar fashion as, but to a less extent than, in Centrosaurus and Styracosaurus.

The longitudinal parietal shaft is oval in cross section with the greater diameter transverse. The posterior transverse bar is bow-shaped, bending slightly backward on each side of the median line and curving rapidly forward at each end to form the postero-lateral angle of the frill. On its upper surface there is a narrow ridge along the curved posterior border, and also a similar thickening on the back margin of each fontanelle. The main upper surface of the bar between the ridges is shallowly excavated.

The squamosal of Chasmosaurus is remarkable for its length, although in comparison with the total length of the head it is shorter than in *Torosaurus gladius*, Marsh of the Laramie. It is transversely concave throughout its length and from near the squamoso-parietal suture slopes downward and outward with a slight upward flare at the free border. Anteriorly, it effects a long sutural junction with the postfrontal and is overlapped by the jugal. It encloses the lateral temporal fossa behind and throws forward a process which forms the greater part of the lower margin of this opening. Its front free border is at right angles to the length of the bone and constitutes the back border of a well defined quadrate notch. Its antero-lateral angle is evenly rounded. Behind its union with the postfrontal its superior surface is broadly rounded transversely and descends rapidly backward to the general level of the parietal portion of the frill. Behind the jugal its surface is almost vertical. In its hinder half the broad front elevation is continued backward as a narrow ridge next to the squamoso-parietal suture. Anteriorly within it overhangs the opening of the supratemporal fossa.

In lateral aspect the jugal is narrow in its lower portion, and evenly rounded at the extremity. Above, it enters into the formation of the lower margin of the orbital rim to some extent. Laterally in front it overlaps the maxilla, and posteriorly above it meets the postfrontal and sends out an extension which forms the front and upper margin of the lateral temporal fossa and overlaps the squamosal for some distance back of this opening. Its posterior border does not assist in enclosing the lateral temporal fossa below, but what appears to be a broken surface on the border beneath the level of the opening suggests a convexity in the outline of the bone at this point. The forwardly directed process from the squamosal beneath the lateral temporal fossa does not reach the jugal and the lower margin of the opening is completed by the quadrato-jugal. Both the quadrate and the quadrato-jugal have been forced out of place, upward, to some extent. A rugose area on the outer posterior surface of the lower end of the jugal suggests that an epijugal may have been present.

The orbit is higher than wide and slightly oblique, with the greater diameter directed downward and forward. The supra-orbital horn-core rises immediately above the eye-opening. It is short and upright, and broadly oval in cross section near the base, with the greater diameter fore and aft. Its basal outer surface is flattened and lies in the same vertical plane as the orbital rim. Behind the horn-core the postfrontal is tumid, and between this convexity and the orbital rim the surface is sunken.

The lachrymal forms the greater part of the front rim of the orbital opening, and meets the jugal below. It is injured anteriorly, and the frontals are not preserved. The postfrontals between the supraorbital horn-cores form a flat surface which slopes downward in front but descends much more rapidly behind. The tumidity of the surface behind the horn-cores merges into the broad anterior elevation of the squamosals. The suture between the postfrontals is not visible in front, but in the midline of the postfrontal surface there is a long, narrow fontanelle which extends back from a point in line with the posterior half of the horns to the anterior end of the raised parietal platform which enters into the formation of the posterior margin of the fontanelle. This opening is rounded behind and in front, and comes to a sharp edge at the margin. Within, the excavation has a smooth floor and extends to each side for some distance beneath the postfrontals.

Three smooth prominences occur in line on the broad anterior ridge of the squamosal, and in continuation there is an indistinct one in advance of the postfrontal suture, the tumid surface behind the supraorbital horn-core being one of the series, and the horn-core itself may be considered as the anterior culmination. In the midline of the coalesced parietals two obscurely marked elevations of a like nature occur in advance of the median shaft.

The coalesced parietals form the floor and side walls of the posterior end of the postfrontal fontanelle, to what extent is not known, but the parieto-postfrontal suture is probably at the anterior end of the narrow surface of bone seen in the superior view of the skull separating the fontanelle from the supratemporal fossa. This entry of the parietal into the formation of the postfrontal fontanelle occurs in both Styracosaurus and Centrosaurus.

The mouth or opening of the supratemporal fossa is rather narrow, and in coming from beneath the postfrontal it deeply undercuts the parietal platform and the squamosal, more especially the latter. The whole of the floor of the fossa at its mouth is supplied by the parietal, the squamoso-parietal suture being at the extreme outer limit of the floor. The sharp overhanging edge of the mouth of the fossa is continuous in its curve and is contributed to by the parietal, squamosal and postfrontal, to a less extent by the last than by the other two elements. In advance of the parietal platform the surface of the bone drops to a slightly lower local level, leaving the anterior termination of the platform sharply defined.

The lower jaw is strong and robust. The depth of the dentary at its midlength, measured from the inner alveolar

border, is a little over one-third of its length. The angular enters largely into the exterior surface of the jaw posteriorly, its sutural junction with the dentary having much the same general direction as in *Ceratops canadensis*. Its external surface is much farther forward beneath the base of the coronoid process than in Triceratops. The surangular, articular and splenial are preserved and will be described at a later date. The coronoid process is strong and terminates anteriorly above in a narrowly rounded hook. The height of the alveolar border above the lower margin of the dentary decreases only slightly from front to back, and in this respect the direction of the border differs materially from that of *C. canadensis*, otherwise there is a general resemblance in the mandible of these two species. The lower teeth bear a very high keel, and the grinding surface, as displayed by those teeth which have been in use, is almost vertical.

The dorsal surface of the skull of Chasmosaurus is rather smooth throughout. Small vascular markings occur on the parietals behind the inclined platform and on the platform itself. The upper surface of the postfrontals show these grooves to a greater extent but not in so decided a manner as the supraorbital horn-cores and the epoccipitals which are the most rugose parts of the skull.

The skull has been prepared, as it appears in the figures, by its discoverer, Mr. Charles H. Sternberg, and his son, Mr. C. M. Sternberg.

MEASUREMENTS.	Feet.	Inches.
Estimated length of skull from midway between apices of parietal epoccipitals to front edge of rostral bone, about	5	5
Length of skull along median line from posterior parietal border to anterior end of dentary	4	7
Maximum breadth of crest	3	5⅝
Breadth between centre of orbits		11
Breadth between lower margin of lateral temporal fossæ	1	6¾
Antero-posterior diameter of supraorbital horn-core near base		2⅝
Transverse diameter of same near base		2
Length of same, tip restored		3½
Length of squamosal from front end of process under lateral temporal fossa to back termination	2	9⅝
Length of coalesced parietals along median line from posterior border to front edge of raised portion between supratemporal fossæ	2	6⅛

Maximum length of intraparietal fontanelle (oblique)	1	8
Width of same	1	$1\frac{2}{8}$
Transverse diameter of parietal shaft at midlength		$2\frac{3}{8}$
Length of lower jaw from back end of articular to front end of dentary	1	$8\frac{3}{8}$
Depth of dentary at midlength from inner alveolar border to lower margin		$5\frac{6}{8}$
Vertical diameter of orbital opening		$4\frac{5}{8}$
Horizontal diameter of orbital opening		$3\frac{6}{8}$
Vertical distance of postfrontal surface between orbits above lower end of jugal	1	$1\frac{1}{2}$
Breadth of crown of tooth of lower jaw		$\frac{5}{8}$
Length of postfrontal fontanelle		$6\frac{1}{4}$
Depth of same anteriorly		$2\frac{1}{2}$
Depth of same posteriorly		3
Height of posterior edge of postfrontal above floor of supratemporal fossa		3

EXPLANATION OF PLATES.

PLATE XVIII.—Lateral view of skull of *Gryposaurus notabilis*, one-sixth the natural size.

PLATE XIX.—Skull of *Chasmosaurus belli*, from above; one-tenth the natural size.

PLATE XX.—Side view of same, similarly reduced.

Abbreviations.—*A*, parietal fontanelle; *AN*, angular; *AR*, articular; *B*, postfrontal fontanelle; *C*, supratemporal fossa; *D*, lateral temporal fossa; *DN*, dentary; *EO*, epoccipital; *FP*, postfrontal; *J*, jugal; *L*, lachrymal; *MX*, maxilla; *N*, nasal; *NO*, nasal opening; *OR*, orbit; *PD*, predentary; *PF*, prefrontal; *PM*, premaxilla; *Q*, quadrate; *QJ*, quadrato-jugal; *S*, squamosal; *SA*, surangular; *SO*, supraorbital.

NOTE.—The fact that the generic term Protorosaurus is already in use was overlooked by the writer, who now substitutes Chasmosaurus to designate the Belly River ceratopsian from Alberta. The new name has reference to the openings in the skull, more particularly to the great size of the intraparietal fontanelles.

SALIX HOOKERIANA BARRATT.

This willow, so abundant in low ground and swamps in the Lower Fraser Valley and on Vancouver Island, is, I think, not understood by the makers of books on the flora of Washington State, or perhaps the plant reaches fuller development in British Columbia. The capsule is very variable in its indument, being either densely tomentose, quite glabrous, or glabrous below or on the sutures and tomentose above, sometimes

becoming nearly glabrous in this intermediate form. According to Hooker's description and figure the capsule is glabrous; but glabrous forms are not so common as tomentose. They occur both on the mainland and on Vancouver Island.

S. Hookeriana flowers at Vancouver in March, shortly after *S. Scouleriana*, from which it is easily distinguished by its furry-tomentose branchlets, which are very brittle at a point just above the fork; by its long style and short stigmas, and by its usually very large, erect, fertile catkins. *S. Scouleriana* has little or no style, long stigmas, merely puberulent branchlets and the fertile catkins soon recurve. The staminate catkins of *S. Hookeriana* are larger than those of *S. Scouleriana*, and sometimes in two sets—the second set not flowering for a month or six weeks after the first, when apparently no late pistillate catkins are in flower. It rarely produces stipules, a point about which Hooker was doubtful.

The closest allies of *S. Hookeriana* in British Columbia seem to be *S. Barrattiana* of the Rockies, which always has large stipules, and *S. Piperi* Bebb, if a few clumps occurring at Vancouver can be so assigned. These clumps have large, oblong leaves shining above and glaucous-pubescent below, and so far agree very well with Bebb's description; but the branches are slightly pubescent, the leaves firm rather than thin, and the capsule may have a very slight pubescence at the apex. The willow is thus, as far as the pistillate plant is concerned, intermediate between the form of *S. Hookeriana* with glabrous or slightly pubescent capsules, and *S. Piperi*. The staminate flowers have not been observed.

In the autumn form this willow quite differs from *S. Hookeriana*. Its leaves turn yellow, and fall late; while those of *S. Hookeriana* turn more or less blackish, and fall earliest of the coast willows. As the type of *S. Piperi* came from Seattle, this species may be expected to occur in southern British Columbia.

J. K. HENRY, VANCOUVER, B.C.

MEETING OF THE BOTANICAL BRANCH.

Held at the University Club rooms, 150 Elgin Street, on the evening of January 17th, the following members being present: E. D. Eddy, R. B. Whyte, L. H. Newman, C. J. Tulley, T. W. Dwight and J. R. Fryer.

Mr. L. H. Newman led in the discussion of a review of some recent work dealing with the phenomenon of variation in plants. He first reviewed some work done by Fruwirth on potatoes. Fruwirth investigated the variations occurring in successive

generations of potatoes. In order to eliminate variations due to hybridization he sowed seeds taken from potato balls grown naturally, that is, no artificial crossing had been practised in producing this seed. After the first generation each succeeding one was produced from the tubers and not the true seeds of the preceding. Careful comparisons were made between the mothers and their respective progeny in different generations in order to observe and record any apparent deviation that might occur. Special attention was given to the colour of the skin and of the flesh of the tubers harvested, together with the size and shape of these. The variations in these features were very marked. Most of them were readily explainable by the principles of heredity, but in one case there were found in the second generation four plants which produced yellow-fleshed tubers, although the flesh of the mother sort was not yellow, but white. This form cannot be explained as recessive because yellow was dominant. No very satisfactory explanation was given for this occurrence. From the results of his investigation Fruwirth concludes "that it is possible to improve our present potato sorts by the continuous selection of desirable hills."

Mr. Newman then discussed briefly variations in pure lines of self-fertilizing plants. He stated that recent work indicates that in plants which are normally self-fertilizing there is practically no variation. While it seems certain that we must abandon the idea of the existence of continuous variation in certain classes of plants, yet we know from experience that strange forms do sometimes occur even in our so-called "pure" lines. While the appearance of many of these strange forms may be accounted for as crossing products, it has not been definitely proven that new forms cannot arise quite independently of intersexular combination. Forms appearing in this way have been termed "mutants" or "mutations" by DeVries, who believes that most new forms arise in this sudden independent fashion.

The speaker then reviewed an account published last year by Dr. Kiessling, of Bavaria, on an elaborate investigation into the origin of a form of two-rowed barley, which seems to show that this form is undoubtedly a mutation. In 1898, Dr. Kiessling obtained a sample of old Austrian barley from a farmer and tested it at the breeding station at Weihenstephan. From the crop of 1900 a number of plants were selected for pure line work. One of these survived the test and came to be propagated in a pure condition from year to year. In 1908, eighteen plants were selected out of this line to prove its constancy. The progeny from each of these plants proved to be constant with one

exception. In this case the plants, on May 10th, were recorded as being somewhat less upright than those in the other cultures. The plants thus deviating were closely studied and their progeny carefully compared from year to year with the progeny of the original pure line. In 1911, it was found that the aberrant type was much more susceptible to cold than was the original mother line. Other evident differences between the two showed conclusively that a new form had arisen. Moreover, the new form showed its own modification curve, and therefore cannot be regarded as a modification of the original line. After much discussion as to an explanation of the origin of this new form Kiessling finally concludes the new type is an example of DeVries mutations.

J. R. F.

NOTES ON THE APOTHECIAL STAGE OF SCLEROTINIA CINEREA IN ONTARIO.

By J. E. HOWITT, O.A.C., GUELPH, ONT.

This fungus was known as *Monilia fructigena*, Pers., until placed in the genus *Sclerotinia* by Woronin in 1899. Recent investigations show that the American Brown Rot fungus of stone fruits is not identical with *Sclerotinia fructigena* occurring in Europe on pome fruits. It agrees more clearly with *Sclerotinia cinerea* and should be referred to that species. In the spring of 1902, Norton found the apothecial stage in abundance in peach and plum orchards in Maryland. In 1906, this stage was reported as being very common in the United States throughout the west. Up to the present time, however, pathologists have not regarded the apothecial stage of importance in the propogation of the fungus. Conidia adherent to bark or bud scales and the mycelium of the mummied fruits or blighted twigs have been considered to be the chief sources of infection. While these are undoubtedly important sources of infection, observations made by the writer during the spring of 1912 point to the possibility that in wet seasons the apothecial stage may be of primary importance in the dissemination of the fungus and the chief source of blossom infection.

In the course of some studies on the life-history of *Sclerotinia cinerea* a careful watch was kept for the appearance of the apothecial stage. On May 25th, 1912, Mr. W. A. McCubbin, my colleague in this work, found numerous apothecia under wild plum trees (*Prunus americana*) at Cedar Mills, Ontario. The soil in this locality is a sandy loam. Apothecia were produced from old plums buried from one to two inches in the sand and

loam. These old plums had evidently been buried for some time in the soil, as last year's plums were still on the surface of the ground. When the apothecia were gathered it was observed that the asci in the more mature ones were discharging their spores. The blossoms at this time had nearly all fallen.

On May 29th, the writer paid a visit to Fruitland, in the Niagara district, Ontario, in search of the apothecial stage. A well cultivated plum orchard (chiefly Lombards) was visited. The soil was a fairly heavy clay loam. Numbers of apothecia were found growing from sclerotia in old dried mummied plums covered by moist earth or lying on the surface of the ground in low spots where water had lain for some time. A closer examination revealed the stipes of numerous apothecia that had evidently withered up as soon as the mummied fruit from which they were growing had been dried by the sun. In another plum orchard, the soil of which varied from clay loam to light sandy loam, many more apothecia were observed, and countless withered stipes indicated how prevalent the apothecial stage had been. When the apothecia were disturbed, the spores were discharged in fine brown dust-like clouds. The petals by this time had nearly all fallen but most of the calices were still intact.

A peach orchard on light, sandy loam was next inspected. In this orchard a heavy cover crop of winter rye was growing. Very few mummied fruits were found on the serface of the soil A number of apothecia were found, however, growing from the mummies buried in the sand. These were most abundant where the cover crop was heaviest and the soil dampest.

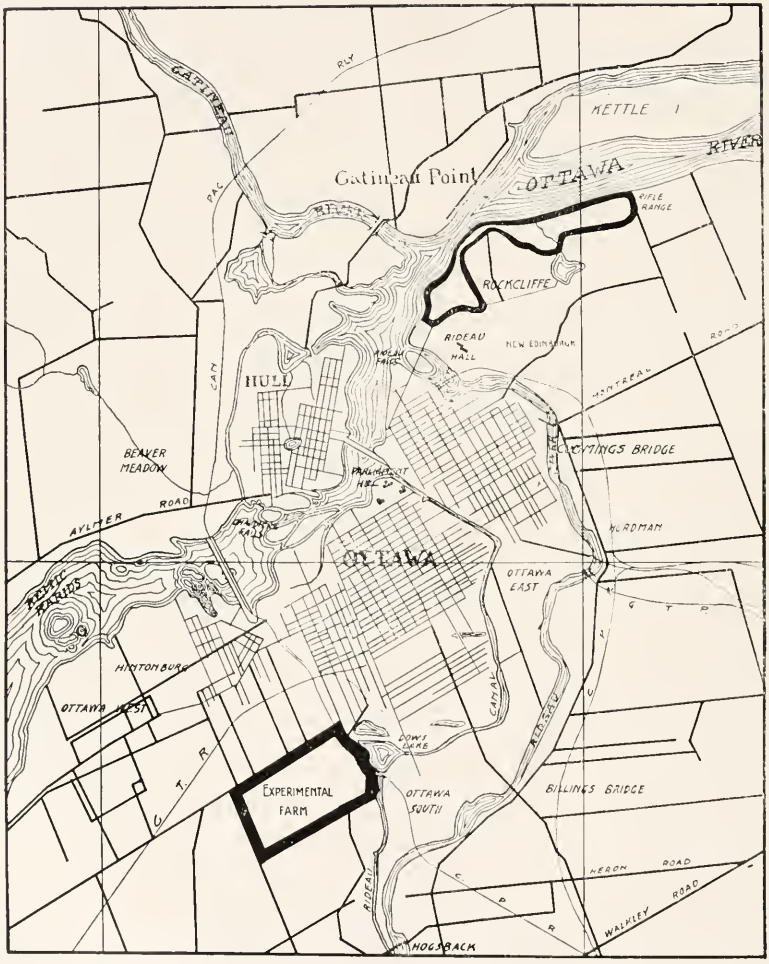
This was the first year that the apothecial stage was observed in Ontario. The continual wet weather during May without doubt accounted for the abundance of this stage of the fungus. It was observed that the apothecia were not produced except after heavy rains, and that they dried up and disappeared within a few hours after the weather became dry and warm. The very brief duration of the apothecia probably accounts for the fact that this stage has not been more generally observed by pathologists.

On the same dates that the apothecia were found in such abundance, mummied fruits and blighted twigs were examined to see if the mycelium was producing spore pustules. Though large numbers of mummies and twigs were examined none showed signs of spore pustules. These were not observed until a much later date. As the blossoms had nearly all fallen at this time, it would appear that the source of blossom infection is either conidia adherent to the bud scales or the apothecial stage produced from mummied fruits beneath the trees. It would seem

from the observations made that large numbers of apotheica are produced in wet seasons and that the asci discharge immense numbers of spores during the blossoming period. It is, therefore, reasonable to suppose that the apothecia are one of the chief sources of blossom infection which later may result in twig blight. It is also possible that the ascospores account for much of the infection of the young fruit. It also seems likely that the apothecia are produced in more or less abundance every spring, but as they wither very quickly when the weather becomes dry they have not been observed, and hence the apothecial stage has been regarded of little importance in the propagation of the fungus and the continuance of the disease.

The writer hopes to continue these observations, as it is desirable to ascertain definitely the extent of the infection due to the production of apothecia in order that proper measures may be recommended for the control of this disease. Plowing under the mummied fruits has hitherto been considered one of the best means of preventing infection but if the apothecia are produced from old fruits which have been buried a year or more in the soil and brought to the surface by fresh plowing, this method would appear to be of little value.

Observations on this fungus were continued in the spring, of 1913. The apothecial stage was found in comparative abundance in plum orchards near St. Catharines. In order to determine whether the apothecia developed from mummied plums which had been buried in the soil for a year or more, or from mummied plums of the previous season, a number of mummied plums gathered in the spring of 1912 (the plums having been destroyed by the Brown Rot during the summer of 1911) were buried in loam and sand at different depths and left outside, exposed to climatic conditions until the spring, of 1913. They were then dug up and placed in moist chambers. Not a single apothecium developed from any of them nor were there any ones of the formation of sclerotia. Some mummied plums gathered last spring, which had hung on the trees or lain on the ground under the trees for the winter, were placed in moist chambers at the same time. On one mummied plum which had lain on the ground for the winter, a number of stunted, poorly-developed apothecia appeared. This experiment, though by no means conclusive, suggests that the apothecia may be developed from mummies of the previous years. These experiments and observations will be continued with the hope of clearing up this and other obscure points in the life-history of *Sclerotinia cinerea*.



Map of Ottawa Showing the Location (Outlined in Black) of the two Bird Sanctuaries: Rockcliffe Park and the Experimental Farm.

Hessian Food-house; One of a Number Erected on the Manchester Corporation Waterworks' Estate, Thirlmere, Cumberland, England for the Winter Feeding of Birds.

Nesting Box in use at Thirlmere, Cumberland, England.

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THE PROTECTION OF BIRDS IN AND AROUND OTTAWA*

By C. Gordon Hewitt, D.Sc., F.R.S.C.
Dominion Entomologist, Ottawa.

It is the purpose of this address to discuss, first, the general question of the protection of birds and the reasons why this is necessary; secondly, the economic value of certain common birds which we desire to protect; and thirdly, a proposal for the protection of the native birds around Ottawa.

The motives behind the widespread and increasing movement respecting the protection of our native birds may be included in two classes, namely, sentimental and practical. Most people, even in this material age, are sensible of feelings of affection towards our birds and are delighted when the return of the first spring migrants announces the termination of our long birdless winter. But the practical considerations underlying the movement are not so generally appreciated and for that reason æsthetic feelings will be assumed and the practical motives discussed.

Few people realize the place of insect pests in the general economy of life, but when it is understood that were it not for their controlling factors insects would in a few years destroy every form of vegetation, and consequently all animal life on the face of the globe, the significance of such controlling factors will be appreciated. In the United States it is estimated on a conservative basis that the annual loss on agricultureal and forest products is about eight hundred million dollars ($800,000,000). I have estimated that in Canada, on our field crops alone, the minimum annual loss due to injurious insects cannot be less than fifty million dollars; this does not take into account the enormous aggregate cost of controlling insect pests. And yet the most valuable insecticidal agencies we have are not only not encouraged but in many cases ruthlessly destroyed. Such a short-sighted and wasteful policy cannot and must not be continued.

*Abstract of an illustrated lecture delivered before the Ottawa Field-Naturalists' Club, 10th February, 1914.

We are endeavouring to increase the productiveness of the soil; birds will assist in doing this by destroying those agencies, namely, insect pests which decrease the amount produced.

The quantity of insect food consumed by birds is almost incomprehensible, but the facts set forth by various investigators on this continent and in Europe give us some idea of the extent to which insects go to make up the diets of birds. Insects constitute 65 per cent. of the total yearly food of woodpeckers, 96 per cent. of that of fly-catchers, and 95 per cent. of the yearly food of wrens. Upwards of 5000 insects have been found in a single bird's stomach. The value of the birds is increased by the fact that at the time when insects are most abundant birds are most active and require most food, especially animal food, to feed their young. A bird normally requires a large amount of food owing to its active habits and high temperature, all of which bodily functions demand a constant and plentiful supply of fuel in the shape of food. A young crow will eat twice its weight in food; a robin weighing three ounces was found by Nash to consume five and one-half ounces of cutworms in a day. It is calculated that a pair of tits and the young they rear will consume about 170 pounds of insect food during a year. These facts and others to be given later will indicate the enormous destruction of insect life that is accomplished by the presence of birds. They constitute one of the fortunate balances of nature. But man is constantly upsetting the balance. Woodlands are cut down and give place to open fields; snake fences give way to wire; subdivisions and town lots obliterate the waste places and often the swamps. All these circumstances tend to drive away the birds formerly resident and breeding in such localities. Then outbreaks of injurious insects occur and their depredations are increased and prolonged by reason of the absence of such important enemies. Therefore, our aim should be to restore the balance by attracting the birds back to our parks and natural reservations.

Not only do birds destroy insect pests, but they contribute to the destruction of weeds. Certain species of our native sparrows are large consumers of such weed seeds as bindweed, lamb's quarters, ragweed, amaranth, pigeon grass, etc. Judd records the result of the examination of over 4000 stomachs of twenty species of sparrows. It was found that for the entire year weed seeds form more than half their food, and during the colder months of the year these seeds constitute about four-fifths of the food of many species. A single bird will often be found to have eaten 300 seeds of pigeon grass or 500 seeds of lamb's quarters or pigweed. Beal estimated that the tree sparrow may consume one-quarter ounce of weed seed per day, and on that basis, in a state

the size of Iowa, this species would consume about 800 tons of seeds annually.

It is important to point out, however, that the weed-destroying power of graminivorous birds may be exaggerated if the question is not investigated with great thoroughness, for while the powerful gizzards of some birds may grind up the hardest coated seeds, in other cases seeds may be capable of germination after passing through the digestive tract, as Collinge has shown in a number of cases in English birds. In such instances the birds would act as disseminators of weed seeds. Then again, in the case of insectivorous birds, besides destroying noxious insects, they will destroy various kinds of insects which are useful by reason of their parasitic habits upon noxious insects. These facts indicate that the question of the economic status of a bird is not always an easy matter to determine and demands *thorough* investigation in each case.

In certain instances useful birds eat grain or fruit. The Horned Larks occasionally eat grain, vegetable food constituting about 80 per cent. of their total food. Six-sevenths of this total amount of vegetable food consists of the seeds of such weeds as foxtail, amaranth, ragweed, and bindweed. It surely is not too much to ask that, in view of the good they effect, a little injury shall be overlooked, especially as they make no charges for the good work they accomplish. It has sometimes seemed to me that in the case of those useful birds which sometimes take to fruit eating, it is cheaper to protect the fruit from the birds than from the insects. As insecticides, birds are the cheapest and most generally efficient that can be found.

The feeding habits of a few of our common species of birds which should be protected may now be considered. The Robin (*Planesticus migratorius*) probably comes first. Early in the year it feeds extensively on cutworms, those insidious enemies of our garden plants and crops; in March they constitute over a third of the robin's food. It is accused of fruit eating, and yet of all the vegetable matter it consumes a large proportion consists of wild fruits; 330 stomachs contained 58 per cent. vegetable matter, of which 47 per cent. consisted of wild fruits and 4 per cent. cultivated fruits.* The Bluebird (*Sialia sialis*) is not so common as formerly in the Ottawa district, having probably been driven away by the encroachments of man. Charming in its habits it responds readily to encouragement, building in hollow trunks and cavities. Insects such as grasshoppers, beetles and caterpillars constitute about 68 per cent. of its food.

*Except where it is specifically stated otherwise, these analyses of stomach contents are taken from the publications of the Biological Survey of the U. S. Department of Agriculture, to which the reader is referred for further details.

With the possible exception of the house wren, probably no other birds so readily take advantage of artificial nesting places as the Chicadees (*Penthestes atricapillus* and others) and Tits. Their unremitting search for insects on every branch, twig and leaf is a fascinating sight and the good they accomplish is difficult to conceive. A Blue Tit will destroy six and a half million insects in a year, and in bringing up a family of about twelve to sixteen young ones, about twenty-four million insects would ultimately be accounted for. Especially valuable are they in the destruction of the eggs of certain species of defoliating caterpillars, such as the canker worms and tent caterpillars, the moths of which deposit their eggs on twigs. Graf, in Switzerland, states that three blue-tits and three cole-tits consumed 8000 to 9000 insect eggs daily; three marsh tits. one cole-tit, a long-tailed tit and a golden crested wren consumed 600 caterpillars in 100 minutes. The pupae of the codling moth and the hibernating forms of plant lice do not escape the sharp eye of these small acrobats. The little White-breasted Nuthatch (*Sitta carolinensis*) which may be seen running not only upwards but also downwards on the trunks of trees, has somewhat similiar habits to the Chicadees. Over 50 per cent. of its food consists of insects. The House Wren (*Troglodytes aedon*) has suffered much by the inroads of the quarrelsome English sparrow which drives it out of its nesting places on every possible occasion. Nevertheless, this confiding little bird which charms us so much with its little bubbling song and exacts such a heavy toll on insect life will gladly accept a nesting box out of which the sparrows may be kept by hanging it rather low down, and having the entrance hole as small as possible.

The Purple Martin (*Progne subis*) formerly nested in hollow trees, but the advent of man encouraged it to nest about his domicile. In some parts of the country, I have noticed the fact particularly in certain sections of New Brunswick, one may see martin houses erected on poles and this form of encouragement is very successful, although the English sparrows are a constant source of trouble to the rightful owners. The value of the martins and swallows around the house and buildings as insect destroyers is appreciated by all who have encouraged them. The Tree Swallow (*Iridoprocne bicolor*), which nests in hollow trees, is not so abundant in certain sections of Ontario as formerly. Reporting the success of nesting boxes during 1913, Mr. W. E. Saunders, of London, Ont., writes: "Another lot of boxes which were put in place on an island in the Rideau Lakes were a source of actual competition among the tree swallows, there being more pairs than there were nests, and considering the fact that these

birds are almost extinct in south-western Ontario, where they were formerly tolerably common, it would seem an excellent policy to encourage them in the Ottawa district while you have them there".

Two of the woodpeckers may be attracted by the use of nesting boxes. The Flicker (*Colaptes auratus*), which occurs in and around Ottawa, feeds largely on ants; a single stomach has been found to contain over 5000 ants. In another instance 28 white grubs, one of our worst pests of grass land and certain crops, were found in the stomach of a flicker which feeds largely on the ground. It also feeds upon wild fruits, such as the wild black cherry. The Downy Woodpecker (*Dryobates pubescens*) is a most valuable ally, as it feeds largely on beetles that destroy trees by boring into the bark and timber. An examination of 723 stomachs showed that 76 per cent. of the diet was animal food, consisting chiefly of insects.

Reference has already been made to the weed-destroying habits of our native sparrows. One of the first birds to arrive in the spring, breaking the long winter silence with its welcome little song, is the Song Sparrow (*Melospiza melodia*), which is very domestic in its habits. About three-fourths of its food consist of weed seeds and one-fourth of insects. Beetles, especially weevils, form the greater portion of the insect food. A thick hedge, dense shrubs or piles of logs provide suitable nesting places for this most welcome of our sparrows. The Chipping Sparrow (*Spizella passerina*), whose confiding ways give it a warm place in our affection, has somewhat similar nesting habits to the former. It is, moreover, the most insectivorous of our sparrows. About 42 per cent. of its food consists of insects and spiders, and caterpillars make up the major portion of the insect food, especially when the young are being reared, when as many as 17 feedings per hour, on an average, for a brood of our nestlings have been recorded. The retiring and sombre Junco or Snowbird (*Junco hyemalis*), destroys insects and feeds on weed seeds. An examination of 500 stomachs gave 23 per cent. animal food (caterpillars, bugs and beetles), and 77 per cent. vegetable food, of which over 61 per cent. consisted of weed seeds. In September the proportion of weed seeds may rise as high as 95 per cent. of the food.

Before discussing the details of the proposal for the protection of the Ottawa birds, it will be of interest to refer to the results of certain schemes of bird protection which have been adopted in other countries.

The greatest exponent of the practice of bird protection is undoubtedly Baron von Berlepsch, and to him we are indebted for the splendid example he has given at Seebach in Germany. His ideas have been adopted by various states in Germany and in the countries where the protection of birds and the provision of nesting boxes constitute an important and necessary adjunct of forestry methods. An instance, given by Baron von Berlepsch, of the practical value of bird encouragement may be quoted. The Hainich wood, south of Eisenach, which covers several square miles, was stripped entirely bare in the spring of 1905 by the caterpillars of the Oak Leaf-roller Moth (*Tortrix viridiana*). The wood of Baron von Berlepsch, in which there had long been nesting boxes, of which there are now more than 2,000, was untouched. It actually stood out among the remaining woods like a green oasis. At a distance of a little more than a quarter of a mile farther, the first traces of the plague were apparent, and at the same distance farther on still it was in full force. It was plain proof of the distance the tits and their companions had gone during the winter and after their breeding time. Similiar observations were made during a plague of the same insect (*Tortrix viridiana*) in the Grand Duchy of Hesse, where the protection of birds has been carried on in a sensible and energetic fashion for over ten years. Of 9,300 boxes hung up by the Government in the State and Communal woods of the Grand Duchy of Hesse, 70 to 80 per cent. were occupied in the first year and in 1907 all were inhabited. On and near Baron von Berlepsch's Seebach estate, 90 per cent. of 2,000 nest boxes in one wood were occupied, and nearly all of 500 and 2,100 in other localities. In Hungary similar measures are taken largely owing to the admirable work of Otto Hermann, one of the foremost European advocates of bird protection.

Some years ago when investigating the depredations of the Larch Sawfly (*Nematus erichsonii*) in the English Lake district I was impressed with the value of birds as natural means of control, and as birds in the worst infested district, namely Thirlmere, were not so abundant as they should have been, it was recommended that they should be protected and encouraged by means of nesting boxes. The corporation of the city of Manchester owns Thirlmere, this lake being their water supply, and they distributed nesting boxes of the pattern which I devised and which is illustrated herewith. (Fig. 1). The advantage of this box was that it could be made out of the slabs or rejected outer portions of the lumber bearing the bark. Three equal lengths of the slab are nailed together to form three sides of a long box, the outside of which, bearing the bark,

was round and the inside square. The fourth side is made of a flat piece of wood forming the back of the box; this piece is longer than the other sides and projects above and below the box, thus providing means of attaching the box to the tree (see Fig. 2). The top and bottom of the box may be made of slab wood. Several holes should be bored in the bottom, which is nailed on, to keep the nest dry. The top is hinged to the back board and when in use is fastened down by means of a screw, which permits the lid to be opened for the purpose of cleaning out the old nests. By so utilizing waste lumber, these boxes were made very cheaply at the sawmill. A boy could readily make similar boxes. Plate XXI shows such a box in use. In the first year (1908) 60 boxes were distributed and 31 per cent. were occupied. The number of boxes was increased yearly until in 1911 there were 347 boxes, of which 66 per cent. were occupied.* I am informed that in 1913, 75 per cent. of the boxes were occupied. In addition to the provision of nesting boxes, feeding houses of the Hessian type (Plate XXII) were erected for the purpose of feeding the birds in the winter

Fig. 1
Nesting Box Made of Slab-wood, Ready for Hanging.

In addition to the provision of nesting places for those birds nesting in cavities and hollow places, the protection of birds involves the carrying out of other measures also. For birds nesting on or near the ground piles of logs or brushwood may be left in sheltered places and thickets of closely growing shrubs and vines permitted to remain here and there. Piled logs will also provide shelter for many birds during inclement weather. While most of our birds leave us during the winter,

*For further particulars and illustrations see Bull. 10, Second Series of the Experimental Farms, Dept., Agric., Canada, entitled "The Large Larch Saw Fly."

The Berlepsch Nesting Boxes in various sizes may be obtained from the Royal Society for the Protection of Birds, 23 Queen Anne's Gate, London, S.W., England, who will gladly furnish a price list; or from the manufacturer: Hermann Scheid, Büren, Westphalia, Germany.

except in certain places where the chicadees may be found, there are certain occasions where feeding may be adopted with advantage. Not infrequently after the arrival of certain of our early migrants in the spring a cold spell and snow occurs. On such occasions feeding can be resorted to with great advantage. The fact that birds require water is not so generally

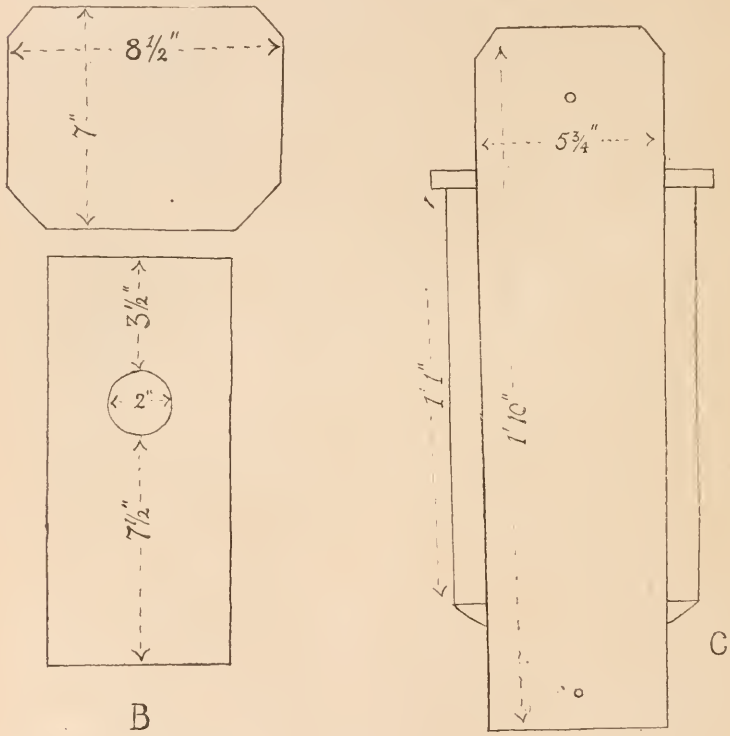

Fig. 2

Structural Details of Nesting Box Shown in Fig. 1 B.—Lid on Front of Box. C.—View of Box from Back.

realized as one would wish. Especialy is this the case during our hot summer months. One of the most attractive additions which can be made to a garden is a bird's drinking trough or fountain. This should be shallow enough to permit the birds to take a bath. The best type of artificial bird water supply for a garden is a shallow pool, two or three feet in diameter, and a few inches deep, in which a few reeds and water plants are

planted. If this is placed in a wooded corner of the garden or shrubbery it will be constantly visited by all kinds of small birds.

The foregoing discussion of the advantages and methods of bird protection leads me to the chief object of this lecture, namely, the outlining of a definite scheme for the protection and encouragement of the birds of Ottawa, which scheme, I am pleased to say, has been enthusiastically adopted by the Ottawa Field-Naturalists' Club. Those who have lived in Ottawa for a number of years will have observed with regret the destruction one by one of places which were the haunts of many wild l irds The rapid growth of the city and the outward march of the streets and houses have driven the birds from their former quarters. We are now witnessing the destruction of one of the most delightful of all nature spots around Ottawa, namely Beaver Meadow. The city is gaining in population and taxes at the expense of natural beauty. But as we cannot and should not wish to prevent such extension, we should take every means possible to offset the losses in natural beauty so occasioned.

There are within the city limits, but at present on the outskirts of the built-over districts, two areas unequalled by their natural beauty for the purpose we have in view. I refer to Rockcliffe Park and the grounds and Botanical Garden of the Dominion Government's Experimental Farm. The former, being a piece of woodland and forest rescued from the hand of the lumberman and builder, is one of the most beautiful natural parks in eastern Canada. The Experimental Farm, laid out and planted about twenty-six years ago,is even better suited to the purpose in view, owing to the abundance of trees and shrubs of all kinds, especially those bearing wild fruits. Since the establishment of the farm, efforts have been made to prevent the destruction of the birds and the robbing of their nests and Mr. W. T. Macoun, the Dominion Horticulturist, showed great zeal in this protection.

It is proposed to regard these two areas as bird sanctuaries in which steps shall be taken not only to prevent the destruction of the birds and the despoiling of their nests, but also to encourage their presence by providing those species which nest in holes and cavities with nesting boxes and sites. I am very pleased to say that the Ottawa Improvement Commission have consented to provide and distribute this spring two hundred and fifty nest boxes in Rockcliffe Park, and to constitute the same as a bird sanctuary. The Director of the Experimental Farms has agreed to the distribution in the spring of one hundred and sixty nesting boxes in the grounds of the Farm and the Botanical Garden, which wlll constitute a sanctuary. Apart from

the æsthetic motives, the practical value of the encouragement of birds in both these places is of inestimable importance, as they constitute the most efficient protective agencies of the trees that can be secured, and the cost of their assistance—the cost of the nesting boxes, etc.—regarded in the light of an insurance premium against insect depredations, is at the lowest rate imaginable.

The existence of two such bird sanctuaries will undoubtedly tend to prevent the gradual disappearance from the Ottawa district of a number of birds which are becoming less abundant than formerly. Further, it is reasonable to expect that when the northerly migrations are taking place in the spring, the encouragement we are arranging to offer will meet with a response, and birds which otherwise would have passed on will stay with us through the season to our profit in every way. The scheme will afford the best check that we can adopt in preventing, so far as is possible, the gradual departure of a number of our native birds from the Ottawa district.

The successful carrying out of this scheme will require the sympathy and willing co-operation of all. The Field-Naturalists' Club is honoured by having as its patron H.R.H. the Duke of Connaught, Governor-General of Canada, who has requested me to express his warm sympathy and interest in this proposal. Mr. Borden, the Prime Minister, to whom I explained the scheme wrote: "It is needless to say that the proposal which you have in hand commands my entire sympathy." Sir Wilfrid Laurier has for some time urged the adoption of such a scheme. The Field-Naturalists' Club feels that it can rely upon the assistance of all those who have the preservation of the beauty and charm of our city and its surroundings at heart. With a view to assisting in the suppression of the wanton destruction of nests by robbing and birds by small rifle shooting on the part of boys in and around the city, the assistance of the Boy Scouts is being secured. Col. A. P. Sherwood, Commissioner of Dominion Police, writes: "I assure you that you could not have appealed to anybody more sympathetic in regard to the protection of our native birds, and I will certainly have this matter taken up at once by the Local Council of Boy Scouts". It seemed to to me that as protectors of bird life and as policemen, the Boy Scouts would furnish an unrivalled auxiliary in this work. The idea is in accord with the spirit of the Boy Scout movement and the influence of such boys upon their more wayward and less enlightened brothers would undoubtedly be beneficial.

Finally, we must remember that the results of our action along the lines I have indicated will not influence Ottawa alone.

The activities of the Capital are observed and recorded throughout the country, not always to our credit The force of example in such a protective movement will surely have effect on other places. Those who have travelled throughout Canada know how lightly the protection of birds is regarded, especially by those to whom it is most essential. The Provincial Governments have their regulations governing the protection of birds, but it is only by education and example that any real progress will be made in this movement which has for its object the guarding of our allies in the protection of our crops and the preservation of the most beautiful forms of animal life.

LITERATURE WHICH MAY BE CONSULTED

"Useful Birds and their Protection," by E. H. Forbush, Massachusetts State Board of Agriculture, 437 pp., 171 figs., 56 plates. 1905.

"Birds of Ontario in Relation to Agriculture," C. W. Nash, Ontario Department of Agriculture, 124 pp., figs. 1913.

"How to Attract and Protect Wild Birds," Martin Hiesemann, Trans. by E. S. Buchheim, Witherby & Co., London, 86 pp., figs. 1908

Bulletins, Nos. 3. 9, 13, 15, 21, 23, 24, 30, 32, 34, 37, 44, of the Biological Survey, Farmers Bulletins Nos. 54, 497, 506, 513, and Year Book for 1895, of the U.S. Department of Agriculture. Farmer's Bulletin No. 513 entitled "Fifty Common Birds of Farm and Orchard" was also republished in the National Geographic Magazine, June, 1913.

MEETING OF THE ENTOMOLOGICAL BRANCH

The third meeting this winter was held at the residence of Mr. F. W. L. Sladen on the evening of February 5th. Present: Dr. C. Gordon Hewitt, Messrs. W. H. Harrington, A. Halkett, Arthur Gibson, J. M. Swaine, Norman Criddle, V. Kitto, A. E. Kellett, J. I. Beaulne and F. W. L. Sladen.

Mr. Sladen opened the proceedings by exhibiting his world collection of Bumble Bees, and drew attention to the different colour schemes they displayed. These colour schemes are not confined to the natural groups but to particular regions. In Europe one common colour scheme is a uniform tawny yellow, another, probably the commonest, a black ground with two yellow bands and a white or tawny tail. Black with a bright red tail is a third pattern. This is a form of melanism. In

Denmark and Southern Scandanavia nearly all the species are much darker than usual. Surrounding this region is a wide circle including Britain and the Swiss Alps, in which the species are less extensively darkened. Outside this circle, for example, the Pyrenees and Northern Scandanavia, there is hardly any tendency to melanism. A colour scheme common to Europe and America is dull yellow with a black inter-alar band. The dominating pattern in North America is pale greenish yellow with a broad black tail, exemplified in *Bombus vagans*, *perplexus* and *impatiens*. Another North American pattern is pale yellow with a black band across the thorax and a red band across the abdomen. These instances of regional convergence are sometimes stronger in the queen than in the male, and Mr. Sladen suggested that this might be because the queen probably needs to display warning colours more than the male on account of a period in the life cycle of the bumble bee, lasting about a month, in which the existence of the race depends upon a small band of slow-flying, heavily-laden queens that would easily fall a prey to any bird that might care to pursue them. Mr. R. I. Pocock, Curator of the London "Zoo", found that bumble bees were distinctly distasteful to birds.

Dr. Hewitt brought forward a recently published monograph, by Dr. F. W. Cragg, of the Indian Medical Service, on the comparative anatomy of the proboscis in the blood-sucking flies, in which the author shows that these flies can be arranged in a series commencing with those flies which are blood-suckers by habit but have no biting mouth parts, namely, certain species of *Musca*, and passing on through those which are provided with more or less efficient biting organs, such as *Philaematomyia* and *Hæmatobia*, to those forms, such as *Stomoxys* and *Glossina*, which have entirely lost the characteristic structure of the labella by means of which the non-biting flies absorb nourishment. The probable evolution of the blood-sucking muscidae from the non-blood-sucking forms has a possible bearing on the the theory concerning the origin of the Haemoflagellates.

Dr. Hewitt also called the attention of the members to Dr. Graham-Smith's recent book on "Flies and Disease" in which he brings forward a greater amount of evidence, chiefly original, in regard to the dissemination of bacteria than has hitherto been submitted by any investigator in the field.

Mr. Harrington showed specimens of the Cotton Boll Weevil, and referred to the enormous damage done by this insect in the Southern States. Dr. Hewitt said that at the recent Meeting of the Entomological Society of America at Atlanta, Dr. Hinds had read a most interesting paper in which he showed

that this pest had been an important factor in rousing the farmers to practice better methods and to adopt rotation and co-operation, and had uplifted them socially and in other ways. Mr. Harrington also showed some Curculionidae that he had taken in Japan, and called attention to their large size and bright colours as compared with the representatives of this family in Canada.

Mr. Gibson exhibited Sir George Hampson's recent volume (XIII) of the Catalogue of the Lepidoptera Phalænæ in the British Museum, the subject of which is the classification of a part of the subfamily Catocalinæ and the subfamilies Mominæ and Phytometrinæ. He mentioned specially two genera, viz., *Zale* and *Phytometra*. The latter includes species which were placed under the old name of *Plusia*. The volume is of much value to Canadian students. He also spoke briefly on "Some little-known Cutworms." The species discussed were *Barathra curialis*, *Mamestra atlantica*, *Agrotis aurulenta*, and *Porosagrotis orthogonia*. The life history of two former species were studied some years ago. The larvae of the first named occurred throughout eastern Canada in 1905, and much loss was occasioned through its ravages to garden plants, both vegetable and ornamental. The last named species, which has been referred to under the name *delorata* in publications of the Division of Entomology, was chiefly discussed. This cutworm, which is a new destructive form, occurs in southern Alberta and during 1911 and 1912 thousands of acres of grain were destroyed by it. Mr. Gibson explained the work which the Division has been doing in the study of the life history, habits of the larvae, control measures, etc.

A general discussion of sundry subjects, entomological and otherwise, brought a very pleasant evening to a close

F.W.L.S.

CORRESPONDENCE.

EDITOR, OTTAWA NATURALIST: In 1913, a number of bird nesting boxes were put up in various parts of the country for the accommodation of birds that nest in cavities. This work was furthered through your own kindness in allowing a notice of the importation of these boxes to appear in the columns of the OTTAWA NATURALIST and the result was that the demand for these nesting boxes which were supplied to the inquirers at actual cost was greater than the supply, and consequently I am bringing out a further quantity this year.

The reports from the use of these boxes are very encouraging. One friend near Hamilton put up several Flicker boxes and had every one of them occupied. He also had Bluebirds and Wrens in the smaller sizes. Another lot of boxes which were put in place on an island in the Rideau Lakes were a source of actual competition among the Tree Swallows, there being more pairs than there were nests, and considering the fact that these birds are almost extinct in south-western Ontario, where they were formerly tolerably common, it would seem an excellent policy to encourage them in the Ottawa district while you have them there.

The last importation of these Berlepsch Nesting Boxes cost 43 cents for the Wren size, 55 cents for the Bluebird size and $1.29 for each of the two sizes for Flickers and Screech Owls. It is expected that the cost this year will be just about the same. I shall be glad to reserve for members of the Ottawa Field-Naturalists' Club any number that they may request and would suggest that in shipping to Ottawa I might make a single shipment to some central point, as otherwise the expense for freight on shipments of one or two boxes would be unreasonably high.

The birds which most readily use these nests are Wrens, Bluebirds, Tree Swallows and Flickers, all of which are not only worthy of protection and encouragement but are also delightful neighbours.

W. E. SAUNDERS, LONDON, ONT.

BOOK NOTICE.

BIRDS OF ONTARIO IN RELATION TO AGRICULTURE.—By Charles W. Nash: Ontario Department of Agriculture; Bulletin 218; 5th edition, 124 pages, 48 illustrations.

A copy of the new edition of this publication recently came to hand. The importance of a study of our insectivorous birds cannot be overestimated. The service they render to the agriculturist, or horticulturist, in feeding upon injurious insects, destroying field mice, etc., and in devouring weed seeds, is of the utmost value. The author has, for many years, studied specially the feeding habits of our birds, and the results of such work is invaluable. Much original information, therefore, appears in the bulletin; the illustrations are from his own drawings. In the discussion of the different species, descriptive notes are given of the adult, the young, and the nesting habits. The fact that it has been found necessary to print five editions of this bulletin speaks volumes for its usefulness. A. G.

MEETING OF THE BOTANICAL BRANCH.

February 14th, at the home of Mr. A. E. Attwood, the following members present: L. H. Newman, N. Criddle, J. Dickson, R. B. Whyte, C. J. Tulley, Dr. Blackadar, W. T. Macoun, A. E. Attwood, J. R. Fryer.

Mr. W. T. Macoun led in a discussion of the subject, "The Wild Fruits of Canada," describing many forms, especially those which give promise of economical usefulness.

APPLE—Two species of wild apple growing in Canada were mentioned—*Pyrus coronaria* (American Wild Crab Apple) and *Pyrus rivularis*, a western species. The former is the poorest we have and not much use is likely to be made of its fruit. A double-flowered variety of a species closely related to this, known as Bechtel's Crab, blooms at the end of May, and its flowers are so large and fine that it would make a beautiful ornamental tree. The tree may be obtained by grafting or budding.

PLUMS—Four species were referred to—*Prunus nigra*, *P. americana*, *P. pumila* (sand cherry) and *P. maritima* (Beach plum). *Prunus nigra* is found from Newfoundland to Manitoba along the Great Lakes. It is a very tough tree and is not broken down by heavy snowfalls. In this respect it is in contrast to *P. americana*. The fruit of *nigra* is all red, or all yellow, or red on one side and yellow on the other. Its skin is soft and dissolves easily. The period of ripening is early and lasts about a month. There is probably a great future for *P. nigra*. These trees are practically self-sterile, so that it is necessary for two or more individuals to grow together. *P. pumila* bears some very good fruit and some that is of no use. *P. maritima* has not as yet proved to be of any value.

CHERRY—*Prunus serotina* (Wild Black Cherry), *P. virginiana* (Choke Cherry) and *P. pennsylvanica* (Bird Cherry) were mentioned. *P. serotina* is a large tree, the main value of which is in its wood. The fruit has a strong and a trifle bitter taste. *P. virginiana* grows as far north as latitude 62. The fruit of this plant varies tremendously. Some bushes bear fine fruit, others very poor. *P. pennsylvania* grows far north and as far west as British Columbia. Its fruit is small, but varies somewhat in size and has a fine acid flavour. It is used for stock on which ordinary cherries are grafted.

GRAPE—*Vitis vulpina* grows wild in Manitoba, and there are great possibilities of developing from it a grape which will be useful as fruit to the western provinces. *Vitis labrusca* (Fox

Grape) will not thrive in Manitoba: its fruit buds are usually killed by frost in the spring.

Rubus idaeus aculeatissimus, formerly *Rubus strigosus*, (Wild Red Raspberry) grows very far north. *Rubus occidentalis* (Black Raspberry) does not range far north. Cultivated varieties are not hardy at Ottawa. These two species hybridize, giving a form known as *R. neglectus*, the fruit of which is larger than that of either of the original species. The Blackberry has not a wide range. It does not grow in Manitoba. In British Columbia there is a raspberry known as the Salmon Berry, *Rubus spectabilis*, for which one has to acquire a taste. *Rubus triflorus* is a low-growing form and its fruit is a red berry with a delicious flavour *R. Chamaemorus* has a very seedy berry for which a taste has to be acquired.

CURRANT—*Ribes hudsonianum* grows as far north as latitude 57 and *R. floridum* (Wild Black Currant) as far as latitude 54, while *R. lacustre* (Swamp Black Currant) runs almost to the Arctic Circle. The Missouri Currant grows in southern Alberta and is quite hardy.

The gooseberries mentioned were *Ribes oxyacanthoides* (Smooth Gooseberry) and *Ribes Cynosbati* (Spring Gooseberry).

BLUEBERRY—These were represented by *Vaccinium pennsylvanicum*, but there are several species which produce good fruit. These do not grow on sweet soil; they require acid soil. This explains why attempts to grow them have often been unsuccessful.

CRANBERRY—Cranberries are cultivated in Nova Scotia and Prince Edward Island. They grow in bog land. The main difficulty is to prevent freezing. *Vaccinium oxycoccus* remains under the snow in good condition and is therefore a valuable species.

Viburnum Opulus, var. *americanum* is a high bush form growing in the western provinces. Its fruit is substituted for cranberries and used chiefly for jellies.

JUNEBERRY—This fruit is appreciated in the prairie provinces. *Amelanchier alnifolia* grows in the west and *Amelanchier canadensis* abounds in Ontario.

STRAWBERRY—The strawberry grows almost to the Arctic Circle. Two species were mentioned—*Fragaria virginiana* and *F. chiloensis*, the latter of which grows from Alaska to South America and from it originated the English strawberry.

There are many of our wild fruits which have delicious flavour and many others which by improvement can be developed into fruits quite as fine and valuable as those we now value most.

J. R. F.

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