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REMARKABLE POINTS IN THE LIFE-HISTORY OF PHYLLOPODS.

BY PROFESSOR E. E. PRINCE.

Dominion Commissioner of Fisheries, Ottawa.

The brief but interesting notes on Ottawa Phyllopods, contributed to these pages by Mr. Andrew Halkett in July last, refer to crustaceans of such singular scientific interest that some additional observations may not be out of place. The Order Phyllopoda includes the crab-like form *Apus*, believed to closely resemble the ancestors of the Class Crustacea, and others like *Limnadia*, *Artemia*, *Branchipus* and *Daphnia*, the last ("the water flea") being one of the most enchanting of living objects under the microscope, and presenting in its eggs and life-history, many interesting points to the biologist.

It is to the shrimp-like *Branchipus*, and *Artemia*, that the present notes will be mainly confined. In the first place, the structure of the eye, as Mr. Halkett pointed out, is of the most striking character. It is not a mere black spot seated in the skin, as it is in *Daphnia*, nor is it a completely stalked moveable eye, as in the shrimp and crab; it is in fact neither sessile nor stalked; but intermediate between the two, and forms a fixed protruding organ foreshadowing in its form and pseudo-facetted character the stalked compound eye of the lobster. No organ of vision in the Class Crustacea is of a more profoundly interesting character. It shows the sessile eye in process of transformation into a prominent stalked eye, a remarkable illustration of

evolutionary development. But in these Branchiopods we find a further exemplification of development or evolution of a still more extraordinary nature. Many intelligent minds remain in a state of suspended judgment regarding the doctrine of evolution because examples are not forthcoming of one kind of animal actually becoming converted into another. Evolution to the modern naturalist means, amongst other things, that old forms of animals have actually changed into new and different forms. The little creatures under consideration afford, perhaps, the most striking illustration of the accomplishment of such a change. Naturalists have long been familiar with one species, *Artemia salina L*, which lives in salt-water. It can endure saltness so extreme that in the famous salt pans at Lymington, Hampshire, England, where the brine is so strongly charged with salt that every other creature immersed in it is found to die, this delicate shrimp-like crustacean abounds and flourishes. The workmen call them Brine-worms, and they may be seen gliding on their backs through the water, with their feet in constant motion, ascending and descending, bending in endless curves, turning over and over, wheeling to the right and to the left, and apparently enjoying their brief term of active life. As is well known, Schmankewitsch, by adding fresh-water to the salt-water in which these creatures were living, succeeded, in the course of several generations in transforming them into the fresh-water species (*Artemia mülhausenii*). He also reversed the process with similar success. His experiments have been much criticised but it seems established that Schmankewitsch, at least, changed one species of Phyllopod into another. The tail-lobes, in the two species just named, are so different that no naturalist could confuse them. In the freshwater species the lobe is strongly bifid and provided with a thick bunch of setae or hairs, whereas in the marine species (*Artemia salina*) the lobe is rounded and blunt, showing very slight bifidity, and the terminal hairs are wholly absent. Moreover the gills, which are attached to the swimming feet, differ very much in both species. But Schmankewitsch claimed that he did more, that he changed the fresh-

water *Artemia* into *Branchipus stagnalis L.* the species apparently which Mr. Halkett described. *Artemia* differs little from *Branchipus* in general form, though the former has eight segments in the posterior part of the body while *Branchipus* has nine. Verril, it is true, has disputed this and has maintained that the only reliable feature of distinction is the pair of prehensile organs at the anterior end of the body in the male. Apart from disputes as to details, the fact is generally accepted that the greater or less saltness of the water determines, in the most marked manner, the form and structure of these creatures. Naturalists are fully aware of the potency of changed external conditions in modifying the characteristic features of animals, but if *Artemia salina*, as Schmankewitsch claims, can be transformed into not only a different species of the same genus, *Artemia milhausenii*; but more, that it can be changed into *Branchipus stagnalis*, a species of a different genus, by gradually adding fresh-water to salt-water, the experiment is one of the most momentous character.

Hardly less interesting is the fact that the eggs of these Phyllopods can endure the utmost variations of temperature, moisture, and dryness. Mr. Halkett describes the eggs as dark bodies like small pellets, enclosed in a pouch behind the gill-feet. They appear to escape from this pouch and remain unharmed through conditions of the most trying and perilous nature. Some Phyllopod eggs will not, indeed, hatch out unless subjected to extreme dessication, of which the ova of *Apus* are an example; but the eggs of *Branchipus* survive equally well whether they have been kept in perfectly dry or in moist mud. Of course the albumen is so difficult to dry that it may be subjected to extreme dessication without really becoming dry. In fact it is this feature in the albumen of eggs, which explains some of the supposed marvellous cases of Infusorians, Rotifers, and the like, which are stated to have revived after thorough and prolonged dessication. Pouchet has shown that the animals really died, but their eggs survived, and on being moistened, hatched out. The new generation were thus mistaken for the supposed resuscitated parents. The eggs of many Phyllopods

seem to absolutely require, for their welfare, subjection to a temperature almost as low as freezing point. They also survive, as we have seen, extremes of dryness. It would appear from Carl Semper's experiments that the eggs of *Artemia* must be be both dried and frozen before they will pass through their normal embryonic changes. Thus does Nature exhibit to us her strange paradoxes! The two most hurtful and fatal influences so far as the eggs of most aquatic animals are concerned, appear in the Phyllopods to be the necessary and most favorable conditions for development. Under these conditions the eggs may remain for lengthy periods without hatching out. Semper, for example, obtained eggs of *Artemia* in dry mud in 1872, but the young brood did not hatch out for five years. *Branchipus* eggs were kept in like manner, in dry mud, from 1867 until 1877, and after this long period of dessication, and apparent dormancy, produced the nauplii, or young of *Branchipus*, in the normal manner. Experiments of this nature with the eggs of *Lepidoptera* and other Arthropods ended always in fatal results. It is a curious fact that the eggs of *Branchipus* flourish under great extremes of temperature. They will freely hatch out in any temperature between 32° F. and 86° F.; but at the latter temperature the young nauplii emerge in about twenty-four hours, whereas at a point midway (58° F.) they take several weeks to hatch.

With such wonderful powers of endurance, so far as its eggs are concerned, it is no matter of surprise that *Branchipus* thrives in the shallowest ponds—mere rain-pools in fact—which are frozen into solid sheets of ice, or dried up into cakes of hard mud. Each winter and each dry summer sweeps away the whole race of adults: but the eggs survive as fine dry dust. The mummified and frozen eggs are caused to hatch when the appropriate season comes, though several seasons may elapse before the new generation bursts forth from the shell. Intense summer heat or an unseasonable return of frost may suddenly cut off the brood in the midst of their activity; but their eggs sink into the underlying mud, and endure for one or for many seasons until

the sleeping germs are roused into free active existence. Mr. Halkett found examples of both sexes, but it not unfrequently happens that for several seasons only females occur. These produce agamic eggs, which like the ephippial eggs of *Daphnia*, so elaborately described by Sir John Lubbock in 1857, are able to give birth to normal young. The production of non-sexual eggs by *Branchipus* is another feature of unusual biological importance.

With such safeguards against extermination it is not surprising that this highly organized and beautiful crustacean should be widespread over our planet. It occurs in every quarter of the globe and the salt-water form abounds, as Mr. Halkett notes, in the remote salt-lakes of this continent. Semper was however struck by its absence in certain oceanic islands, where *Daphnia* and nearly related Entomostracans occured. Strangely enough the unfavourable cause is the absence of extreme winter cold, as Brauer demonstrated. *Branchipus*, in the egg-state may be carried long distances, may be dried for many years, and frozen for months; but it needs the exhilarating influence of penetrating cold such as that which our Dominion boasts to give the stimulus essential to its continued vitality and successful incubation.

OTTAWA SPIDERS.

By W. Hague Harrington, F. R. S. C.

Our last volume contained an interesting list of one hundred Canadian spiders, of which thirteen were indicated as occuring at Ottawa. Subsequent shorter lists increased the number recorded in this locality to about twenty. A start having thus been made toward a knowledge of our spiders, it seems to be an appropriate time to publish a list of those which I have collected. This I am in a position to do through the kindness of Mr. Nathan Banks who has recently examined my specimens. Many more species will yet be added to our lists as on numerous

occasions I have seen interesting specimens which for want of a bottle of acohol, or boxes, I have not been able to secure. The majority of those obtained were captured in the field during my searches for hymenoptera,but some occurred when sifting swamp-moses for small coleoptera. As my knowledge of these skilful spinners is deplorably slender I may be permitted to quote from Mr. Banks' letter in which the list of names was enclosed.

"One of them, *Icius canadensis*, appears to be new. Another *Tmeticus bostoniensis*, is new to my collection Many years ago Blackwall described some spiders from Canada, few of these have been identified ; the presence of *Icius harti* Em. in your collection enabled me to identify it with the *Salticus fuliginous* of Blackwall. There are several other interesting spiders in the collection. The specimen of *Epeira prompta* is particularly large and fine, and of a variety rarely taken ; it looks like a green lichen. The male of *Xysticus limbotus* which you send is also rare ; as are *Icius formicarius* and *Synageles picata*. One would hardly have expected that *Theridium unimaculatum* and *Theridula sphærula* occurred so far north. * * * * Besides this list there were two or three little Microtheridæ in the collection but they are females and it usually is necessary to have the male ; one of them is possibly the female of the *Tmeticus bostoniensis*, which is only known from the male."

On comparison of the following list of my Ottawa spiders with that taken from Mr. Emerton's paper on Canadian Spiders it will be found that only about twenty species are common to both lists.

DRASSIDÆ.

Gnaphosa conspersa *Th.*

CLUBIONIDÆ.

Clubiona obesa *Htz.*
" riparia *Koch.*
Clubiona abbotti *Koch.*
Thargalia agilis *Bks.*

AGALENIDÆ.

Agalena nævia *Htz.*

DICTYNIDÆ.

Amaurobius tibialis *Em.*
" bennetti *Blk.*
Dictyna maxima *Bks.*
" volupis *Keys.*

ULOBORIDÆ.

Uloborus plumipes *Koch.*

THERIDIIDÆ.

Theridium murarium *Em.*
" unimaculatum *Em.*
" frondeum *Htz.*
" differens *Em.*
Theridula sphærula *Htz.*
Ceratinella læta *Cb.*
Cornicularia communis *Em.*
Lophocarenum florens *Cb.*
Tmeticus bostoniensis *Em.*
Microneta quinquedentata *Koch.*
Linyphia marginata *Koch.*
" phrygiana *Koch.*
" mandibulata *Em.*

EPEIRIDÆ.

Epeira nordmanni *Th.*
" insularis *Htz.*
" trifolium *Htz.*
" strix *Htz.*
" patagiata *Clerk.*
" sclopetaria *Clerk.*
Epeira trivittata *Keys.*
" displicata *Htz.*
" prompta *Htz.* (paroula *Keys.*)
Singa variabilis *Em.*
Argiope transversa *Em.*

TETRAGNATHIDÆ.

Tetragnatha extensa *Linn.*
Tetragnatha laboriosa *Htz.*

THOMISIDÆ.

Xysticus gulosus *Keys.*
" stomachosus *Keys.*
" limbatus *Keys.*
Oxyptila conspurcata *Th.*
Coriarachne versicolor *Keys.*
Misumena vatia *Clerk.*
" georgiana *Keys.*
Tibellus oblongus *Walck.*
Philodromus aureolus *Walck.*

LYCOSIDÆ.

Ocyale undata *Htz.*
Dolomedes scriptus *Htz.*
Pirata montanus *Em.*

ATTIDÆ.

Phidippus mystaceus *Htz.*
" rufus *Htz.*
Philæus militaris *Htz.*
Dendryphantes octavus *Htz.*
Astia vittata *Htz.*
Ergane borealis *Blk.*
Attus palustris *Peck.*
Icius elegans *Htz.*
" fuligeneus *Blk.* (hartii *Em.*)
" formicarius *Em.*
" n. sp. (canadensis *Bks.* Ms.)
Synageles picata *Htz.*

Families 11, Genera 36. Species 61.

NOTES ON RECENT CANADIAN MOLLUSCA.

AN OLD RECORD.

Ten or twelve years ago Dr. Foote, of Philadelphia, sent me a leaf from the Proceedings of the Academy of Natural Sciences of that city, containing a list of shells collected in the extreme north of what is now Canada. It is page 330 of the Proceeding for 1861. Recent references to the geological distribution of several of the species catalogued indicate that this list has been lost sight of, and give me some warrant for republishing it in the NATURALIST.

"Catalogue of land and fresh water univalve mollusks collected in British America by Messrs. Ross, Kennicott and Drexler and deposited in the Smithsonian Collection. By W. G. Binney."

FROM ENGLISH RIVER.

Helix arborea Say.
" chersina Say.
" striatella Anth.
Bulimus harpa Say.
Achatina lubrica Say.
Limnæa jugularis Say.
" appressa Say.
" ampla Mighels.
" palustris L.
Physa heterostropa Say.
" hypnorum L.
Planorbis trivolvis Say.

FROM FORT SIMPSON TO MACKENZIE RIVER.

Succinea avara Say.
" lineata W. G. B.
Limnæa appressa Say.
" palustris L.
Planorbis trivolvis Say.
" parvus Say.

FROM JAMES' BAY.

Succinea ovalis Gld. non Say?
Bulimus harpa Say.
Physa sp.
Planorbis armigerus Say.

FROM MOOSE FORT.

Limmæa n. sp.?

FROM MOOSE FACTORY.

Vitrina limpida Gld.
Succinea ovalis Gld non Say.
" obliqua Say.
Helix arborea Say.
" striatella Anth.
" labyrinthica Say.
" monodon Rackett.
" young albolabris or thyroides.
Achatina lubrica Mull.
Limnæa palustris L.
" appressa Say.
Physa heterostropha Say.

FROM FORT RESOLUTION, SLAVE LAKE.

Succinea Haydeni W.G.B. var. minor.
Physa hypnorum L.

FROM HUDSON'S BAY.

Limnæa appressa Say.
" palustris L.
" caperata Say.?
Planorbis bicarinatus Say.
" parvus Say.
Amnicola lustrica Say.
" porata Say.
" limosa Say.
Valvata tricarinata Say.

HELIX chersina = fulva, and L. appressa and jugularis = stagnalis. From our present knowledge of the distribution of H. albolabris and H. thyroides, it is certain that the young mesodon from Moose Factory was not thyroides. The list is of univalves only; but bivalves also were collected. Dr. Lea has described two anodons collected on this expedition = A. Kennicotti, from Great Slave Lake, at Fort Rae and north end of Lake Winnipeg, and A. Simpsoniana, from Fort Rae, (Jour. Acad. Nat. Sci., 1862: 212 and 214). When two new species were found, other bivalves were undoubtedly collected. Who will furnish the list, if it is in existence? L.

A MANITOBAN LIST.

Another list of special interest to Canadian students of conchology—or, to use the fashionable term, malacology—appears in the Natural History Bulletin of the State University of Iowa, Vol. II, 1893, pp. 291 and 292. It is a catalogue prepared by my old friend, Mr. Shimek—to whom I am indebted for a copy—of the shells collected by Mr. C. C. Nutting, on the Lower Saskatchewan in 1892. The precise locality of the expedition is not stated, but collections appear to have been made not far from Lake Winnipeg. The list is as follows:

Bithynella obtusa Lea.
Valvata tricarinata Say.
Succinea ovalis Gld.
" avara Say.
Limnæa stagnalis L.
" palustris Mull.
" desidiosa Say.
" caperata Say.
Physa gyrina Say.
Planorbis trivolvis var. macrostomus Whiteaves.
Planorbis bicarinatus Say.
" albus Mull.
" parvus Say.
Segmentina armigera Say.
Sphærium sulcatum Lamk.
" striatinum Lamk.
" occidental Prime.
Pisidium sp. indet.
Unio luteolus Lamk.
Margaritana complanata Bar.
Anodonta ferussaciana Lea.

The expedition under Mr. Nutting was organized by the University of Iowa. It was an extension of the university work in zoology from mere study within the walls of the university building to practical observation and collection in a field where material abounded. The results are set forth in the Bulletin mentioned, which is a valuable contribution to the zoology of Canada. It may be of some moment to those

interested in university work to note that the expedition to Manitoba was followed in 1893 by one to the Bahamas, under the same auspices, which was equally successful. When will some Canadian university awake to the practical advantages of such expeditions?

Might not our own Club with profit make an extended excursion next summer into the scientifically unknown regions of the Upper Gatineau or Ottawa? L.

HERMANN HELLRIEGEL

LATE DIRECTOR, EXPERIMENT STATION, BERNBURG, GERMANY.

Intelligence recently reached us of the death of Professor Hellriegel, the eminent German chemist and vegetable physiologist. His name will always be inseparably connected with that most important of all modern discoveries in agriculture —the assimilation of free atmospheric nitrogen by the leguminosæ; for it will be remembered that it was the patient researches of Professor Hellriegel and of his colleague Dr. Wilfarth that established beyond dispute the ability of these plants to draw, at least, a part of their nitrogen from the air. Previous to the work of Hellriegel and Wilfarth, the results of which were first published in 1886, it had been held that no plants had the power to avail themselves of uncombined nitrogen. These scientists, however, showed that the legumes (clover, pea, bean, lupine, etc.) were exceptions to the law—if law it is—and had the distinguished honour of first pointing out how these plants effect this free nitrogen assimilation by the agency or symbiosis of certain micro-organisms residing in tubercles or nodules upon their roots.

By those who are aware that nitrogen is not only one of the essential constituents of plant food but also the most costly

of all those that have to be supplied to farm crops, the value value of this discovery may in some measure be estimated. It was the chief of the first fruits of the modern application of chemistry and scientific methods to the solution of agricultural problems.

F. T. S.

REPORT OF THE GEOLOGICAL BRANCH.

TO THE COUNCIL OF THE OTTAWA FIELD-NATURALISTS' CLUB:

The leaders of the Geological section beg to report that the work of this branch of the Club has been satisfactory. Owing, however, to the absence from the city, during a great part of the season, of two of the leaders, not so much detailed work was accomplished as would probably have been done had they been able to attend the several excursions. This is, however, probably of not so much importance just now to the Club itself, since the geological formations of Ottawa and vicinity are now being studied in detail by one of the field parties of the Geological Survey, and materials are now being collected for the publication of a topographical and geological map of this area, with a report thereon, at an early date. This map, when issued, will be of special value to the members of the Club in their several excursions to points in the vicinity of the city.

The three principal excursions of the season, viz., to Galetta, Chelsea and the Paugan Falls, on the Gatineau, were all to localities occupied for the most part by the same kinds of rock formation. These consist largely of crystalline limestones, with associated gneiss, which are a part of the Grenville series, and which are cut by various intrusions of diorite, pyroxene, syenite, etc. At Old Chelsea and the Paugan the limestones contain serpentine, which forms the outer zone of certain masses of white pyroxene, occurring in the mass of limestone itself. The serpentinized portion carries small veins of chrysotile,

which is also found at a number of places in the vicinity of Ottawa, and which has been somewhat extensively mined in recent years. Good illustrations of its mode of occurrence are found at the mines on the east bank of the Gatineau, a short distance below the Paugan Falls. The intrusive character of the diorites and granites can also be well studied at this place, which may be said to form one of the most attractive spots for excursions in the Gatineau River area.

In the rocks at Old Chelsea opportunities were afforded for the study of the mica and apatite deposits, while small quantities of serpentine and renssellærite are found just at the forks of the road to King's Mountain. A handsome variety of red jasper, from which fine specimens can be obtained, is found in the vicinity in connection with one of the mica mines, and certain dykes of pyroxene just to the north of Mr. Chamberlain's house, furnish large numbers of pyroxene crystals, of which good specimens can readily be collected. This locality is also a very interesting one for geological work, and will readily furnish matter for study for several excursions in this branch of the Club's work.

The deposit of sands and clays in the cuttings north of Chelsea station, on the Gatineau Valley railway, contains marine shells from which collections were obtained by members of the Club, and has already been referred to in a previous report.

The limestone of Galetta resembles closely that of the Paugan and Chelsea. Dykes of syenite and diorite cut these at many points, and one of these, crossing the Ottawa River at the Chats, near Fitzroy Harbor, causes the long chain of falls opposite that village, which is regarded as one of finest pieces of broken water anywhere on the Ottawa. This limestone is probably the extension of the same belt seen on the Gatineau, though its continuity is broken by great masses of syenite north of the River Ottawa. At one place, about a mile north-east of Galetta Village, a deposit of galena once mined, can be seen in the limestones in close proximity to a large syenite dyke which here cuts the strata.

R. W. ELLS,
W. F. FERRIER,
H. M. AMI.

ANNUAL REPORT OF COUNCIL.—1895-1896.

TO THE MEMBERS OF THE OTTAWA FIELD-NATURALISTS' CLUB:—

The Council elected by you on March the 19th, 1895, has pleasure in reporting that the bye gone year has been one of marked success.

The attendance at the excursions and lectures was most satisfactory.

The number of members at present on the roll is about 250.

To carry on the routine work of the club during the year, your council held fourteen meetings, at which *Leaders* in the various branches of the Club's work were appointed, besides an Editor and Associate-Editors for the OTTAWA NATURALIST.

At the invitation of the Royal Society of Canada to send a a delegate, our President, Mr. Shutt, was chosen, as he has been previously, to represent us. At its meeting he presented the annual account of the work of the club, which account is incorporated in the Transactions of the Royal Society of Canada.

It appears necessary in the interest of the Club to draw the attention of its members to the fact that as there are at present about 100 members still in arrears, and considering that the annual fee is small it would help the Club materially if these still in arrears, would without delay hand the amount due, to the Treasurer.

Under the auspices of the Club, three very successful excursions were held during the year.

The 1st excursion was to Chelsea on the afternoon of Saturday, May the 18th, 1895 A most enjoyable time was spent, and several Fellows of the Royal Society, as guests of the Club, were with us.

The 2nd excursion was to Galetta on the afternoon of June the 15th, 1895, and altho' not so largely attended as the previous excursion to Chelsea, still the time was most profitably spent in observing nature and in collecting specimens.

The 3rd and last excursion was to Paugan Falls, on the 14th Sept., 1895. This was an all-day excursion, and being in

the fall of the year many points of peculiar interest were examined to advantage.

A number of enthusiastic members also availed themselves of the sub-excursions held on Saturday afternoons. On such occasions, when a few go together, work of a very important character is as a rule accomplished.

The OTTAWA NATURALIST has been under the editorship of Dr. Ami with a staff of Associate Editors. During the absence of the Editor from Ottawa for a time, Mr. Kingston was acting editor. Members generally have expressed their appreciation of the successful issue of the official organ of our club for the past year—its articles have been varied and its general character excellent, and the decided improvement in the tone of its contents, not to speak of its neat outward appearance, seems to foretell something of what the Ottawa Field-Naturalists' Club is likely to become in the future. The Council deem it advisable that a memorial be addressed to the Provincial Government asking for assistance to aid in publishing the NATURALIST.

The Library of the Club is perhaps less known to the members generally than it might be. It is mostly made up of valuable exchanges—the publications of other Associations interested in natural history and kindred sciences.

During the past winter the club held eight soirées jointly with the Literary and Scientific Society. There was a marked increase in the attendance and the Council and members generally are highly gratified at the success of the entire lecture course. The amalgamation scheme proved to work so admirably that the hope is entertained that as great success may attend the course in years to come.

On 26th Nov., 1895, a Conversazione was held at which addresses were delivered by Dr. MacCabe, Dr. Ells, and Mr. Shutt, objects were viewed under the microscope and specimens of Natural History exhibited. The microscopes were under the charge of the following gentlemen :—Prof. Saunders, Prof. Prince, Dr. Ami, Mr. Dowling, Mr. Wilson, Mr. Babbington, Mr. Odell, Mr. March, Mr. Sinclair, and Mr. Halkett. A choice

Gerhardt spectroscope was also exhibited by Mr. McGill, and the evening was further rendered entertaining through selections of music—vocal and instrumental—by Mr. and Mrs. Bedlloe, Miss Lamb, and Mr. Miller. Through the kindness of Mr. Scott, and permission of Dr. MacCabe, the electric lights were put into the Assembly Hall for that occasion.

The following lectures were also delivered under the joint auspices of the Literary and Scientific Society and the O. F. N. C.

1895.

Dec. 5th The value of Botany in Agriculture by Prof. Macoun.
A Naturalist in British Columbia by Mr. James Fletcher.

Dec. 12th A Greek Tragedy (Literary and Scientific Society's lecture) by Rev. Prof. McNaughton of Queen's University.

1896.

Jan. 23rd Extinct Monsters, with limelight illustrations by Dr. Ami.

Jan. 30th Recent Explorations in Labrador with limelight illustrations by Mr. A. P. Low. (Literary and Scientific Society's lecture.)

Feb. 6th How to study Botany, by Dr. Burgess of Montreal.

Feb. 20th Pompeii: a Roman City of the 1st century (Literary and Scientific Society's Lecture) by Dr. Adams of Montreal.

Mar. 5th Bacteria, their Functions in Nature by Mr. Shutt.
Eggs and Nests of Fishes, illustrated with diagrams by Prof. Prince.

The thanks of the Club are due to Dr. MacCabe, Principal of the Normal School, and to the Minister of Education for their kindness in giving the use of the Assembly Hall for the course of lectures, and to Dr. McCabe for the use of a room for the Council meetings.

The foregoing is an account of the work of the Club for the year 1885-'96, and is now submitted by the Council for the consideration of the members in general.

ANDREW HALKETT, *Secretary.*

FRANK T. SHUTT. *President.*

OTTAWA FIELD-NATURALISTS' CLUB.

TREASURER'S STATEMENT, CLUB YEAR ENDING 17TH MARCH, 1896.

RECEIPTS.

Balance on hand from '94-'95		$ 13 88	
Subscription fees received—			
Arrears for previous years	$ 74 00		
For current year	154 00		
For 1896-97, paid in advance	7 00		
		235 00	
Received for advertisements in NATURALIST		139 50	
" NATURALISTS sold		30	
" "Authors' extras" to date		16 62	
" Plates used in NATURALIST		2 00	
Net proceeds of excursions		16 45	
			423 75

EXPENDITURE.

On OTTAWA NATURALIST, 11 numbers of Vol. IX—			
Printing	$295 63		
Mailing, typewriting and engraving	18 60		
Postage	21 31		
		$335 54	
Printing "Authors' extras"		19 25	
General printing and stationery		8 98	
" postage		5 50	
On soirees and meetings—			
For Circulars, programmes and notices	$ 14 39		
Doorkeeper, travelling expenses of lecturer	12 90		
		27 29	
Labels for library		2 00	
		398 56	
Balance on hand		25 19	
			$423 75

D. B. DOWLING, *Treasurer.*

We certify that we have audited this account, and have examined the books and vouchers of the Treasurer, and find them correct.

OTTAWA, 13th April, 1896.

A. G. KINGSTON, WM. P. ANDERSON, } *Auditors.*

TO OUR OTTAWA MEMBERS.

By The President.

It is much to be regretted that there was not a larger attendance of members at the Annual Meeting of the Club on the 17th ultimo. All should be interested in hearing the report of the work accomplished during the year, in learning the status of the Club, in the election of officers and in ascertaining the special features of the field work suggested for the coming season.

The Council have been much gratified at the well filled halls that greeted the lecturers during the past winter, and trust that the practical appreciation accorded the winter programme will be further shown by large attendances on our field days throughout the summer.

In order to stimulate our members towards greater activity in field work in the various branches of Natural History, which, indeed has always been the chief feature of the Club's work, the Council has decided, this year, to offer prizes for the best collections in Botany, Entomology and Geology. Details and conditions of the competitions are to be found in another column. Numerous opportunities in the general and sub-excursions (notice of which will appear in our next issue) will be afforded for this work and the Council trust that a large number will determine at the opening of the season to take advantage of them. At all times, our leaders will be found very ready to help all who are endeavouring to acquire a better and more systematic knowledge of nature, as she is manifested in the many forms of life above us, and of the earth that gives them habitation.

F. T. S.

NOTES, REVIEWS AND COMMENTS.

GEOLOGY.—*Summary Report of the Geological Survey of Canada*, by Dr. G. M. Dawson, C.M.G., Director, Ottawa, March, 1896.

This report, just issued, contains many features of great interest to the general public, as well as to those more particularly engaged in mining enterprises, and in scientific work generally. It treats of the work of the whole staff for the year 1895, and shows that the scope of the Survey's work is still as comprehensive as in former years.

The operations of the field staff extended from the Atlantic to the Pacific, and included another expedition into the interior of Labrador Peninsula in order to complete certain lines of investigation necessarily left unfinished from Mr. Low's former explorations of that area.

All the provinces were included in the Survey's operations with the exception of New Brunswick, the distribution of the parties being determined, as far as possible, in accordance with the importance of the work to be done.

In British Columbia two parties, under the leadership of Messrs. McConnell and McEvoy were engaged; the former more particularly in the Kootenay District, where much attention was devoted to the study and mapping of the rich mineral bearing zones, while the latter was engaged in the study of the country in the vicinity of Shuswap Lakes and south-eastward.

East of the Rocky Mountains the boring operations now being carried on in the Athabasca River district, to determine the value of the great petroleum basin which evidently exists in that part of the North-West, were continued, but the oil-bearing horizon was not reached, owing to the great difficulty encountered from soft strata in prosecuting the drilling. There is, however, a prospect that this important investigation will soon reach a successful issue. The chief work on the plains was carried out by Prof. Macoun, more particularly near the southern border, and was confined largely to the study of the plant and

bird life of that district many important observations being recorded. A study was also made of the conditions which are presented for improving the bad lands of this district by irrigation, and this will probably, before long, prove beneficial.

In Manitoba and Keewatin, north-east of Lake Winnipeg, investigations were continued by Mr. Tyrrell into the character and structure of the Archæan gneisses, etc., and of the overlying Pleistocene clays and sands and the existence of considerable areas of good land suitable for agricultural pursuits was ascertained.

In Ontario, four parties were engaged at somewhat widely separated points. In the Rainy Lake district the question of the gold deposits was carefully studied by Mr. McInnes, and the indications observed point to the carrying on of very extensive mining operations in this area at no very distant date. Further east, near Lake Temiscaming, the relations of the Huronian and Laurentian were ascertained by Mr. Barlow during the first part of the season, considerable importance pertaining to this area from the presence there of the Huronian nickel-bearing rocks of Sudbury, while the latter half of the season was devoted to the mapping of the old rocks in the County of Haliburton, to the south of the Ottawa and Parry Sound railway.

In eastern Ontario work was carried on south of the Ottawa River, between Pembroke and Arnprior by Dr. Ells, where the separation of the Grenville series of the Laurentian from the underlying or fundamental gneisses was accomplished over a very considerable area. The study of the relations of the schists and other rocks of the Hastings series to the crystalline limestone and the gneiss of the Laurentian was also taken up and satisfactory progress made. The Hastings series is an important one, economically considered, since it embraces the principal gold deposits of the Madoc and Marmora districts, and many of the iron ores along the Kingston and Pembroke railway occur in the rocks of this division. Considerable areas of the fossiliferous Cambro-Silurian rocks are also found in this portion of the province, resting upon the underlying gneiss and limestone.

The country east of Ottawa, and between the Ottawa and St. Lawrence Rivers, in which the rock formations belong to the several divisions of the Cambro-Silurian system, and are largely concealed by drift, was examined by Mr. N. J. Giroux. The attempt was made to obtain here some reliable data as to the thickness of the several formations, in order that a guide might be afforded for future boring operations for water in this area.

In Quebec also, important practical work was done by Mr. Chalmers in his study of the gold-bearing gravels of the Eastern Townships, more especially of the Beauce and Ditton districts; while in the great area north of the St. Lawrence, the explorations of Dr. Bell resulted in the mapping of the River Nottaway to the north of the height of land, flowing into James Bay, and the finding of a very considerable area of good land of great value both as a source of supply for timber, and for agricultural pursuits.

In the Labrador Peninsula continued explorations were made by Mr. A. P. Low in the hitherto unknown area north of the Gulf of St. Lawrence, which have already been referred to.

In Nova Scotia important work was done both by Mr. Fletcher, in the coal basins of eastern Cape Breton, and by Mr. Faribault, in connection with the structure of the gold-bearing rocks of the Atlantic slope. In both of these areas many questions of great practical interest to the mining community were investigated.

The branches of Palæontology, Zoology, Chemistry and Lithology are closely connected with the work of the field staff. These received a full amount of attention, and good work was done in all. That of Chemistry and Mineralogy is of special interest to those engaged in mining, since the determination of the value of the various ores of gold, silver, nickel, iron, etc., is constantly being demanded.

It is of interest to know that the number of visitors to the Museum increases with every year, and that the total for 1895 was very nearly 27,000. From this it is evident that the Museum

collections must prove very important educational factors, and that the study of the minerals, rocks, birds, animals and plants there displayed must exercise a very marked influence upon the minds of those whose tastes tend naturally in the direction of some of the branches of Natural History. The necessity of increased accommodation for the display of the contents of the Museum is pointed out, as also the danger to which these valuable collections, representing the work of half a century, are exposed in their present location. The report on the whole contains a very large amount of valuable information relating to the Mineral Resources and Natural History of the entire Dominion, and should have a wide circulation.

R. W. E.

ORNITHOLOGY.—*Brown Pelican.*—There has recently been added to the collection at the Geological Museum, a mounted specimen of the Brown pelican (*Pelecanus fuscus*,) obtained by Dr. Ami from J. W. Hogg, Esq., of Pictou, N. S., by whom it was shot in May, 1892, on Pictou Island. It is a male bird, in breeding plumage and in excellent condition. Another specimen taken previously in the same locality, was to be seen in the museum of the Pictou Academy until its destruction by fire in the fall of 1894. Unlike the white species, which frequents the rivers and lakes of the interior, breeding largely in the Canadian North-West, the Brown pelican is a bird of the southern sea-coasts, and seldom penetrates further to the north than Long Island, N. Y. The two individuals above mentioned are believed to be the only ones on record for Canada. An allied species on the Pacific coast, the California brown pelican, sometimes visits British Columbia.

Winter Birds.—The Pine grosbeaks arrived at an unusually early date this winter, one being taken on 18th November by Mr. W. H. Thicke Throughout the winter they have been present in larger numbers than in any previous season since 1888. They feed mostly on mountain-ash berries, but a complaint comes from the Experimental Farm of numerous depredations committed upon the buds of the Norway spruces.

On Ash Wednesday, passing, on snowshoes, through a grove of cedars, in Ottawa East, I was puzzled to know the meaning of an odd-looking trail which was found in a number of places. Forming a continuous furrow about 1½ inch. wide and almost as deep, it was apparently the track of some small rodent though the foot-marks could not be distinctly seen in the light snow. It seemed, however, to come from nowhere and lead to nowhere, but lay in separate patches of redoubling and zig-zagging as intricate as a labyrinthine puzzle. At last, passing round a clump of trees, we flushed a pine grosbeak in the act of tracing one of these mysterious patterns as he gleaned from the surface of the snow the scattered seeds which the last storm had shaken from the cedar trees. As soon as one knew what it meant, it was easy to detect the mark of the tips of the wings on both sides of the trail, where at intervals he had taken a short flight, whenever the snow was too light to sustain his weight.

A small flock of American goldfinches in their modest winter plumage was seen on 14th February.

The Northern shrike has become a very regular winter resident with us, much to the discomfiture of the flocks of house sparrows. He is our only winter songster and though not of the highest order, the carol he pours forth to the first bright sunshine in February is a pleasing earnest of the songs of summer.

Snowflakes, Black-cap chickadees, Downy woodpeckers and Whitebreasted nuthatches are the only other birds observed this season, none of the rarer winter visitants having been reported. A. G. K.

ROYAL SOCIETY OF CANADA.—*May Meeting, 1896, Ottawa.*—The Fifteenth General Meeting of the Royal Society of Canada will be held in the Normal School Building, Ottawa, during the week commencing Tuesday, 19th May next. Titles and short abstracts of papers must be forwarded to the Secretary, at Ottawa, at least by the first of May. Abstracts must be typewritten when possible. Fellows who intend to be present should notify the Secretary in the first week of May.

The Ottawa Field-Naturalist's Club will, it is expected, be duly represented on this as on previous occasions.

THE OTTAWA NATURALIST.

VOL. X. OTTAWA, MAY, 1896. No. 2.

CHEMICAL WORK IN CANADIAN AGRICULTURE.

By FRANK T. SHUTT, M.A., F.I.C., F.C.S., Chemist,
Dominion Experimental Farms.

In bringing before you an epitome of the work accomplished for Canadian agriculture by the Chemical Division of the Experimental Farms during the past eight years, it may be advisable by way of introduction to say something of the important relationship that exists between Chemistry and Agriculture. And in order to make this relationship clear we may first consider briefly the character and scope of these two great sciences.

Chemistry busies itself with the study of the composition of all matter, solid, liquid and gaseous—living and inert—and endeavours to ascertain the laws that govern the changes which such matter is continually undergoing in the animal, the vegetable and the mineral kingdoms. Thus, chemistry has found out the nature of plant constituents and the source whence plants obtain them. It indicates the various food elements and the proportions in which plants take them from the atmosphere and from the soil respectively. Hence, not only soil exhaustion and diminished yields resulting from the practice of continually cropping without any concomitant return of soil plant food, become easily understood with the aid of chemistry; but the way for a more or less speedy return to fertility is indicated. In other words, by analysis and vegetation experiment (the latter practically a synthetical method) the

peculiar requirements of our farm crops are ascertained and economical means of supplying these wants are suggested. After studying the conversion of soil substances and of the constituents of the air into vegetable tissues, chemistry further endeavours to learn the function of these latter when used as food by animals. Thus, experimental research has shown that starch, sugar, gums, etc. (the class of nutrients known generally under the term carbohydrates) fibre and oil, products of vegetable metabolism are chiefly of service in the animal system in producing heat and supplying energy for work, while the albuminoids or nitrogenous organic matter elaborated by plants find their chief function as flesh formers and in supplying the requisite constituents for the production of blood, milk, wool, etc.

It may be urged that these are for the most part questions of vegetable and animal physiology, and rightly so ; but is not physiology a name for that special branch of chemistry that seeks to explain the changes in matter that attend or are produced by the vital functions of plants and animals ? At all events, physiology is largely chemistry, for if the former science tells us that living matter is composed of cells capable of nutrition and reproduction, the latter shows how the changes of the matter within the cells, primarily leading to their nutrition, and secondarily to their reproduction, are true chemical transformations.

Concerning Agriculture, we may say, adopting a definition given for English grammar by an old author that it is "both a science and an art." It is the oldest of all arts, save perhaps that of the chase. The art of husbandry includes and imparts skill in all farming operations—draining, plowing, harrowing, seeding, cultivating, harvesting, threshing, and indeed all work concerning the culture of the field and the care of farm animals. Of late years great progress has been made in agriculture as an art, and this principally through the introduction and assistance of improved implements and machinery. The sickle and the flail are almost forgotten instruments of the past, and many of the implements—

triumphs in mechanics—now in general use were not even faintly foreshadowed twenty-five years ago.

The science of agriculture first makes plain the reason for and the results of the various operations we have just enumerated and then studies the whys and wherefores of the changes brought about by nature through plants and animals. If agriculture as a whole may be said to have for its object the economic production of plants and animals and the materials elaborated by them during their life, agriculture as a science endeavours to ascertain the causes and conditions that lead to the consummation of this object.

Although Botany, Zoology, Physiology and Physics all lend their aid, it will be apparent from what I have said that Chemistry furnishes the basis and a large proportion of the superstructure of scientific agriculture; indeed, so interwoven and intimately connected is chemistry with all branches of farm work that agricultural chemistry and scientific agriculture may be counted as almost synonymous terms, for it is difficult to conceive an agricultural problem that does not make demands upon chemistry for its solution. It is most certainly true that agriculture is fast passing beyond the ranks of empiricism. We recognize that it has entered the realms of science; and the hope for the future of agriculture, as has been well remarked by an eminent English authority, lies in the larger adoption of those methods which science with practice advocates.

Interesting, however, as these considerations are, we must pass to the matter in hand and show wherein assistance has been rendered by the Dominion Government to Canadian agriculture by the chemical researches carried on in our laboratories at Ottawa.

VIRGIN SOILS OF CANADA.

The factors of a soil's fertility may be briefly enumerated as follows:—

1 The amount and availability of its plant food.
2 Its mechanical condition or tilth.
3 The conditions of climate, rainfall, temperature, etc.

It is thus apparent that the knowledge afforded by a chemical analysis, when properly interpreted, is of great value as an indication of a soil's productiveness and for suggesting its economical treatment with fertilizers. A complete soil analysis comprises a series of most careful and accurate chemical operations, the determining of the amounts of plant food and more especially of the nitrogen, potash and phosphoric acid. Since such work necessitates a considerable expenditure of time, only typical soils, representative of large areas that have never been cropped or manured, are submitted to complete analysis.

As might be expected, the soils in Canada are exceedingly varied as regards their origin, their nature and composition. We have not yet the data that would enable us to speak of all classes of Canadian soils, for considering the area of the arable land in the Dominion, the work accomplished can scarcely be said to do more than give us information regarding the soils of widely isolated districts. Our endeavour will be, as opportunity offers, to continue this chemical survey and thus gradually accumulate data that will be of service, directly to our own farmers and of interest and value to those of other countries who may be meditating emigration to the Dominion by bringing before them a knowledge of the character of Canadian soils.

To mention a few of the more typical soils of the various provinces, I might, beginning in the West, tell you of the rich and fertile soils from the valleys of the Fraser and Pitt Rivers in British Columbia.

These alluvials deposits, composed of detritus, cover many thousands of acres, and rank, both as regards mechanical condition and richness of composition, with the best soils of any country in the world. Of nitrogen, potash and phosphoric acid, as well as of the minor elements of plant food, analysis has proved them to contain large stores. Undoubtedly, the soils formed by the deposits of other rivers in the province would show themselves on examination to be equally rich in plant food.

Another class of soils in British Columbia are the upper "bench" soils. Those analysed have been of a light and sandy character, considerably inferior to the soil just referred to as regards plant food, but, nevertheless, owing to the extremely favourably climatic conditions that prevail, have proved themselves to be capable of producing good and profitable yields.

British Columbia also possesses in many of her valleys areas of mucky soils, essentially rich in organic matter and nitrogen. These with proper treatment are exceedingly productive and eventually will prove of great value for the growing of most of our farm crops.

Concerning the soils of the North-West Territories, I can state that most of those samples examined have been found to contain large amounts of plant food. Even soils from the areas affected by the deleterious presence of alkali for the most part contain all the necessary elements for productiveness, and only await the proper treatment of drainage and the application of certain chemicals to make them fertile in a high degree.

The prairie soil of Manitoba constitutes a real mine of plant food. A sample examined from the Red River valley, a black loam more than two feet in depth, was of a very high order, possessing remarkable amounts of all those materials which crops require, and ranking as pre-eminent from both a chemical and mechanical standpoint. From the analysis, I calculated that an area of one acre to the depth of one foot, contained, approximately: Nitrogen, 33,145 lbs; Potash, 33,950 lbs; Phosphoric acid, 9,450 lbs. When we compare these amounts with those present in average fertile soils, viz: Nitrogen, 3,500 lbs; Potash, 7,000 lbs; Phosphoric acid 6,000 lbs., the great agricultural value and possibilities of this prairie soil will be obvious.

Both the North-West Territories and Manitoba are justly noted as grain growing areas and more especially for producing large yields of wheat rich in gluten and of excellent milling qualities. The magnificent soil of these districts has been one of the chief factors in bringing about this result. Our farmers

in the far West, however, should learn before too late that this store of fertility is not inexhaustible and that the export of grain results in soil exhaustion which must be met by the application of manures and fertilizers if the present conditions are to be preserved. Undoubtedly, the climate there prevailing is one that assists in the conservation of soil plant food, but this factor, obviously, is not one that should be relied on to the neglect of replacing plant food.

The difficulty of obtaining in Ontario samples of virgin soil representative of large areas has prevented me hitherto from being able to draw any conclusions that would be of general importance and value. As data accumulate, we may be in a better position to speak more definitely and probably to map out this province into districts according to the original character of its soils. In the meantime, we can report that in most instances the results we have obtained show a sufficiency of plant food for lucrative crops yields.

Unfortunately the practice of "burning" when clearing up land has been most disastrous over large districts, destroying vast stores of humus and nitrogen, a loss that can be replaced only by many decades of skilfull procedure and care.

From the Province of Quebec both heavy and light soils have been received. Many of the frontier lands are in a condition of partial exhaustion, owing to the one-sided method of farming that has been in vogue. These must be built up with green manuring and by application of barnyard manure and fertilizers, thus replacing those elements that many years of cropping have taken away. Undoubtedly, the virgin soils of the areas here referred to were just as rich in plant food as those of any province in Canada, a statement that receives corroboration from results obtained in the examination of certain newly broken Quebec soils.

Hitherto, the soils from the Maritime Provinces examined by us have been few in number. Such data, as we have however, would go to show that their virgin soils are capable of giving excellent crops under proper treatment.

In closing this cursory review of our work in this branch of agricultural investigation, it only remains to say that our examination of Canadian cultivated soils points to certain economic methods of improvement that may be recommended to our farmers in order to enhance the productiveness of their fields.

These briefly are as follows :—

1 The more extensive growth of the legumes (peas, beans, clover, etc.). These plants alone have the ability to assimilate the free nitrogen of the air and thus are particularly valuable for "turning under" and also as fodder crops. Green manuring (the ploughing under of a green crop) with clover adds to the soil's store of fertility in nitrogen and humus, improving the soil both chemically and mechanically.

2 The application of wood ashes to supply the second essential element of plant food, viz: potash. Canadian wood ashes (in other words, Canadian soil fertility), though much undervalued at home, find a ready sale in the United States. Our farmers receive in exchange for their ashes but a tithe of their worth. Does not parting with them under such conditions seem like killing the goose that laid the golden egg? If wood ashes are not obtainable, muriate of potash or kainit (a potash salt mined in Stassfurt, Germany) should be used to supplement the barnyard manure.

Again, there are many of our soils and crops that would be benefited by an application of a soluble phosphate. Apatite or mineral phosphate of lime we have in Canada in abundance and also the raw materials for manufacturing the sulphuric acid to treat it with and make it soluble. It only remains for our farmers to intelligently use the superphosphate in order to increase the fertility of their fields and at the same time assist an industry that would be of great importance to the country.

3 Compared with the soils of other countries, many in Canada appear to be deficient in lime. This fact suggests that the judicious application of lime, marl or gypsum (at the same time supply other forms of plant food) would lead to good re-

sults. We have ample testimony that on many of our heavy and light soils this treatment has been eminently satisfactory.

NATURALLY-OCCURRING FERTILIZERS.

Closely relating to the question of soil plant food is that of fertilizers. In many parts of the Dominion are to be found vast deposits of material rich in the elements nessary for plant growth. These accumulations of swamp muck, peat, marl, gypsum, moss, river and tidal muds, seaweed, etc., etc., are all most valuable. Their composition should be better known and their methods of application more universally understood. Analyses made in our laboratories have established the fact that swamp mucks are nitrogenous fertilizers of a high order. In an air-dried condition they will average per ton between 30 lbs. and 40 lbs. of nitrogen which element by suitable fermentation may be converted into assimilable forms for crop use. Moreover, we have ascertained that this material (air-dried) is an excellent absorbent so that it can be used to advantage in and about our farm buildings and indeed everywhere where there is liquid manure to absorb. By its use in this way not only is the most valuable portion of the manure saved from loss but the buildings, the farm and the yard well kept clean. The fermentation that subsequently ensues in the manure pile results in the production of a rich and quick acting fertilizer. These deductions are drawn from over one hundred analyses made by us of muck collected in the various provinces of the Dominion.

A word or two about moss litter. During the past year an investigation was made in our laboratories of samples of peat moss from New Brunswick. The results obtained established a high value for this substance as a bedding material. Its absorptive capacity is high, the air-dried moss holding as much as 16 and 18 times its own weight of liquid. Not only is it useful in keeping stables dry, but also preserves them free from odour, for it has the property of absorbing ammonia and other gases Moss litter (principally species of Sphagnum) contains about half of one per cent of nitrogen, as well as notable quantities of othe

fertilizing ingredients. The resulting manure ferments well and is of excellent quality. Here again we have an opportunity to establish a lucrative business in Canada—one of value, not only to agriculture but to commerce generally; for moss litter is in great demand for use in the stables of the larger cities of the United States.

We must pass over our deposits of marl and gypsum, merely recording the fact that our analytical work in the Farm laboratories has shown that we have, in many districts, in a cheap and obtainable form just that element which many of our soils require to bring them into a high state of productiveness.

Seaweed from the Atlantic and Pacific coasts of Canada has been analysed by us, and its value as a manure, on account of the potash and nitrogen it contains, well established. The ease and rapidity with which this fertilizer decays in the soil, liberating its constituents in forms at once available for plant use, greatly enhance its value.

The tidal deposits of the Maritime Provinces, and more especially of the Bay of Fundy, have received careful examination at our hands. Their beneficial action has been shown to depend not only upon the nitrogen and organic matter they contain, but also upon the somewhat small amounts of the other essential elements of fertility they possess or of the carbonate of lime they supply. While not of the character of commercial fertilizers in the quantities of plant food they contain, they are undoubtedly valuable for many soils as amendments, both chemically and physically. As they differ very much, it is exceedingly difficult to speak of these muds as a class. While some are but of the nature of fair soil, others on examination are found to contain notable quantities of nitrogen, potash, phosphoric acid and lime.

FODDERS AND FARM CROPS GENERALLY.

There is now such a large accumulation of analytical data respecting the composition of our native and introduced grasses, clovers, Indian corn, roots of all kinds, cereals and milling bye-

products, that it will only be possible for me on the present occasion to refer to a few of the more important features of this work and to direct your attention to those conclusions that seem to be of special interest to us as Canadians.

In 1888 we began an examination of our wheat, the results being published in Bulletin No. 4 of the Experimental Farm Series. That work was almost exclusively confined to wheat grown in Manitoba and the North-West Territories. Not only was the composition of the grain ascertained, but as far as possible the influence of climate, soil and cultivation upon the wheat were studied. Our analyses of the western wheats showed besides other good features, a large percentage of albuminoids (gluten). Both the physical and chemical data testified to the excellent milling qualities and the high nutritive value of the Red Fife as grown in the provinces referred to. The effect of environment upon wheat is an interesting study, but one into which we cannot to-night examine with minuteness. It must suffice to state that the conditions of the North-West appear to be particularly favourable to the increase in the most important constituents of the wheat, viz: the albuminoids the percentage of of albuminoids (or flesh-formers) present being the chief factor used in grading and valuing wheat.

Further analytical work on Canadian cereals was that done by me when acting as a professional juror at the World's Columbian Exposition in Chicago in 1893. Of 166 samples of wheat submitted to analysis, 49 were from Canada. The data, which are published in my report now in press, again furnish ample proof of the very excellent qualities of the wheat from Manitoba and the North-West Territories. Indeed, the averages from these provinces are fully equal to those afforded by the best grain growing districts of the world. The samples submitted by the Province of Ontario at this Exposition had not been selected with care or skill, and, as a result, the general Canadian average of quality appears to be much lower than it really is.

From our analyses, the points in favour of Canadian oats appear to be (1) a heavy kernel, (2) a low percentage of moisture, (3) high albuminoids and (4) a large percentage of fat. It must be remembered, however, that oats, like wheat, are greatly influenced in composition by their conditions of growth, and, therefore, while there are many samples exhibiting the qualities I have mentioned, there are many districts in which by careful cultivation the feeding value of the oats might be increased.

THE GRASSES OF CANADA.

The enormous importance to our farmers, stock raisers and dairymen of palatable, nutritious and cheap fodder led to a determination of the food constituents of many species of native and introduced grasses. The analytical data already published have been largely obtained from the examination of grasses grown under the care of the Botanist of the Farm at Ottawa, though a considerable number of samples from Manitoba were also analysed.

Grasses may be divided into two agricultural classes; pasture grasses and meadow grasses, those of the first class springing up well when eaten off, those of the second being characterized by yielding a heavy crop of hay. The requirements of a good grass are: (1) That it should produce a heavy crop; (2) That it should be hardy; (3) That it should be rich in the more valuable food constituents; and (4) that it should be palatable.

Of native pasture grasses, I can speak in special commendation of June Grass (*Poa pratensis*), a rich, palatable perennial. In all respects it is a most excellent pasture grass, abundant everywhere and worthy of more careful cultivation. A careful study of this grass (sometimes known as Kentucky Blue Grass) led Mr. Fletcher, the Botanist of the Farms, and myself to the conclusion that it was "undoubtedly the most valuable pasture grass in the Dominion."

Red Top (*Agrostis vulgaris*), though not a native grass, is now very common. This also is a valuable grass and one

especially adapted for low lying lands, where it may well find a place in permanent pasture mixtures.

Austrian Brome Grass (*Bromus inermis*) is an introduced perennial, hardy, and a heavy cropper, producing a good aftermath of excellent feeding quality. By reason of the richness of its composition and its luxuriant habit of growth, it is certainly one of the most valuable of the introduced grasses.

Orchard Grass (*Dactylis glomerata*). This is a grass which responds well to liberal treatment, giving large crops on rich soils and particularly suitable for shady pastures.

These must suffice as types or illustrations of our work in the examination of Canadian grasses—the complete series comprising nearly three hundred analyses. I would, however, refer to some general conclusions, drawn from this investigation, regarding the right period at which to cut for hay.

In analysing the same grass at different stages of growth, it was noticed that certain changes of composition take place as the plant approaches maturity; the percentages of water, ash and albuminoids and fat decrease, while the percentage of fibre and usually the nitrogen free extract increase. In the younger stages, the grass is more succulent and palatable, and our work also shows that it is during the earlier weeks of growth that the plant's nitrogen and mineral matter are taken from the soil—which point to the advisability of thoroughly preparing the seed bed by cultivation and fertilizing, and to the value of top dressings with nitrate of soda while the crop is still young.

Further, the data we obtained allow us to infer that a loss of much valuable and digestible food material occurs when a grass is allowed to thoroughly mature before it is cut for hay. Scientific evidence is all in favor of cutting at or shortly after the flowering period.

INDIAN CORN.

No account of the coarse or bulky fodder plants of Canada would be complete without some reference to the character of the Indian corn crop, one which ranks next in importance to

grass, and certainly the one which above all others has made winter dairying possible and profitable.

Owing to the large yields obtained and its succulent and nutritious character, corn furnishes one of the best and certainly the cheapest of our bulky fodders. An immense amount of chemical work has been done in our laboratories to ascertain, (1) the requirements of this crop, (2) the relative value of certain varieties for feeding purposes, and (3) the best time for cutting, whether for the silo or for preservation in the dry condition. Our data on this subject are voluminous. I can now but refer to one or two of the more important conclusions.

Analyzing the principal varieties at five different stages of of growth and ascertaining the weight of the crop per acre at the same periods, we learned that a variety coming to early maturity (known as the glazing condition) would at that stage afford nearly twice as much real cattle food per acre than if cut a month earlier. The more practical deductions from our chemical work may be summarized as follows :

1. That the ground should be well prepared and rich in available plant food constituents, and more especially in potash.

2. That such varieties should be planted as will in all probability come to maturity before danger from frost.

3. That corn should not be sown broadcast ; for vigorous growth and in order to come to maturity it requires plenty of room for both roots and leaves.

4. That cutting either for the silo or for drying in stock should be delayed (unless it is touched by early frost) until the corn reaches the glazing condition.

Other fodder crops, including clover, beans, rye, and roots of all kinds, have been carefully studied and their requirements and relative feeding values made known for the guidance of our farmers. Since the profits in farming to-day depend as much upon cheap production as upon good prices ; the value of the knowledge of cheap and efficient feeding materials is obvious.

FRUITS AND VEGETABLES.

Canadian Horticulturists are being assisted by the chemical investigations instituted with the view of ascertaining the special requirements of our fruit trees. The knowledge thus afforded will lead, I trust, to the more economic and profitable application of fertilizers. Already reports on the chemistry of the apple and strawberry have been published, and further contributions will be issued shortly.

Spraying in order to prevent and check the ravages of insects and fungous foes is now recognized as an indispensable operation by all progressive orchardists. Without Bordeaux mixture and Paris green we can no longer gather a harvest of apples free from spot and the inroads of the Codling Moth. It has been our duty, therefore, to examine into the chemistry of these insecticides and fungicides, in order to obtain an exact knowledge of their constitution, modes of action and best methods of preparation.

WELL WATERS OF FARM HOMESTEADS.

Of the many lines of research in Agricultural Chemistry that we have prosecuted since the establishment of our laboratories, few have been of greater importance than the examination of the well waters of Canadian farm homesteads. Though the natural waters of the Dominion as found in the rivers, lakes and springs are the purest, the equal in wholesomeness and good quality of the best to be found in any country, the water used by the farmer and his cattle is too often of a most pernicious character. It is very much to be regretted that so many of the samples received by us from farmers were seriously polluted. It would appear that our farmers have been in the habit of locating, for convenience sake, the well in the barnyard or stable, or dangerously near some contaminating source. The result of this is that many wells are acting as cess-pits, and their impure waters are reeking with organic filth and disease-producing germs. We have at last awakened such an interest in this vital ques-

tion by the publication of our results and by addresses before conventions of farmers that concerted action by Ontario dairymen is spoken of towards compelling all those sending milk to a creamery or cheese factory to have an ample supply of pure, fresh water, free from all drainage matter.

In the foregoing résumé I have not been able even to mention many important branches of work undertaken by the Chemical Division of the Experimental Farms. To those who would know more of the ways in which we endeavour to help Canadian agriculturists, or who may wish for further details of the work which I have brought before you to-night in outline, I would suggest the perusal of our annual reports and bulletins.

The national importance and value of these chemical investigations will be apparent when we reflect that Canada is essentially an agricultural country, that her future progress as a nation must in a very large measure be proportionate to the progress of her agricultural industries. It is not for me on this occasion to speak of her minerals and forests (which undoubtedly are stores of untold wealth); but it is my privilege and duty to say that I believe her to be a great food-producing country, that her prosperity lies chiefly in the pursuit of agriculture, in producing butter and cheese, in stock raising, in fruit-growing and in the cultivation of grain.

NOTE ON CARDINIA SUBANGULATA DAWSON, AND ARCA PUNCTIFER DAWSON.

By HENRY M. AMI.

Some time ago the writer had occasion to call Sir William Dawson's attention to the above species of fossils from the carboniferous limestone of Windsor, Nova Scotia, stating that the names which they bore were pre-occupied. In reply Sir William has requested me to publish the following names or designations for the two species described by him in his "Acadian Geology," page 304, London, 1868.

For *Cardinia subangulata*, Dawson, Acadian Geology, p. 304, fig. 108, London, 1868, Cardinia angulifera is proposed.

For *Arca punctifer*, Dawson, Acadian Geology, p. 304, London, 1868, not figured, Arca puncticostata is proposed.

NATURAL HISTORY NOTES FOR APRIL, 1896.

The following notes of the dates of arrival of birds in April of this year are not intended for those which may have been observed in any specially sheltered spot, as individual arrivals, but are of those which appear generally around Ottawa.

ROBINS appeared in gardens on the 9th, and were numerous on the 10th instant.

The SONG SPARROW (the "rossignol" of Quebec) was first heard on the morning of the 10th instant, its arrival this year being remarkably late. Last year it arrived the 3rd of April, and in 1894 it and Blue-birds were seen on the 11th March. Its ordinary arrival is the 27th March. This year a cold and continuous north and north-west wind set in on the 26th March, continuing with little intermission to the 9th of April, when a warm south-west wind blew, and apparently brought with it our early birds.

The BLUE-BIRD was seen on the 11th of April.

The PURPLE GRACKLE abundant on the 13th.

The PEWEE was heard uttering its plaintive note on the 19th.

WHITE-BREASTED SWALLOWS were abundant over the Rideau River on the 20th.

The SWIFTS were abundant over the city on the 28th.

A BAT (probably the common bat) was flying around on the evening of the 19th. The temperature that day reached 82 Fah.

MAPLES were in full bloom on the 22nd.

FROGS were heard all around on the night of the 16th.

Ottawa, 29th April, 1896. H. B. SMALL.

CLUB NOTES.

PRIZES IN BOTANY, ENTOMOLOGY AND GEOLOGY.

At a meeting of the Council of the Ottawa Field-Naturalists' Club, held in the Normal School last month, it was unanimously agreed to offer prizes for competition among the members of the Club in three of the branches of our work, viz: in Botany, Entomology and Geology.

The collections are to be made during the collecting season of 1896, and obtained within the limits of the "OTTAWA DISTRICT," as defined in the April number of the NATURALIST for 1895.

First and *second* prizes are offered in each branch.

Competition opento any member of the Club exclusive of the leaders, who will be called upon to act as judges in their respective sections.

1. BOTANY.—For the best collection of botanical specimens. The specimens obtained are to be properly and neatly mounted on paper. Accuracy of naming, quality of the collection, and number of species will be taken into consideration.

2. ENTOMOLOGY.—For the best collection of insects in any one or more orders. Accuracy of naming, care in preparing mounting, collecting, etc., will be taken into consideration.

3. GEOLOGY.—For the best collection of fossils, rocks or minerals from any or all the formations in the Ottawa district, named and classified according to the most approved methods.

EXCURSION TO CHELSEA.

Half-day excursion to the mountains.—The Excursion Committee of the Club, acting in accordance with a resolution of the Council, has completed arrangements for the May or Spring excursion of the Club, when the district around Chelsea will be visited. The delightful scenery at and around Chelsea and the excellency of the region as a botanical, entomological or geological hunting ground is too well known to be described here.

Ample accommodation will be provided for excursionists, as the observation cars for the party will be left on a siding for the use of the members of the Club.

The following very low rates have been obtained :

Members of the O. F. N. Club, of the Ottawa Camera Club, Students of the Provincial Normal School : Adults, 25 cents ; Children, 15 cents. Non-members : Adults, 35 cents ; Children, 15 cents. The excursion train leaves the UNION STATION (Gatineau Valley Railway) at 2 p.m. sharp, returning shortly after sundown.

It is expected that there will be a large attendance of members and their friends, also a number of visiting members of the Royal Society of Canada.

SUB-EXCURSIONS.—As one of the primary objects of the Club has always been to foster studies and researches in the field of Nature about Ottawa, the leaders of the Club have agreed to be present at the City Post Office Saturday afternoons at 2 p. m. to organize field parties in Botany, Entomology and Geology. Mr. James Fletcher, Prof. Macoun, Mr. A. G. Kingston, Dr. Ells, Dr. Ami, Mr. Harrington and others will be present.

METEOROLOGICAL OBSERVATIONS.

The Editor of the NATURALIST acknowledges with sincere thanks the receipt of an abstract of meteorological observations taken at Ottawa from Mr. R. F. Stupart, the director of the Meteorological Service in Toronto. This abstract is a valuable record of the weather, and will be found on pages 47 and 48 of this volume.

NEW MEMBERS.

1. C. de Blois Green, Esq. (Osoyoos, B.C.) ; 2. H. O. Honeyman, Esq., B.A. (Richmond, Que.) ; 3. Léon Gérin, Esq., B.A.; 4. Eugene Belleau, Esq., B.A. ; 5. Rev. W. A. Burman (Winnipeg, Man.).

Frequency of the Different Winds from Observations at 7 a.m., 2 and 9 p.m., Ottawa, 1895.

	N.	N.E.	E.	S.E.	S.	S.W.	W.	N.W.	Calm
January	4	3	17	4	11	17	25	4	8
February	4	2	4	2	6	16	37	11	2
March	7	2	8	0	14	16	26	18	2
April	13	7	23	6	6	8	13	11	3
May	5	7	10	3	19	18	18	7	6
June	8	5	5	1	7	13	17	15	19
July	4	8	7	5	12	12	27	14	4
August	3	2	6	2	9	12	34	19	6
September	6	3	7	1	13	24	23	13	0
October	12	4	7	4	17	13	20	14	2
November	10	9	19	3	12	15	11	11	0
December	7	10	23	2	7	14	14	3	13
Year	83	62	136	33	133	178	265	140	65

February 8—Heaviest snow storm of winter, depth 18 inches.
" 5—Coldest day of year, mean temperature—16°.43—16°.43.
March 28—Last snow of season.
May 22—Last frost of season.
June 2—First thunder.
" 26—Heaviest rain storm, depth 2.27 inches.
July 7—Warmest day of year, mean temperature 79°.27.
Sept. 10—Last thunder storm.
October 9—First frost.
" 17—First snow, depth not measurable.
Nov. 23—First measurable snow, (3.0 in.)
Dec. 3—First temperature below zero—7°.5.
" 31—Stormiest day of year, mean velocity 25.9 miles.

Abstract of Meteorological Observations at Ottawa for the Year 1895.

	MONTH.												YEAR.
	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	
Average height of barometer at 32° and reduced to sea level	30.010	29.776	30.025	30.067	29.930	30.048	29.955	29.918	30.008	30.007	30.174	30.122	30.003
Highest barometer	30.054	30.499	30.570	30.680	30.534	30.461	30.264	30.272	30.476	30.592	30.593	30.780	30.780
Lowest barometer	29.246	29.093	29.483	29.384	29.390	29.604	29.530	29.623	29.577	29.493	29.387	29.051	29.057
Monthly and annual ranges	1.408	1.406	1.087	1.296	1.144	0.797	0.734	0.649	0.899	1.099	1.206	1.723	1.723
Average temperature of air (Fah.)	12.73	13.63	20.15	42.45	57.59	69.53	65.80	65.16	58.90	39.92	31.75	20.51	41.52
Difference from average	+2.13	+1.33	-2.35	+4.25	+2.89	+7.53	3.21	1.04	+0.90	4.52	+1.22	+4.39	+1.13
Highest temperature	37.9	38.0	41.9	71.3	93.5	91.8	91.2	86.8	90.3	65.8	60.0	52.8	93.5
Lowest temperature	19.3	-23.0	-10.0	15.3	27.5	40.5	46.5	39.0	34.0	16.5	1.5	-17.5	-23.0
Monthly and annual ranges	57.2	61.0	51.9	56.0	66.0	42.3	44.7	47.8	56.3	49.3	58.5	70.3	116.5
Average maximum temperature	21.12	21.09	29.89	51.16	70.01	80.77	76.37	76.51	70.86	50.57	41.27	28.48	.....
Average minimum temperature	2.27	3.61	10.16	32.21	45.87	57.80	54.75	54.15	49.18	30.35	24.60	11.25	.....
Average daily range	18.85	17.48	19.70	18.95	24.14	22.97	21.62	22.36	21.68	20.22	16.67	17.23	20.16
Average pressure of vapour	0.075	0.076	0.090	0.186	0.351	0.500	0.449	0.477	0.388	0.210	0.171	0.123	0.260
Average humidity of the air	85	85	82	69	67	60	60	75	71	81	87	90	78
Average temperature of dew point	12.0	12.3	18.2	32.7	49.2	59.5	56.6	57.7	52.0	35.7	30.6	20.5	36.37
Amount of rain in inches	R	R	R	2.58	3.54	5.65	3.13	3.23	1.68	0.41	1.86	2.29	24.37
Difference from average	-0.55	-0.46	-0.84	+1.06	+1.11	+2.71	-0.03	+0.10	-0.90	1.98	+0.24	+1.51	+1.07
Number of days of rain	5	2	1	10	12	11	13	14	8	7	9	6	98
Amount of snow in inches	38.5	19.5	8.9	.....	.....	.....	.....	.....	.....	*	6.0	7.5	80.4
Difference from average	+13.2	2.6	-5.8	-4.7	*	.....	.....	.....	.....	-0.9	-3.4	14.8	+19.0
Number of days of snow	13	6	10	.....	.....	.....	.....	.....	.....	2	6	11	48
Percentage of sky clouded	62	61	50	52	63	55	58	63	56	62	74	69	60
Number of days completely clouded	7	5	4	8	3	2	2	2	2	4	10	11	60
Average velocity of wind (miles)	7.95	7.03	10.10	7.70	7.30	5.11	7.30	5.28	6.86	10.20	8.39	5.84	7.42
Number of auroras	1	1	2	3	0	3	0	0	1	0	0	0	11
Number of thunder storms	0	0	0	0	0	7	1	3	2	0	0	0	13
Number of fogs	0	0	1	0	0	0	0	0	1	1	1	0	4

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ANNOTATED LIST OF SOME NOCTUIDS TAKEN AT OLDS, N.W.T.

By JOHN B. SMITH, Sc.D.

By the kindness of Mr. James Fletcher, Dominion Entomologist, I received recently a little lot of Noctuids in papers, "which," writes Mr. Fletcher, "I asked a friend (Mr. T. N. Willing) to collect for you at Olds, North-West Territory, about forty miles north of Calgary and about sixty miles east of the main chain of the Rocky Mountains." The specimens were not very well collected, and were in poor condition generally; but they are of great interest, nevertheless, and indicate something of the line of distribution of the species. I have received of Mr. F. H. Wolley Dod sendings of specimens from Calgary, which in part duplicate those received from Mr. Willing; but Mr. Dod's collections indicate a somewhat distinctive, more typically western fauna, while at Olds, the fauna is on the whole more northern and eastern. At Calgary the Atlantic and Rocky Mountain faunas join for some species, so that we get forms that are puzzling and intermediate in character; at Olds the northern and eastern types predominate so far as limited collection makes it possible to judge. None of the peculiar or new species taken by Mr. Dod at Calgary occur in this sending from Olds.

The specimens seem to have been collected at light, and the dates run from May 26 to September 2. More specifically, the dates are, May 26, June 3, 4, 20, 21, July 15, 18, 20, 21, 23,

24, 27, 28, 30, August 2, 4, 5, 6, 8, 10, 11, 14, 16, 17, 18, 20, 21, 22, 25, 27, and September 2. The best date, or that on which most specimens were collected, is August 20.

RHYNCHAGROTIS RUFIPECTUS Morr., August 18; one male specimen of normal type in all particulars. The species extends across the continent and occurs on the Pacific coast as far south as Los Angeles.

PACHNOBIA LITTORALIS Packard, July 18; one male. The specimen is unusually dark, the contrasts of the fore-wing well marked, but the transverse lines incomplete and somewhat indefinite. The species extends from Labrador into the Northern Rocky Mountain region, and has not yet occurred south of Colorado.

PERIDROMA OCCULTA Linn., August 5 (1); August 8 (1); September 2 (1). Apparently normal forms in all respects, but two of the three are very badly marred. The species occurs throughout the Northern and Eastern United States to Nova Scotia and the Rocky Mountains of Colorado.

PERIDROMA ASTRICTA Morr., August 4 (1); August 5 (1); August 10 (1). All are females, in rather poor condition. In this species and in the preceding the badly marred specimens seem to have been papered while still alive, and the specimens oviposited in their envelopes. The larvæ hatched and apparently devoured most of the body of their parent, before themselves perishing. The distribution is much as in the preceding species.

NOCTUA COLLARIS G. & R., August 16 and 22; two male specimens. Both are large and rather dark forms, with the collar and shade between the ordinary spots well defined; but the other markings tending to become obscure. This is the most western record of this species. It is a typical northern and eastern form.

NOCTUA CLANDESTINA Harris, June 21 (2); July 20 (1); July 24 (2); July 30 (1); August 8 (1); August 20 (1). All are dark typical specimens, and vary only a little in size. A well

marked eastern form, without the least tendency to the *lavalis* type, which is marked in some Calgary examples.

CHORIZAGROTIS BALINITIS Grote, July 15 (1); July 24 (5), July 23 (1); July 27 (2); July 28 (1); August 2 (1); August 2 (1); August 5 (1); August 6 (1); August 14 (1); August 21 (1). Evidently a common species in this locality and probably close to its true home. It has been also recorded from Calgary, British Columbia, and the Mountains of Colorado. I have two specimens labelled "California," but without more exact data. I have never had the opportunity of examining so many specimens of this species before, and find that, as in the others of the genus, there is very little variation except in the distinctness of the markings; well defined in some, almost obsolete in others. The males run smaller as a whole than the females. While the species has a casual resemblance to *messoria* in appearance, it is easily distinguished by the wing form and and by the smooth, somewhat glistening vestiture.

FELTIA SUBGOTHICA Harv., August 20; one male only, of the normal type. This species occurs throughout North America.

CARNEADES RIDINGSIANA Grote, August 20; three male specimens of the normal type. They agree with each other and with specimens from other localities. This species has been heretofore recorded from Colorado, Arizona and New Mexico, and is therefore somewhat of the south-western type.

CARNEADES DISSONA Moeschler, August 20; two males. I make this identification with some doubt, but the specimens seem different from *munis*, and are not *opipara*. The only point in which they fail to agree with typical *dissona* is, that the woolly clothing of the underside is not blackish. On the other hand, it is darker than in *munis*, and I am inclined to believe that we have to do with a local form of Moeschler's species It will require further material to make this certain, however. Moeschler's species has been thus far recorded from Labrador only.

CARNEADES INSULSA Walker, August 6 and 11; two males. They are in bad condition, but show more red than usual in the ground color. The species occurs throughout the northern and mountainous regions of North America.

CARNEADES TESSELLATA Harris, August 2; one male, one female. They are somewhat different from the usual eastern type, but are unfortunately too poor to serve for purposes of critical comparison. The species occurs throughout North America north of Mexico.

CARNEADES REDIMICULA Morr., August 20; two males, offering nothing unusual. The species is here at the most north-western limit recorded.

MAMESTRA PURPURISSATA, G. & R., August 20; two males in such condition that determination was barely possible. This is the most north-western limit thus far recorded.

HADENA LATERITIA Hfn., July 21 (1); July 27 (1); August 25 (1). The late specimen is a female; but none offer anything worthy of special remark. The species has not yet been recorded from any point west of the Rocky Mountains.

HADENA IMPULSA Morr., July 21; one specimen of usual type. This is a typical northern and eastern species, but also occurs, rarely, in Texas.

HADENA DEVASTATRIX Brace, July 18 and 21: two male specimens. The examples are unusually well marked and the black ornamentation is so contrasting as to obscure the recognition of the species at first sight. Occurs throughout North America.

ORTHOSIA CONRADI Grote, August 4 (1); August 5 (1); August 14 (1); August 17 (1); August 20 (1); four males and one female. I am not quite certain of this determination, because the species of this genus have not yet been satisfactorily studied. They do not seem to be congeneric, and I suspect that one species figures both as a *Xylophasia* and as an *Orthosia*. Of the specimens before me no two are quite alike, and the female is of a much brighter red-brown than any other specimen

I have ever seen. Heretofore the species has not been recorded anywhere nearly so far north-west.

CIRROEDIA PAMPINA Gn., August 27; one specimen of the normal form. Mr. F. H. Wolley Dod has taken at Calgary a series of a remarkably pale form of this species which gives a strange impression and seemed, at first, to indicate a good species. More abundant material, however, proved it to be a local and by no means constant variety, intergrading with the typical form.

DRASTERIA DISTINCTA Neum., May 26 (2); June 3 (1); June 4 (1); June 20 (1). This interesting little form seems to have its home in this region. It has been referred as a variety of *crassiuscula*, and may eventually prove to be such. I have a specimen of *crassiuscula* from Long Island that would easily pass for *distincta*, except that it lacks that the peculiar livid or bluish tinge that allies *distincta* to *carulea*. The latter species is recorded from California, but I have it also from Oregon, Washington, Vancouver and British Columbia. Calgary seems to be the point of meeting between *crassiuscula* and *carulea*, and *distincta* appears to be intermediate between the two. Larger collections to the east and to the west of this locality will prove of great interest.

PHILOMETRA GAOSALIS Wlk., August 4; one male of normal type. The species is here close to the recorded western limit of its range.

A LITTLE WOOD AND SOME OF ITS FEATHERED DENIZENS.

By Miss A. C. TYNDALL.

It covers five or six acres of ground perhaps, and is situated partly on the top of a hill, and partly in a deep hollow or ravine. A beautiful little stream takes its way through the hollow, it runs mostly over a bed of sand, and pebbles of many colours; the water is perfectly clear, the trees—big-leaved bass-woods and large alders—bend over it; giant ferns droop over the tiny tide. A dead and fallen tree, a relic of the old forest, forms a natural bridge for our miniature river, and where the trees meet over-head the wild clematis links them together in most beautifully draped arches. This is in the hollow; on the high ground grow cedars, ashes, and a few elms, thus affording every bird his favourite tree. Such a little wood is always a favourite place of resort and residence with the greater number of our song-birds, and although the larger birds for the most part prefer wilder, more lonely places, where their enemy, man, is not so likely to find them, there are very interesting birds of this latter description to be met with occasionally; from a lone whip-poor-will who has left his fellows in the high woods of the uplands to act as soloist here, or the owl who may be heard holding forth on a stormy evening in the gruesome manner approved of by his kind, to the sparrow-hawk who has turned a hollow "rampike" rising out of the tangled growth of fern and climatis, into a veritable ogre's castle to his small neighbours, by making his nest there.

One of the most beautiful of the small song-birds to be found in little woods like this, is the goldfinch, also known as the yellow-bird or wild canary. Most people are familiar with the appearance of this little finch from seeing it as a cage bird—the male with the golden-yellow of his summer plumage well set off by the black of his cap, wings and tail; his mate no less pretty, though less showy, in her modest garb of olive-green and

yellow. The goldfinch may readily be distinguished from most other birds while on the wing by its peculiar undulating flight, with an exclamatory note which sounds like the syllables *per-chick-o-pee*, to mark each rise and fall.

This bird nests late, building operations usually beginning about July. The nest is one of the neatest, best shaped and woven to be found among birds of his kind; much resembling that of the kingbird, though much smaller. It may be looked for in a small tree or clump of bushes in the little woods and pasture fields he frequents. This little finch has a sweet voice which is no less pleasing in his call notes than in his very pretty song.

Through July, when song-birds are every day becoming fewer, an untiring vocalist whose clear, but somewhat shrill notes, may be heard from the tall tree-tops from morning till night, is the indigo-bird. This is a very handsome little bird when in full summer plumage, which for some reason or other he very often is not—that is to say that whereas his entire coat, with the exception of the wings and tail, which are black, should be a bright satiny blue, it is very often mingled with the brown feathers of his winter plumage—which is, by the way, the same as that which his mate wears the year round. The nest of the indigo-bird is not the beautifully woven thing which that of the goldfinch is; it is a little larger, made of dead leaves and grass, and is placed most often in a bush not far above the ground. The eggs are four, are pale blue in colour, and may be found in July.

A bird of dazzling colour, of most gorgeous plumage, is the scarlet tanager, but it is a shy bird, and does not often allow the observer more than a passing glimpse of its rich scarlet and black plumage. Like the greater number of birds of brilliant hue, the female bird, and the young until their second year, are quite different in appearance from the gaily coloured head of the family, their plumage being a dull olive-green.

The scarlet tanager builds its nest about the middle of May, on the horizontal branch of a large tree, generally in the more

sequestered parts of the woods. The eggs number from three to four, and are of a dull blue colour, spotted with two or three shades of brown or purple. The brood is fledged early in July if no accident occurs, and they leave for the south the middle or end of August.

Not so brilliantly coloured as that of the tanager and goldfinch, but lovely in another way, is the plumage of the rose-breasted gross-beak, black, white and rose-pink being his colours. Black head, back and tail, black and white wings with a touch of pink in the linings, white belly and front up to where it reaches the clear bright pink of the breast, this is the striking combination in hues of the plumage of the rose-breasted gross-beak. He has a voice of rich round tone too, which may be heard in his loud rollicking song all through June and July.

This bird sometimes sings while on the wing, and the song thus given has a very pretty effect as he flits rapidly through the groves. Starting from a clump of trees close at hand, he is next heard a little further away, then at some distance, and finally the song dies away far in the depths of the woods.

Another summer visitant often to be met with in small woods and orchards, is the cedar or cherry-bird, as it is often called—perhaps from its love of cherries, which causes the owner of cherry trees to regard it as an unwelcome visitor to the orchard.

It is a handsome bird, with its crested head and soft reddish-brown plumage touched with scarlet and yellow about the wings and tail, but it has no song, and instead, only a peculiar whistling note, not very loud, and not easily mistaken for that of any other bird. The cedar-bird comes in May, and leaves again in September ; it nests late, through July and August. The nest is compact and well built, and is placed in a small tree, most often a cedar ; the eggs are purplish white with dark spots.

The red-winged blackbird or starling, is another bird who may be met with in the little wood, although his home and chief haunt is the low marshy meadow on its borders. He has a

nest, it seems to me, unnecessarily large, constructed out of rushes and coarse grass, in a thicket of alders there—last year it was in a tuft of rushes, and one of his fellows had one in a bush standing by itself close by—opinions among these birds as to the best location for domicile appearing to differ somewhat.

The red-winged blackbird is a strikingly handsome bird with silky black coat and scarlet and yellow epaulets, but his ways are not winning, nor his manners the most polished. Without a moment's intermission, as long as I am half-a-mile or more from his domestic possessions, he keeps up a series of shrill complaints and lamentations, fluttering now high overhead, now near the ground, first at some distance away, and then very near—until I am glad to leave the place to him. It is manners like this which often lead to such a birds' being "collected" for other reasons than the good of science.

REPORT OF DOMINION EXPERIMENTAL FARMS FOR 1895.

By Wm. Saunders, LL.D., F.R.S.C., etc., Director.

The annual report of the Experimental Farms for 1895, recently issued, is a volume of 426 pages, full of information to all those who are interested in agriculture or horticulture. It opens with the report of the Director, which covers 73 pages.

Following a few introductory paragraphs, we find details of experiments with 45 varieties of oats, 36 of barley, 43 of spring wheat, 25 of fall or winter wheat, and 68 of pease, making in all 192 different sorts of grain which have been experimented with during the yast year. The results are given of the sowing of these in groups or plots on similar soil and under similar conditions in every particular. The growth of each sort, showing that there are great variations, which are evidently due to individual characteristics possessed by these different samples.

Among the wheats, barleys and pease tested there are included 87 new sorts which have been produced at the Experimental Farm, by cross fertilizing. Among these there are a considerable number of varieties which are of high quality and very productive.

To gain information as to the best time for sowing, a large number of plots have been devoted to successive sowings of oats, barley, spring wheat and pease; the first sowing having been made in each case as soon as the land was in fit condition to receive the seed, and the subsequent sowing a week apart. The crop in each of these plots has been harvested and threshed separately and the yield of each determined and compared.

Many experiments have also been conducted with a number of varieties of Indian corn, turnips, mangels, carrots and potatoes and information gained as to the quality and usefulness of the several sorts. Tests have been carried on with many fertilizers and combinations or fertilizers, for the purpose of ascertaining their effect on particular crops, and further tests also to learn the

value of clover as a green manure for fertilizing purposes. Experiments have been conducted with barnyard manure, to find out the loss in weight which occurs in this material during the process of rotting.

Particulars of the distribution of samples of seed grain among Canadian farmers are also given, which show that the total number of samples distributed during 1895 was 27,991, and the number of applicants supplied, 26,941.

The testing of seeds for vitality has been continued, and during the past year 1776 samples of grain and other seeds have been tested for farmers, to ascertain whether they possessed that vitality and germinating power necessary to insure good results.

An interesting and useful chapter to all lovers of flowers is that on roses, which contains information on the different clases of roses, their hardiness, and general treatment, which is followed by a list of those sorts which have been grown with the greatest success in Ottawa.

The visits of the Director to the branch farms are also referred to, and a summary is given of the immense correspondence now carried on by the officers of the Experimental Farm with the farming community. The letters received during 1895 number 35,481, and the number of letters and circulars of instructions sent out, 58,592; while the number of reports and bulletins sent out through the mail was 227,631.

This document also includes the report of the Director's assistant and foreman of forestry, Mr. W. T. Macoun. This officer gives a very interesting account of the growth of the various species of trees in the forest belts, with the particultrs of the annual growth made by the different sorts, under the different methods of treatment which have been adopted. The hedges, avenues, lawns, borders and flower beds are also reported on, all showing good progress. Some details are given of the advancement made with the work in the Arboretum and Botanic

Garden. in which there were included. at the end of 1895, 935 species and varieties of trees and shrubs and 863 of herbaceous perennials. This fine collection of trees, shrubs and plants is fast becoming one of the most attractive features of the Farm and will, in the future, be a most valuable aid to botanists as a collection for reference, and at the same time will attract the attention of all others interested in this usefvl line of work.

THE NINTH ANNUAL REPORT OF THE CHEMIST TO THE DOMINION EXPERIMENTAL FARMS, MR. FRANK T. SHUTT, M.A., F.I.C., F.C.S.

The first chapter of this report is devoted to a consideration of certain virgin soils from the Province of British Columbia. The analytical data, presented in tabular form, are very complete, showing not only the *total* amounts of plant food constituents in the soils, but also the proportions of these which may be regarded as more or less *immediately available* for crop use. These latter determinations were made according to the method of Dr. Dyer, an eminent English agricultural chemist, and in soil investigations they mark a distinct step in advance of previous work. We infer that it is not only possible by chemical means to ascertain approximately the relative richness as regards the total amounts of the essential elements of fertility in a soil, but that the relative amounts of these that can be at once acted upon by exudations of plant rootlets, may be determined. Such information must prove valuable in suggesting economic and effective methods of soil fertilization.

The details regarding the soils here reported upon cannot now be discussed, but will be found of interest to readers who are wishful to learn somewhat of the character of the untouched soils of our far-west province. This chapter besides diagnosing

nd suggesting lines of treatment for the soils under consideration gives a general account of the factors, chemical and physical, that conduce to a soil's fertility.

Under the caption "Naturally-occurring Fertilizers," the composition of a large number of swamp mucks, marsh, river and mussel muds is given. The samples are from very widely distant points in Canada, and the results show that farmers may easily and cheaply in many parts of the Dominion supplement their supply of home-produced barnyard manure, enhancing the fertility of their fields. The composition of the Bracken Fern (*Pteris aquilina*) has also been ascertained. It appears to possess in a marked degree the ability to exhaust the soil of certain mineral ingredients, and hence should not be allowed to spread through pastures, as often noticed.

An interesting chapter appears on the "Nitrogen in the clover crop." The analytical figures show that in the experiment recorded there were 172.3 lbs. of nitrogen stored in the leaves, stems and roots of this plant, per acre. In this way the value of clover as a green manure is brought before our agriculturists. The data of this investigation are particularly interesting.

A short report on moss litter from New Brunswick follows, giving the amounts of fertilizing constituents it contains and its absorptive capacity. Evidently in this dried sphagnum, Canada possesses a most valuable bedding material and one which must come more and more into use in cities, replacing the more bulky straw now employed.

Industrial Fertilizers: These include "Waste from a Shoddy Factory," "Bone and Meat Meal Tankage," "Slaughter-house Offal, etc., etc., the analytical data being accompanied by directions for their use.

The investigation commenced some years ago into the value of finely ground mineral phosphate has been continued, and some interesting results are here brought forward on this important question.

The chemistry of Arsenate of Lead, a new insecticide

recommended as a substitute for Paris Green, is explained and directions for the preparation of the spraying fluid furnished.

Sixty-five samples of well waters from farmers' homesteads have been examined during 1895 and are here reported upon. The results show a most unsatisfactory condition of affairs, a very large proportion of the wells evidently receiving drainage of a pernicious character.

This report concludes with a detailed account of the composition of Canadian cereals examined at the World's Columbian Exposition, at which Mr. Shutt acted as a professional juror in chemical investigations. This investigation marks the first systematic and scientific enquiry into the composition of Canadian grown grains. The excellent qualities of the wheat grown in Manitoba and the North-West Territories are depicted, the percentage of albuminoids being very high, coupled with good milling properties. Data regarding Canadian oats, barley and buckwheat are also given.

We learn that copies of this report may be obtained by applying to Mr. Shutt at the Experimental Farm, Ottawa.

THE ANNUAL REPORT OF THE ENTOMOLOGIST AND BOTANIST TO THE DOMINION EXPERIMENTAL FARMS, DR. JAMES FLETCHER.

This report presents an interesting review of the insects and plants which have particularly required attention during the past year. It naturally treats principally of agricultural pests, but farmers are not the only ones that can benefit by a perusal of its contents. Students of insects will find many new facts recorded here concerning insects belonging to various orders. The Amputating Brocade Moth occurred in enormous numbers in Western Ontario, and we learn that this year the caterpillars from eggs laid by these moths are working serious havoc in the grain fields. Cabbages and Turnips were injured

in certain districts by plant lice. Among the new attacks treated of we note the following: A rather severe outbreak was that of the Carrot Fly, *Psila rosæ*, at Rothesay, N.B. In pastures on Cape Breton Island, the Cottony Grass-Scale, *Icerya poltis festucæ*, was very numerous, but was much reduced in numbers by parasites. In Essex County, Ontario, the Black Peach aphis required treatment; the Carpet Beetle, miscalled the "Buffalo Moth," appears to be spreading in Canada, and it will be well for all housekeepers to procure Dr. Fletcher's report and study it carefully. The different subjects are well arranged, and a good index makes them easy to refer to. The divisions of the report are: Insects Injurious to Cereals, Fodder, Plants and Fruits; Household Pests; and a report on the Apiary, including reports from Mr. John Fixter, who has the practical management of the bees on the Central Experimental Farm, and from Mr. Shutt, upon certain brands of "Foundation." The The report closes with a well illustrated article on Some Specially Noxious Weeds.

THE ANNUAL REPORT OF THE HORTICULTURIST TO THE DOMINION EXPERIMENTAL FARMS, MR. JOHN CRAIG.

This is contained in an illustrated pamphlet of sixty pages The following are some of the more important topics discussed in the letter of transmittal: The development of the fruit industry in different parts of Canada; the shipment of perishable fruits to Britain; cranberry culture.

In the body of the report, considerable space is devoted to an article, didactic in character, bearing upon apple culture. This will be found to be of much service to orchardists. The care of orchard trees and the handling of the product are matters of increasing importance to Canadian fruit growers. Some of the new and valuable varieties are described and figured. These include seedling, as well as named varieties.

Under "Notes on the Blossoming of Fruit Trees in Canada" will be found data of scientific and economic value, covering the blossoming period of the leading fruits in widely separated portions of the Dominion. By referring to these records the orchardist may so arrange his fruit trees as to bring together those varieties blossoming at or about the same time, in order to encourage thorough fertilization of the blosoms.

The results of cultural experiments with raspberries, strawberries and blackberries are detailed, and valuable deductions drawn therefrom.

Under "Spraying Experiments" the value of this practice is emphasized by the results obtained in treating plant diseases particularly injurious to orchard and garden crops. Extensive varietal tests are described in connection with vegetable and tobacco experiments. The report is sent without charge to farmers, fruit growers and others who express a desire to receive it.

FIELD DAY AND EXCURSION TO CHELSEA, QUE.

The first general excursion or field of the Club was held on Saturday, 23rd May, 1896, when Chelsea and the beautiful district thereabout were visited.

Close upon two hundred excursionists left the city *via* the Ottawa & Gatineau Valley Railway. The party was composed chiefly of members of the Ottawa Field-Naturalists' Club, but there were present also in goodly numbers, students of the Provincial Normal School, Ottawa; besides members of the Ottawa Camera Club and various friends of these institutions.

Among those present were noticed: Dr. James Fletcher, Dr. R. W. Ells, F. T. Shutt, Esq., H. B. Small, Esq., R. B. Whyte, Esq., W. J. Wilson, Esq., D. B. Dowling, Esq., M. O'Brien, Esq., W. C. Bowles, Esq., R. A. A. Johnston, Esq., S. B. Sinclair, Esq., Miss Marion Whyte, Miss G. Harmer, Mrs. R. W. Cowan, and many others.

The weather was all that could be desired and everything went off very well. On alighting at the station in Chelsea—on the very edge of the Laurentide Hills—the President, Mr. F. T. Shutt, addressed the party and pointed out the various places of interest in the neighbourhood, intimating at the same time the names of those gentlemen who were present to pilot the various sections of the Club. The attractive and bewitching appearance of the woods afforded to the botanists a fine field for research, soon the scene of great activity. The geologists followed the railway track and examined the cuttings along the way in a westerly direction, devoting particular attention to the Pleistocene clays, gravels and sands occurring there.

The valley of the Gatineau is particularly wild and enchanting in the month of May. The swollen waters were busily carrying upon their bosom the wealth of the forests of the north, and one after another in rapid succession the logs could be seen gliding along smoothly, now in a placid basin, where the delicate green tracery of the foliage was beautifully mirrorred—then,

diving headlong into the foaming current till they reached some embayment or eddy.

The botanists, as usual, were in the majority and their efforts were amply rewarded with a splendid harvest of beautiful plants.

On reassembling at the rendez-vous the President, Mr. F. T. Shutt, addressed the members present and in well-chosen and happy remarks referred to the success of each department of the Club represented. He then called upon the different leaders present to describe some of the specimens collected and note objects of interest observed.

Dr. H. M. Ami, being called upon as geologist, gave a brief sketch of the history of the district from a geological standpoint. Chelsea was situated just where the two extremes in geology meet, viz., where the Archæan or oldest formation rests up on the Pleistocene or youngest series of rocks.

The Archæan rocks of the district were very extensively and beautifully developed from Chelsea northward to Hudson Bay, and the Gatineau River which flowed at our feet so tortuously and rapidly was one of the oldest streams in Canada—the bed being cut out of the hard gneissoid and granitic rocks of the Archæan system of which the Laurentian is the basal or fundamental formation.,

In the newest, or Pleistocene deposits, were to be found: I. Boulder-clays and "till" of glacial origin. These were remnants of the "Great Ice Age" which has left markings all over the Laurentide Hills and on the softer and newer Ordovician limestone strata of Parliament Hill and Ottawa generally. II. Marine clays of the "Leda clay" formation capped by marine sands and gravels, both of which carried sand. From specimens collected by Messrs. W. J. Wilson, D. B. Dowling and the writer in the cutting half-a-mile north of Chelsea station the following species of marine shells were obtained:—

1. *Leda (Portlandia) arctica*, Gray.
2. *Macoma fragilis*, Fabricius.

3. *Macoma calcarea (?)* Chemnitz.

4. *Saxicava rugosa*, Linnæus.

These shells here occur at an altitude of about 410 feet above present sea level.

Mr. W. H. Harrington then followed and described many of the insects collected and observed by the entomologists. He devoted special attention to the study of the coleoptera and diptera. In the latter order the number of species was amazingly large, so also regarding the hymenoptera. He had discovered several new forms, and many more interesting and undescribed species awaited the keen eye of the naturalist who would find it and place it on record.

Mr. H. B. Small was then called upon and said:—

The leader in Zoology has so little left him apart from bird and insect life, in a settled part of the country, that I must diverge from speaking on animal life proper and instead, allude to natural history generally. To place stuffed specimens in cabinets and plants in drawers, Sir John Lubbock styles only the drudgery of the study, but to watch the habits and study the instincts of animals, that constitutes the true interest of natural history. Some may delight us specially by the beauty or their voice, others by their habits, especially those living in communities such as ants or bees. The lover of Nature can never be dull, for in every blade of grass, in every stone he finds something to open a train of thought. Kingsley remarked that such a one is never alone in his walks, for he has the bird and the insect always around him. As the seasons come round he gathers fresh stores to look back upon as happy memories, and for him all Nature seems to have been specially created. Loveliness is around us everywhere, but because of its being always before us, it is overlooked. Were we compelled to dwell inside the earth and only got a chance to see the rising and setting sun, we should be lost in admiration of its beauties, which from familiarity we lightly pass by. To the ardent disciple of Nature every ordinary walk may be made a morning or an evening sacrifice, and the study of nature may become a veritable fairy tale.

Mr. R. B. Whyte, leader in Botany, and an ardent botanist, then addressed the large gathering. He took up the leading forms of flowering plants collected during the day and described their structure, uses and gave such interesting notes that many

were taken down for reference in note-books, with which the excursionists were provided.

Among the interesting finds were :—*Cypripedium acaule*, belonging to the orchid family ; *Clintonia borealis*, a member of the lily family, besides several forms belonging to the Rose and Pea family. The application of the knowledge of botany to scientific agriculture was well exemplified in the remarks made by Mr. Whyte. Interesting notes were also given on such species as :—*Coptis trifolia*, golden thread ; *Aralia nudicaulis*, *A. quinquefolia* and *A. trifoliata* or Sarsaparilla and Giniseng ; *Cornus Canadensis*, &c.

Dr. James Fletcher then spoke and concluded the series of addresses given by the leaders. He was introduced by the President as the "father of the Club." In his usual happy and bright manner Dr. Fletcher (upon whom the Senate of Queen's University, Kingston, has recently conferred the honour of the doctorate degree) spoke of the humbler kinds of plants, dealing principally with the fungi and filices or ferns. There were many kinds of the former which were edible, and the latter were most beautiful as ornamental plants. The mode of growth and reproduction of these plants were then graphically described and useful hints how to collect, prepare and preserve specimens were also given.

This excursion can be well described as one of the most enjoyable and successful that has been held under the auspices of the Club.—H. M. AMI.

SUB-EXCURSION NO. 1.—On Saturday afternoon, May 9th, the first sub-excursion of the season was held to Rockliffe. There was a large party, consisting chiefly of the Normal School students, and many of them members of Mr. Sinclair's Botany Class. The usual rendezvous, the City Post Office, was left at 2.15 p.m. Mr. James Fletcher, Miss Marion Whyte and Dr. Ami, of the Council, went with the excursionists. The afternoon proved a most satisfactory one, notwithstanding the

excessive heat. The early season made it necessary for all who wished to make complete collections of the spring flowers, to show great activity in gathering the many species which were found to be in perfection. Leaving the street cars at Rockliffe, the route taken was towards Hemlock Lake and then back again towards Beechwood to the street car line. The wild plum, *Prunus Americana*, was in perfection and some beautiful bushes were seen in the small coppice above Hemlock Lake, where formerly *Daphne Mezereum* used to grow, but of which unfortunately from the land having been cleared for building purposes, not a single bush is now to be found. *Viola Selkirkii* was found in good condition, as well as many others of the less local spring flowers After leaving the woods, and before returning, a practical lesson on Botany was given by Mr. Fletcher, plants collected during the afternoon being used as illustrations. The outing was a very enjoyable one and was participated in by about sixty ladies and gentlemen.

SUB-EXCURSION NO. 2 ; BEAVER MEADOW, HULL, QUE.—About fifty members of the Club and students of the Normal School attended this sub-excursion. The weather was delightfully warm and pleasant, but the mesquitoes were very vicious in the "meadow" itself. Prof. Macoun, Dr. Fletcher and Mr. S. B. Sinclair led the botanists and entomologists whilst Dr. Ami took charge of the geologists and led them to the "pile" of Trenton limestone and shale taken out of the cutting on the Aylmer Branch of the Pontiac Railway. The genial president, Mr. F. T. Shutt, was also present and took an active part in the programme of the day. On re-assembling and comparing notes the Botanists were addressed by Prof. Macoun and Dr. Fletcher. Prof. Macoun dwelt more particularly upon the trees of the district visited and replied to a number of interesting and puzzling questions put to him during the afternoon. A very interesting discussion took place upon the relations of the different members of the Urticaceæ or Elm family. Prof. Macoun promised to

give us additional information on this important topic. In a few pleasing words Dr. Fletcher pointed out several interesting relations between plant and insect life, illustrating his points with specimens obtained. On the way home along the Aylmer Road opposite the Protestant cemetery, the geologists were treated to a graphic illustration of the effects of the glacial period. The collections of fossils made during the afternoon proved very interesting, in the neighbourhood of thirty species having been obtained by Messrs. W. J. Wilson, A. M. Campbell, Hugh Anderson and Dr. Ami.

ROYAL GEOGRAPHICAL SOCIETY OF LONDON.

At the meeting of the Royal Geographical Society held in London on the 27th day of April, 1896, the President announced that the Back Grant had been awarded to Mr. J. B. Tyrrell, of this city, and one of the old members of this club, in recognition of the geographical work done by him in the Barren Lands west of Hudson's Bay. The grant, usually given in the form of an instrument or piece of plate, was founded in 1878 by Sir George Back, who in his will bequeathed a sum of money to the Society "the annual interest of which is to be applied to the rewarding of meritorious explorers."

The award, which will be accompanied by a diploma, comes with peculiar appropriateness to Mr. Tyrrell, as Sir George Back himself was one of those who did most to explore the Barren Lands of Canada, for in 1819 and again in 1825 he accompanied Sir John Franklin through Canada to the shores of the Arctic Ocean, and in 1834 he descended the Thlewi-cho or Back river to its mouth opposite King William's Land, passing within seventy miles of the river discovered by Mr. Tyrrell in 1893. Among those who have been similarly honoured by the Geographical Society are. L'Abbé Petitot, for work in the Mackenzie Basin ; D. L. Brainard, of the Greely Expedition ; and F. C. Selous, the African explorer.

The President announced at the same meeting that the Gill Memorial was granted to Mr. A. P. Low, of the Geological Survey of Canada, for his researches in the Labrador Peninsula.

NATURAL HISTORY NOTES—MAY, 1896.

May 7th—During the evening large numbers of plover and sandpipers were on the wing, and till midnight their shrill notes were audible as they were apparantly circling round in the vicinity of the Rideau river. Evidently a very large flight of the late arrivals was passing over. Night, sultry and thunder to the south.

May 10th—The whip-poor-will was heard in the vicinity of Ottawa, and had been heard above Aylmer a few nights previous.

May 14th—Night-hawks appeared in numbers. I could get no reliable data of their appearance prior to this. Last year they were seen on 5th May, and in 1894 on 15th and in 1893 on 21st. This shows how variable is the time of their arrival, dependant, doubtless, on the temperature.

May 21st—A pair of yellow-billed cuckoos were flying round among some large elm trees on Wilbrod Street. A few years ago they built in that vicinity but the nest was unfortunately destroyed. They had not been seen there since till this date.

H. B. SMALL.

ORNITHOLOGY.—I think I have never seen pine gross-beaks as plentiful as during the past winter. From the beginning of December until nearly the end of March, they were to be seen any day almost, in the groves and small woods, and even in the trees about the houses ; sometimes in large flocks, sometimes three or four together—the latter being the case more in the earlier part of the winter.

Chick-a-dees have been more than usually numerous this winter in this locality ; there have been the usual number of blue-jays to be seen, crows in abundance, and wood-peckers a few. I saw a flock of red-polls once or twice through the winter, but that was all.

I usually learn of the presence of a few owls in the neighbourhood during the winter, either by their being driven by un-

commonly severe weather to seek their prey in barns and barnyards, or by hearing their weird voices from the woods in unsettled weather. This season I have seen or heard of none.

The birds are very late in arriving this spring, I saw a robin for the first time on the second of this month. There were one or two song-sparrows to be seen and heard a little earlier than this, but as there had been at least one in the neighbourhood all winter, I could not feel certain that they were new arrivals.

This is the first season I can remember of that there have been no shore-larks to be seen—or at least when I have been able to see or hear of any. A. C. TYNDALL.

CEDAR BIRDS EATING APPLE BLOSSOMS. *Ampelis cedrorum (Vieill.).* Two specimens of this pretty little bird were received yesterday from Mr. J. P. Jones. Mr. Jones says that he noticed about a dozen of them busily picking off apple blossoms, which they succeeded in doing very rapidly. An examination of the crop of one of them showed it to be tightly packed with petals and stamens of apple blossoms, though the smaller and less conspicuous pistils were not discovered. I find that Cook says the flowers of fruit trees, notably apples and cherries, are a common food of this bird. Any injury wrought in this way is probably more than counterbalanced by the large number of noxious insects it destroys. J. CRAIG.

PORZANA NOVABORACENSE.—On the 22nd October, 1895, I shot a small Yellow-rail in a marsh some twenty-four miles from the city. This is the first record of a specimen of this species obtained in this vicinity. GEORGE R. WHITE,

Leader in Ornithology.

NEW MEMBERS.—During the past month the following persons have been enrolled upon the membership book of our Club:—Charles Stevenson, Esq., Montreal; William H. Smith, R.N.R., Halifax, N.S.; Miss E. Williams, Ottawa; Miss G. Hannington, New Edinburgh; W. J. Barrett, Esq., Ottawa; Dr. Beeman, Perth, Ont.; Miss L. Mathews, Ottawa; Miss Helen N. Bell, Ottawa.

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HOW WHALES BREATHE.

By PROFESSOR EDWARD E. PRINCE,

Dominion Commissioner of Fisheries, Ottawa.

No sight is more common, on a sea-voyage, than the spectacle of a whale "blowing." Many people imagine that the creature spouts forth a column of water, and most artists so depict it, forgetful of the fact that the blow-hole or spiracle, being really the nostril, is used for respiration, and that all cetaceans or whales are air-breathing creatures. It is true that fishes, which are cold-blooded, inhale water, for they breathe by means of gills: but whales have warm blood and have no gills, and indeed, are not fishes at all. Like ourselves they have a pair of lungs, and are compelled to rise to the surface of the water in order to breathe. If detained under water too long they are drowned like any other air-breathing animal. Some of the largest species remain submerged for thirty or forty minutes and on rising to the surface spout eight or nine times and then descend again. The sperm-whale spouts sixty or seventy times at brief intervals of three to ten seconds and then dives below. Whale hunters say that, when hunted, a whale will remain below for an hour. The white column thrown up at each "spout" of the whale, is really the hot damp breath mingled with a little mucus and water. In the cold atmospheric stratum just above the waves the breath is condensed and falls like a shower of fine

rain or spray, and the colder the weather the more marked and visible is this phenomenon. When a large whale raises its snout sufficiently far out of the water the column is thrown up precisely like a jet of steam forcibly escaping from a boiler. This jet may be ten or twelve feet high in the case of an Arctic whale or a huge Finner ; but in the porpoise, one of the smallest of the whales, the jet is an insignificant puff only six or eight inches in height. Sometimes the creature breathes before the blow-hole is clear of the waves and a low fountain like a boiling jet is then formed, but if the blow-hole is level with the surface of the sea a small quantity of water is carried up with the rushing column of hot vapour. The cloud of ejected vapour, in very still weather, hangs for a considerable time and moves slowly over the water until it dissipates and fades away. Its appearance when seen from the level of the sea, as the late Professor H. N. Moseley recorded, "is very different from that which it has when seen from the deck of a ship ; it appears so much higher and shoots up into the air like a fountain discharged from a very fine rose." Whereas the great Arctic whale (or Right whale) possesses two blow-holes side by side, and throws up two lofty jets of vapour, the Beluga or white porpoise, and the small porpoise or sea-pig, exhibits a single crescent-shaped aperture, and like the huge sperm-whale ejects a single puff or column ; but in the last-named whale the spout curves over in front of the head, and forms an arch of white vapour. Two blow-holes occur in the Hump-backs, but in the Beaked Whales (*Hyperoodon*) which are allied to the toothed sperm-whale, there is a single cruciform aperture.

Great force being required to expand the spacious chest of these huge monsters, the muscles used in the breathing operation are very powerful and this is especially true of the muscular diaphragm. The elasticity of the lungs, due to the enormous development of "yellow fibres," and the pressure on

the surface of the body, by reason of the external water, renders the emptying of the lungs very easy, and the out-rush is not only swift and powerful enough to clear the complicated nasal passages, but to throw up the vapoury breath to a considerable height; as we have seen.

I have on many occasions been privileged not only to examine the carcases of these gigantic creatures after capture, but to see them at close quarters when enjoying themselves in active life. On the Pacific coast, while cruising up the great inlets, and between the numerous islands, along the British Columbia sea-board, I frequently found myself in the midst of a school of whales, numbering in some cases at least twenty. The sea was as calm as a lake, and in the cool still atmosphere, the great clouds of vapour shot up at intervals all around, while the monsters glided with slow gracefulness after the shoals of minute animals on which they were feeding. At times one, in a fit of playfulness, would cause a great commotion, and with his flippers and tail throw up a storm of spray and foam; but the school as a whole moved leisurely and noiselessly like dark shadows rising and sinking in the water. On certain occasions, when engaged in fishery investigations on the Scottish coast I found myself in close proximity to schools of gigantic Rorquals. They rose around our fishing yawl on all sides, and constantly threw up columns of white vapour accompanied by a deep bass snort or sigh like the gasp of the piston in a Cornish engine. When one of these mighty creatures, fifty or sixty feet in length, spouted within a few yards of us, the vibration made our vessel tremble, and one can understand the feelings of the novice on board ship who, in the long night watch, saw clouds of vapour and heard terrific sighs and snorts, and asked appealingly "How soon will I be off this perilous duty with those great guns afiring off so close to me?"

This process, by which whales breathe, may be likened to

sneezing, the ejection of the breath out of the nostrils being so powerful and spasmodic. It is easy to understand that in air-breathing creatures, which are born and live their whole life in the water, special provision was necessary to prevent the entrance of water into the windpipe and air passages, more especially as water must be taken in along with their food. Most of this water is thrown out again from the mouth, but the solid particles of food are retained and swallowed.

If we examine the breathing apparatus say in a small porpoise, we find that the trachea or windpipe is very short, and of wide calibre. At the top; the epiglottis projects like a conical funnel, and can be raised until it is pushed into the opening of the nasal chamber in the roof of the mouth. But a whole series of complex structures intervenes between the outer valved blow-hole, on the summit of the head, and the epiglottis or top of the windpipe. Five of these structures may be noticed in the porpoise, viz.: first; the valve of the crescentiform spiracle; second, the spiracular tube; third, a double enlarged chamber, really the two smelling sacs, but not used for purposes of smell; fourth, the sub-spiracular passage; fifth, the final opening into the mouth which is provided with a strong circular band of muscle. The purpose of the tubes, chambers, and valves is to afford passage to the air, entering, and driven out of the trachea and lungs, while at the same time preventing the entrance of water. Were water to gain access to the windpipe it might choke and kill the whale. We adopt in our churches in Canada an analogous arrangement in order to allow of the admission and exit of the congregation, while, as far as possible, preventing the entrance of cold air. Thus the storm-porch with its tight-fitting doors leads into a vestibule, which in some churches, leads into one or two curtained recesses, these finally opening, by baize-covered doors, into the body of the church.

The sense of smell, like that of hearing, is in the whales

either very defective or practically absent. The olfactory nerves, in fact, degenerate in all Cetaceans except the great baleen whales, the nasal chambers and passages being modified, as we have seen, for the peculiar respiration characteristic of these aquatic mammals.

Pennant in his "British Zoology" remarks that whales "like land animals, breathe by means of lungs, being destitute of gills. This obliges them to rise frequently to the surface of the water to respire, to sleep on the surface, as well as to perform several other functions." In the eyes of the law whales are still regarded as fish, and along with the sturgeon are, in Britain, named "Royal fish," and belong to the sovereign, in accordance with an old Act of Edward the Second, which runs "Item habet varectum maris per totum regnum Ballenas et Sturgiones captos etc.," so that when accidentally stranded or captured on British shores, "the king and queen divided the spoil," as Pennant quaintly adds: "the king asserting his right to the head, her majesty to the tail." Nor was the Queen's share to be altogether despised if Frederick Marten's opinion is to be trusted. "The flesh of the whale is coarse and leathery" he wrote, about three hundred years ago, "but somewhat resembles that of the ox . . . . . the flesh of the tail is softer." It is not the object of these notes, however, to determine the culinary excellencies of the whale, but to refer simply to certain striking features in the respiration of these gigantic creatures.

SURVEY OF TIDES AND CURRENTS IN CANADIAN WATERS.

By WM. P. ANDERSON, ESQ., C. E., Chief Engineer,

Department of Marine and Fisheries.

Good progress has been made by the technical branch of the Department of Marine and Fisheries in the survey of the tides and currents of the Gulf of St. Lawrence and Altantic coasts of the Dominion.

Self registering tide gauges, giving continuous records day and night throughout the year, are now in operation at Quebec, Father Point, Anticosti, the Strait of Belle Isle, St. Paul Island, Halifax, and St. John, N. B.

Tide tables for Halifax and Quebec, based for the first time upon direct observations of the tides, have been published this year, which are infinitely more accurate than anything heretofore available. These tables have been inserted in the leading Canadian and nautical almanacs, and are thus far more widely circulated than they could be through any official medium.

The currents in the Strait of Belle Isle, off the Gaspe coast and in Cabot Strait, at the entrance to the Gulf of St. Lawrence have, during the past two seasons, been examined by Mr. W. Bell Dawson, Engineer in charge of the survey.

It is found that the current in the Strait of Belle Isle is not a constant inward current, as has been frequently claimed, but is fundamentally tidal in its nature. Off the Gaspe coast and in Cabot Strait there is a permanently outward set which, however, nowhere extends below forty fathoms in depth. An interesting development of the investigation of this current is the relation between the density of the water and the track of the current. It is found, as might reasonably be expected from the volume of discharge of the St. Lawrence, that the water off the Gaspe

coast is perceptibly less salty than in other parts of the gulf, and it is expected that the track of this freshened water will bear an intimate relation to that of the outward current.

Water of less density than the normal density of ordinary sea water, or in other words, containing less salt, is also found in Cabot Strait, but the connection with that off the Gaspé coast has yet to be definitely determined.

During the present season Mr. Dawson, on the Dominion steamer Lansdowne, will continue his examination of the currents, taking up first that part of the Gulf between the east end of Anticosti and the Newfoundland and Labrador shores.

Mr. Mackay, Mr. Dawson's principal assistant, will spend the summer on the west coast of the gulf, taking tidal observations with temporary gauges at several different points, for the purpose of establishing tidal differences, which can be referred to the main registering stations. The relations of the tide between different points in the gulf are not yet well defined, while the differences in the river St. Lawrence are remarkably regular, as has been established by comparison of the records of the gauges at Anticosti, Father Point, and Quebec.

Reports of progress have been published in pamphlet form by the Department of Marine and Fisheries, detailing the results obtained by Mr. Dawson up to this season.

THE NATIONAL MUSEUM.

The Museum on Sussex Street is fast becoming much too small for the purpose for which it was originally intended, on its being established in Ottawa. No one who visits that institution to-day will say that it is not overcrowded. The fact is that only a fraction of the resources of our Great Dominion are exhibited at present. Our legislators, who, during the session of Parliament, visit the Museum for the sake of obtaining exact and useful information on the natural resources of any special district, are deprived of the advantage of having the specimens they require to see, exhibited in their proper place in the Museum. The general public also apply for information on all kinds of topics and the fact that the Museum does not show all the specimens available for exhibition is a decided drawback.

Nor can we insist too much upon the fact that the Museum is a fire-trap. To think that the building as it stands to-day from cellar to attic contains the result of fifty-three years of work on the part of a well organised Geological staff, in all parts of Canada. Only two weeks ago a fire broke out in the immediate vicinity of the Museum and burned up a portion of the boundary between two lots adjoining the lot on which the Museum itself is built. We sincerely hope that the Government will see its way clear to build such a Museum as will be a credit to the memory of the first director of the Survey—Sir William Logan.

The Museum, we must not forget, is a unique one. It contains the type specimens described by men of science and these are unreplaceable in case of accident by fire or otherwise. The constant reference which scientific men of Europe and America make to specimens in the case of the Museum on Sussex Street is in itself an index of the value which outsiders place upon them.

And still the question comes—"how long will these valuable specimens be housed in a building quite inadequate to hold or receive the specimens ready to be exhibited therein?" We are

glad to see that the Roy. Soc. of Canada has passed a resolution in this respect at its last session. It is a step in the right direction. Not until the Scientific societies of Canada combine their forces and urge the Government to erect such a National Museum building as will be suitable for the purpose for which it was established, not till then will there be a movement in that direction.

H. M. A.

"SOME COLONIAL MUSEUMS."

By H. H. M. AMI.

An instructive comparative study of nine different Museums visited by Prof. Bather in South Africa, Tasmania, Australia and New Zealand, is given by Prof. Bather, of the British Museum, under the above title. From a cursory examination of the contents of the pamphlet, there are several points of unusual interest to Canadians The value of Museums to a community depends largely upon the material which is exhibited and also upon the manner in which this material is displayed. The educative value of Museums make them a necessity now-a-days aud from the excellence of a Museum, can be obtained a good general idea of the degree of progress and advancement which a community has made in the various branches of thought and research. My purpose here is to give a mere abstract of the pamphlet in question so as to enable the Canadian authorities to gain acquaintance with the advance made by other portions of the British Empire in this direction. The following are the different Museums and the brief abstracts made from the writings of Prof. Bather :—

The South African Museum.—This is situated in Cape Town ; now a-building and to cost £20,000. Workshops and

spirit rooms to be apart from the main building. The Museum will include :—

(a) Carvings, bronze and iron weapons, implements etc. the property of the Royal South African Company.
(b) Fossils, minerals, shells, corals, larger vertebrates.
(c) Birds, fishes, reptiles, insects, marine invertebrates.
(d) Ethnological specimens.

Hobart Museum, Tasmania.—This museum is very neat and effective. It included an Art Gallery, an aquarium, where native fish may be studied and examined critically, also an ethnological collection besides four main divisions of Zoology, Botany, Geology and Mineralogy. Tasmania University and the Royal Society of Tasmania are both connected with this Museum. University Extension lectures are given every year in one of the Halls of the Museum.

Otago Museum, Dunedin, New Zealand.—The chief feature of the museum is its zoological collection. Whales, Birds *(Noctornis Mantelli)* Copepods and Dinornis are also prominently represented. To the museum there is an annex for an Ethnological collection.

Christ Church Museum New Zealand.—In connection with Canterbury College. The largest museum in New Zealand. Very good general collection in Zoology. Extinct birds form a conspicious feature of the exhibits. The Ethnological collections contain Alaskan, Indian, and Japanese costumes. Twelve fine skeletons of Mea birds one of which measures 10 ft. 7 inches in a resting position, besides four species of Apteryx are also present. Fossils, rocks, and minerals from the district are also exhibited, besides an excellent Botanical collection or Herbarium accompanied by a series of flower-paintings Very fine Cetacea and Sirenia, also skulls of Maoris.

Colonial Museum, Wellington, New Zealand.—This is essentially a government Museum. It is the head quarters of the Geological Survey of New Zealand and the collec-

tions are therefore mostly geological. There is practically no arrangement in the Museum as everything is crowded, notwithstanding the great work done by such men as Sir James Hector and Alex. McKay there is insufficiency not only in men, but in means and time.

Auckland Museum, New Zealand.—Size, 100 ft x 50 ft., cost £10,074. A most complete collection of specimens illustrating the life-history of the Maoris. Fine collection of well-stuffed monkeys, in which may be seen that of an orang-outang with callosities, also *Semnopithecus nasalis.* New Zealand rocks and minerals also form part of the collections. The arrangements are excellent. T. F. Cheeseman, F. L. S., etc. in charge.

Australian Museum Sydney.—This is a government museum. Prof. Bather says:—"This is perhaps the largest and most important museum in all our colonies." The old building was altered in 1891. The Ethnological collection is the finest part of the collection. Original collections were burnt in 1882. Some rare birds and a few type specimens. Dr. Ramsay is curator. The various departments comprise, Osteology, Mammalia, Birds, Reptiles, Fishes, Fossils, and Minerals.

Mining and Geological Museum, Sydney.—Fire proof building for the Museum and offices. Geological branch and Dept. of Mines are here located. Fine collection of the minerals of New South Wales. Dr. Etheridge's type specimens of Permo-Carboniferous fossils are preserved here, and also A. Smith Woodward's types of fossil fishes.

Macleay Museum, Sydney.—Prof. Bather remarks that this museum is not necessary in Sydney. It is in connection with the University of Sydney. Contains the collections of W. S. Macleay.

Technological Museum, Sydney.—Cost $20,000, contains 35,000 specimens, all collections made since 1882. Workshops, laboratories and offices just completed. Besides the above three museums in Sydney there is the "University of Sydney Museum."

GENERAL EXCURSION NO. 2. ROCKLAND AND THE QUARRIES VISITED.

Another fortunate choice of date and place was made when the council decided to hold the second general excursion of the club to Rockland on Saturday, June 20th.

A party of about 80, composed of members and their friends boarded the Empress at the somewhat early hour of 7.30 o'clock, and thoroughly enjoyed the sail down the Ottawa, despite the fact that the mercury made a well marked ascent as the morning advanced.

Rockland was reached shortly after ten o'clock, and the party, at the kind invitation of W. C. Edwards, M. P., went for a trip among the islands with which the river abounds for some miles above the village. In this pleasant way more than two hours were spent, affording many delightful glimpses that the amateur photographers of the company took pains to obtain impressions of in rememberance of the day. During this voyage of discovery and enchantment one incident occurred that should be recorded The obliging Captain in the endeavour to find a passage between two islands ran the boat aground. After the engine had been proven powerless to get her afloat, all the able-bodied men on board were enlisted and the volunteer crew worked at the ropes until success crowned their efforts and the "Aid" was once more able to pursue the even tenor of her way.

A landing was made about 1 p.m., and partly on foot and partly in vehicles the excursionists started for the rendezvous, the quarries of Mr. Archie Stewart. Here lunch was partaken of, the lunch basket of the company being supplemented by cooling drinks and grateful fruits through the generosity of Mr. Stewart. This is the second time that this gentleman has entertained the Club, and we wish in this way to publicly acknowledge our appreciation of his kindness and to tender our thanks to him for his hospitality.

The sight of this immense quarry in full work was indeed a surprise to many of us. Tracks and trucks, hammers and

horses all busily employed, and men everywhere; a cut into the side of the hill considerably over 100 feet in height and some hundreds of yards in length, and from which a very large amount of stone has already been taken out; walks and track roads everywhere lined along their narrow way with towering walls of huge blocks of stone ready cut and trimmed for use—these are the sights that meet the eye of the visitor and reward him for the hot, dusty walk from the river.

The quarry is of the lower beds of the Trenton limestone, and the stone appears to be eminently suited for building purposes, being close grained and free from flaws.

During the afternoon a visit was paid by many of the party to the noted farm and out buildings of Mr. W. C. Edwards. Those interested in agriculture inspected the admirable arrangements here in force for carrying on stock feeding on a large scale.

On returning to the wharf it was found that the "Empress" was one and a half hours late, so another delightful sail was taken on Mr. Edwards' tug. For contributing so much towards the real enjoyment of the excursion Mr. Edwards is entitled to the thanks of our members; and we shall not soon forget his kindness. Ottawa was reached in the cool of the evening and another pleasant field-day brought to a close. Circumstances conspired against a large attendance of the Council, but among those who took a prominent part in the management of affairs may be mentioned Mr. Frank T. Shutt, President; Mr. D. B. Dowling, Treasurer; Mr. John Craig, leader in botany; Mr. H. B. Small, leader in zoology; and Mr. Wilson who shared with Mr. Dowling the honour of furnishing information regarding the geology of the district visited.

F. T. S.

NOTES, REVIEWS AND COMMENTS.

BOTANICAL NOTES.

Sisymbrium Alliaria.—Among some plants sent by Miss Alice Bowen from the vicinity of the Gomin Swamp, Quebec, was a specimen of this European weed. Some years ago a large patch of this plant was observed in the grounds of the Hon. G. W. Allan, at Moss Park, Toronto. It is not a very valuable acquisition to our Flora. The white flowers are small, and the whole plant has a rather disagreeable alliaceous odour, from which it takes its English name, Garlic White Cress.

Cypripedium aristinum.—A splendid clump of this rare Lady's slipper has been presented to the Botanic Garden of the Central Experimental Farm by Mr. R. J. Drummond, of Perth. This beautiful little Orchid is very rare. It has been found in this vicinity in Dow's Swamp, at Alymer and at Buckingham.

Arethusa bulbosa.—A few specimens of this lovely Orchid were found in full flower in the Mer Bleue by Mr. W. T. Macoun on May the 28th. This is rather earlier than usual for the flowers to be found.

Listera australis—The bed of this rare but not very showy Orchid was visited on the above named date, and about a dozen specimens were observed in full flower. This locality is the only one so far discovered for *L. australis* in Canada. There is no doubt it is a very rare plant but it is probable that, on account of its dull purplish brown colour, it has been overlooked by collectors.

Habenaria fimbriata, the Large Fringed Orchis.—From time to time specimens of a Fringed Orchis are sent in for confirmation named as above, but in almost all instances the specimens prove to be *H. psycodes*. If full data are kept there is no difficulty in distinguishing between these two species. *H. fimbriata* is not only a larger and handsomer plant in all its

parts, but flowers two or three weeks earlier, the buds are rounder, the spike less crowded and the separate flowers are much larger, deeper in colour, and each one has a rather conspicuous white eye. It has occurred in the vicinity of Ottawa at Eastman's, Buckingham and King's Mere, but is very rare. Mr. J. B. Goode, of Montreal, a well-known and successful collector of our native Orchis, who made an excursion to the Mere Bleue with some members of the Botanical Section, on May 28th found two or three fine plants, although at that time the spike of flowers was only just appearing. The flowers do not expand until the end of June.

Trillium Grandiflorum.—We give herewith a figure of a very beautiful *Trillium* which was received from our esteemed member Mrs. Chamberlin, now of Lakefield, Ont. The specimen was found on May the 1st, under a hawthorn tree in leaf mould with another young specimen. The parcel also contained a specimen of undoubted *Trillium grandiflorum*, of which the inner lobes of the perianth ("petals") were beautifully striped with green. I am inclined to think that the present specimen is a variation of *Trillium erythrocarpum*, the Painted *Trillium*, although there are some characters which tend to make this doubtful. *Trillium erythrocarpum* with both whorls of the perianth green are found from time to time in different parts of Canada and are quite abundant in some localities, particularly along the shore of Lake Erie. I have never felt quite

satisfied, however, that the specimens are correctly identified as *T. erythrocarpum*, and any one who finds this form might compare it with *T. nivale*. To show the remarkable *monstrosity* of the beautiful specimen figured, I give herewith the measurements: Height of plant from ground, 9 inches; stem up to base of leaves, 4 inches; peduncle, 3½ inches; petioles, 2¾ inches; blade of leaf, 2½ inches long by 3 in width; "sepals," 2¼ by 1⅛ inches, leaf like; "petals," 1⅛ by 1¼ inches wide, green and leaf-like, each borne on a petiole half an inch long. When young this inner whorl of the perianth had a white margin on each petal from ⅛ to ¼ inch wide. As the flower grew older this white part turned magenta as in *T. grandiflorum* and ultimately faded whilst the green parts expanded and grew larger and assumed a purplish tinge similar to that of the stem. Pistil with three long slender beaks ¾ inch long; capsule ⅜ by ⅛ inch, spindle-shaped rounded, with the angles flattened slightly towards the apex. I fear that the fruit will not bear seed although it is perfectly green and healthy looking.

The photograph from which the figure is made was kindly taken by our President, Mr. F. T. Shutt, on May the 5th. The above given measurements were made on June the 5th.

Camelina sativa, False flags.—Among European weeds which have been introduced into Canada and which are gradually becoming more conspicuous and aggressive, mention may be made of this plant. As a rule, it is an annual, springing up in the summer particularly in the fields of flax with the seeds of which it is frequently imported, and ripening its seeds the same season. Specimens, however, have lately been received which were found by Dr. F. Johnson, near Delaware, Ont. which had made part of their growth last autumn and were flowering early this spring. This has not been previously observed with regard to this species; but is not at all an unusual habit among several other annual crucifers. It may be seen every year with *Capsella bursa pastoris* and in this district with

the newly introduced and pernicious weeds of the prairie province, Ball Mustard, *Neslia paniculata* and Tumble Mustard, *Tisymbrium altissimum*, *L.* (= *S. Sinapiotrum*, Crantz). In the west owing to the severity of the winter both of these plants are true annuals the seeds germinating in spring and ripening their seeds the same season.

Mr. W. T. Macoun, who is in charge of the work being carried on at the Experimental Farm with introduced ornamental shrubs and trees, reports that, notwithstanding the past unfavorable winter at Ottawa, which began with a long period of very cold weather without any snow on the ground until January 20th and which on the whole has been more disastrous than for some years there was not, however, as great a loss among the trees and shrubs in the Arboretum, Botanic Garden and ornamental grounds at the Experimental Farm, as was at first supposed, many varieties having recovered to a large extent; and at the present date, June 9th, most are looking well. The show of bloom on most of the shrubs has been better so far than it was last year. In the early part of May the trees and shrubs were about a week earlier in blooming than last year, and vegetation is now from two to four days earlier.

J. F.

REVIEWS OF RECENT GEOLOGICAL AND PHYSICAL WORKS.

MCGILL, ANTHONY, B.A., B. SC.,—"*Viscosity in Liquids and instruments for its measurement. Trans. Roy. Soc. of Canada, (new series), Vol. I sect. III 1895-1896, pp. 97-103. Montreal, 1895.*

Separates of this paper were distributed by the author in advance of the volume just issued, June, 1896. The paper is illustrated with diagrams and figures.

H. M. A.

CLARK, W. B. (PROF.) "*The Potomac River section of the Middle Atlantic Coast Eocene*" *American Jour. Sc. and Arts, Vol. I, May, 1896.*

In this article the author concludes—(1) "That the Eocene deposits of the Middle Atlantic slope constitute a single geological unit already described under the name of the Pamunky formation. (2) "The deposits are remarkably homegeneous; consisting typically of glaucenitic sands and clay which reach a thickness of nearly 300 feet. (3) Two clearly defined faunal zones are found, viz :—the Aquia Creek stage and the Woodstock stage."

"Both the geological and palaeontological criteria are wholly inadequate for establishing the great number of local subdivisions recognised in the Gulf Area, and indeed the sequence of forms indicates that no such differentiation of the fauna took place."

H. M. A.

WOODWARD, HENRY, F. R. S., F. G. S.—"*On some Podophthalmous Crustacea from the Cretaceous formation of Vancouver and Queen Charlotte Islands,*" *Quart. Jour. Geol. Sec. of London, Vol- 52, pp. 221-228, London, 1896.*

Among his many accomplishments, the keeper of the British Museum (Natural History Division), is an eminent authority on Crustacea. Notwithstanding his arduous labours in connection with the Cromwell Road Museum, Dr. Woodward has found time to describe several new forms of fossil animals amongst which we note four Canadian podophthalmous crustaceans. The following are the four species just recently described by Dr. Woodward :—

1. Callianassa Whiteavesii.
2. Homolopsis Richardsoni.

3. Palaeocorystes Harveyi.
4. Plagiolophus Vancouverensis.

Callianassa Whiteavesii, Woodward, is described as one of the "small burrowing crustaceans, found at the present day." It is compared with two European species:—*C. neocomiensis* and *C. isochela* both described by Dr. Woodward himself. The Canadian form is smaller than its European congeners. As the name implies, this species is so called in honour of Mr. J. F. Whiteaves, one of the members of our Club.

Homolopsis Richardsoni, Woodward, is compared by Dr. Woodward with the European form *H. Edwardsi*, Bell, from the Gault formation of Folkstone, England.

Palaeocorystes Harveyi, Woodward, was described from two specimens sent to Dr. Woodward by Mr. Whiteaves who had obtained the same from Mr. Harvey in 1892 and from Dr. C. F. Newcombe. The species is named after Mr. Harvey of Comox who is doing a great deal towards elucidating the Natural History and geology of his district.

Plagiolophus Vancouverensis, Woodward, is based upon four specimens in the hands of Dr. Woodward; two from Hornby Island, one from Comox and a fourth from the Museum of the Geol. Soc. of London, Eng. locality and collector not being given.

Regarding other Crustacea from the Cretaceous of Canada Dr. Woodward refers to an *Hoploparia* or *Podocrates* recorded from the Niobrara-Benton of Manitoba, and a long-tailed decapod from the Pierre of the West. The descriptions are accompanied by excellent figures of the types in question.

H. M. A.

CLUB NEWS.

Two of our members, Messrs. J. M. Macoun and Andrew Halkett, have been appointed naturalists on the Behring Seal Commission to enquire further into the life history of the seal and also to observe the methods used in their capture. Mr. Macoun with the British naturalist goes to the Pribyloff Islands. Mr. Halkett will accompany the schooners engaged in pelagic sealing.

During the absence of our genial secretary, Miss Marion Whyte has been kind enough to offer to attend to the duties of the office

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POPULAR CHEMISTRY.

Apropos of PROF. LASSAR-COHN'S Lectures.

How far one may reasonably expect the more thoughtful fraction of the general public to interest itself in the methods and results of chemical research, is a question that many others than the writer have asked. Here is a universe of wonderful completeness and of infinite extent in the midst of which man finds himself; and as far as he is able to judge he is himself the only conscious intelligence within this vast domain Other living beings there are, and some degree of intellectuality we must grant them to possess, but in the full consciousness of an individuality which feels itself distinct from the rest of creation, we have a conviction that man stands alone. He finds, so far as he is *man* in the sense in which this term contradistinguishes him from the lower animals, his chief satisfaction and pleasure is the activity of his mind employing itself upon the vast problem of this universe. He views it from different standpoints, and speaks of it as material or spiritual, natural or supernatural, the world of the senses, or the world of the soul, according to attitude of his mind towards it. He may not hope to solve in its entirety the Sphinx riddle which is thus presented to him but at all moments when he knows himself to be at his best and highest *as a man*, he feels that the only true satisfaction which he may hope to attain as a thinking being is to be got from the serious study of what life means. Every new relation of one phase of existence to another causes, in its discovery, a thrill of pleasure to him, and this, whether it be the inter-relations of the

heavenly bodies, or the reciprocal influence of human beings upon each other. The discovery of a widely operative principle like that which while it "Moulds a tear and bids it trickle from its source," at the same time "preserves the earth a sphere, and guides the planets in their course," is like a red-letter day in the calendar of his mind's growth; and whether as in the instance given, it touches the material side of things, or like the law of heredity which makes us "the heirs of all the ages," it goes deeper and touches the "spirit in man which giveth him understanding," its cognition is a supreme joy, and itself a *pou sto* from which a new purchase may be taken.

What we know as the sciences of Chemistry, Physics, Botany, etc., are nothing more than the imperfectly distinctive names given to different directions in which investigation proceeds. It is quite wrong to suppose that the universe is mapped out into mutually exclusive areas for purposes of research, as an unexplored territory may be divided. Every so-called science overlaps every other; and this is as true of the so called physical sciences as of the metaphysical and of the members of each group in relation to the other. For *knowledge is one;* and there is no so-called material problem which has not a spiritual side to it. It is true that every scientific principle admits of a practical application, and no sooner does a Faraday discover the laws governing induced magnetic currents, than an Edison applies this knowledge to the construction of an electro-motor. We have no fault to find with the utilitarian application, but we would insist that from the only true point of view—that of man's getting closer to the heart of things,—the apprehension of a principle is the main thing. Of course, the great mass of mankind will never apprehend and never value the principle as such: but this is only to say that the masses are developed on the material side only;—a fact too freely acknowledged by us to cause any surprise. They will, however, fully appreciate the practical application; will run their sewing machines and fans by electricity, and will invest their capital in railroad stocks, and hope to realize big dividends.

But one surely has a right to expect that the thoughtful few, "the saving remnant," will find in the appreciation of *the principle itself*, a mental satisfaction full and complete in its degree. And whether any particular general principle or law of nature be won by the labours of a worker in the domain of Chemistry, of Zoology, of Political Science, of Theology, or any other of the much overlapping but conventionally recognized divisions of this immense field of research—co extensive with the universe of matter and mind—every thinker will yearn to be made acquainted with it; every true man will wish to add it to his treasure-trove.

So far as any poor attempts of my own are concerned, and so far as I have welcomed and approved the attempts of others in this direction, these have aimed at making clear the fundamental principles which have been discovered in the domain of chemistry, so that they should be a part of the common stock of natural knowledge won by man. A manufacturing chemist, an analytical chemist, has need of a thousand and one details of knowledge, not only of chemistry proper, but of mechanics and what not, that he may successfully prosecute his *craft*, for he is a craftsman. As a *craftsman* he is distinguished from his fellow men; as a student of nature he is *one* with them, *i.e.*, provided that he is a thinking man at all, which is by no means necessary; for even the successful chemist is no more necessarily a student than the successful builder of electric motors is a Clerk-Maxwell, or a Faraday, or a Lord Raleigh. Now, the one feature in common which all efforts known to me to popularize chemical science have had, is the apathy with which they have been received. On learning that a certain series of lectures on chemistry, delivered by Professor Lassar-Cohn in Germany (Konigsberg) had been received with marked favour, had been published again and again edition after edition, and had finally been translated into English by no less well known a chemist than Professor Pattison-Muir, I hastened to procure a copy of the volume, feeling hopeful that at last the art of presenting scientific truth in taking garb had been discovered. The result

has been a grievous disappointment. I find the lectures to be a concentrated digest of the technical application of chemical—and other—principles, such as one finds and expects to find in treatises on such subjects. No one who possesses a copy of Wagner's Chemical Technology, or other work of a similar kind, need refer to the text of Professor Lassar-Cohn's lectures. Contrariwise, however, it must not be supposed that these lectures take the place of an extended treatise; for they are necessarily a mere skimming of the surface of so vast a subject Much better trust to a volume of Cooley's Receipts or Spon's very valuable Encyclopædic work.

Let it not, however, be imagined that I hold the learned professor in the very least to blame. He has performed, and very well performed, the task he set himself. Every reader of this work will learn, in a general way, the *modus operandi* of the manufacture of soap, sugar, leather, starch, shoeblacking and ten thousand other things—and that is something, is is not? Whether the language, simple as the author has tried to make it, will convey any clear meaning to him, is often doubtful; as, for example, where he is told that cellulose and starch resemble each other chemically, in each having a molecule of 21 atoms, 6 of carbon, 10 of hydrogen, and 5 of oxygen, and that by the addition of two more atoms of hydrogen and one of oxygen—the equivalent of one molecule of water—the Starch molecule is changed into a molecule of glucose. He is much more likely to remember the bare fact that by boiling starch with an acid it is turned into glucose; a fact, the knowledge of which to him is of no use for manufacturing purposes, unless he adds to it a hundred others, regarding details of manufacture, which he can only learn by a long apprenticeship to the business, or by years of experiment at his own cost; a fact, morever, which I hold, is of no more value to him as a thinking human being, than that ethyl alcohol boils at 174° F. under normal conditions of temperature and pressure.

No, the saddest aspect of the matter is this: that thousands of human beings can be interested in a treatment of the subject which restricts itself to a recital of the practical application —while no interest can be aroused in such a presentation of the subject as makes it a part of true human knowledge.

A. MCGILL.

August 19, 1896.

ELECTRICAL FISHES.

By PROFESSOR EDWARD E. PRINCE.

Dominion Commissioner of Fisheries, Ottawa.

Some recent researches have added much to our knowledge of electrical phenomena in fishes. That certain fishes possess electrical properties has been known from classical times, and Oppian, with provertical poetic liberty, describes the shock produced by one of these creatures as passing along the angler's line and rod into the fisherman's body :—

> "His arm of sense bereft,
> Down drops the idle rod; his prey is left,
> Not less benumbed than if he felt the whole
> Of frost's severest rage about the Arctic pole.

Pliny ventured the opinion that these mysterious powers were utilized in killing victims for food, and there is some ground for that view. Fishes classed as electrical belong to very widely separated orders and families but the total number of species is small.

Amongst the Sharks and Rays, the Torpedinidae and two or three species of Skate, alone, are known as electrical. Out of nine or ten thousand species of Teleosteans or Bony Fishes, not more than a dozen possess these remarkable organs.

which are very variable in position, sometimes being located near the head, at other times in the tail, while a new and hitherto unsuspected type of electrical organ is the scattered glandular form, which recent investigations have shown to be spread in the skin of one of our commonest fishes. Naturalists have hitherto been unaware of the fact that the common eel of our rivers and lakes is really an electrical fish. It is possible that extended studies will reveal many more common species endowed with this remarkable property.

The most complex form of electrical organ is that of the electric ray *Torpedo* of which several species exist. Five years ago I secured a living torpedo during an official survey on the Kerry coast, Ireland: an interesting capture when it is noted that Thomas Pennant a hundred years ago says of this fish that it "is very rarely taken in British Seas; the only one we ever heard of being took off the county of Waterford."

I found that the Irish fishermen stood in dread of it, called it a Mum Ray, a corruption no doubt of Numb or Cramp Ray; but begged for the liver of the fish, to which they attributed almost miraculous curative qualities. It was a clumsy ill-looking creature, and unlike the Skate was thick and fleshy at the lateral margin, round in front and lacking the pointed rostrum or snout. In the dirty ochre-coloured skin a rude hexagonal pattern appeared indistinctly, and on dissection, was found to correspond to the columns of modified soft muscle which constitute the electrical organs. They have been aptly compared to a collection of Voltaic piles, each consisting of electric plates of transparent homogeneous substance and invested by tendinous connective tissue, which sends alternating extensions between the plates. Over eleven hundred of these hexagonal columns are said to have been counted in a torpedo weighing seventy pounds. Five large nerve trunks pass from the medulla oblongata, on each side, to the organs, dividing up into 50,000 or 60,000 separate nerve fibres. The nerve terminations in the electric plates were found by Fritsch to precisely resemble those in muscular tissue. The organs occupy the entire thickness of

the body on each side of the massive flattened head. The current, it appears, passes perpendicularly from the underside of the body to the back or *vice versa*. The dorsal side, according to Packard's account, is positive, the ventral side negative, and the discharges are wholly under the control of the fish. In the Irish specimen referred to above this control was unfortunately so strong, not to say stubborn, that the creature refused to give any exhibition of its powers, though every inducement, persuasive and otherwise, was given to it to do so. M. de Quatrefages has recorded the variability of the Torpedo's electric potency, in some examples it is very feeble but in others it is so great as to be dangerous to man and quite fatal to birds and small animals. Repeated discharges weaken its power; but Professor Owen found that under the influence of strychnine the discharges become more powerful. They are accompanied by sounds perceptible by the phonograph. Thus a weak discharge provokes a short croaking sound, but a prolonged discharge of three or four seconds duration is marked by a somewhat lengthened groan. Ordinary muscular contractions, as is well known, are attended by faint sounds like the distant rumbling of carriage wheels.

The two common Skates, *Raia batis* and *R. clavata* it has been found possess curious organs inthe tail which Babuchin styled pseudo-electric. There is every ground for speaking of them, however, as truly electrical. They are, it is true, diminutive, and Prof. Burdon-Sanderson's researches ten years ago showed that their discharges were very feeble, but it is possible that they are either simply rudimentary and progressive in condition or degenerate and retrogressive, and thus differ from those of the Torpedo rather in degree of development than in kind. Into the vigourous discussion on this matter, participated in by the Duke of Argyll, Prof. J. C. Ewart and others in the columns of *Nature*, it is not necessary to enter here. Certainly the huge specimen of a skate, eight or nine feet across the "wings," which it fell to my lot to examine on one occasion, six years ago, possessed electrical organs resembling small corn-cobs situated on each side of the tail. No

electrometer or suitable apparatus was available to test the electro-motive force in a Skate of such enormous dimensions. The Sting Rays, with a tail exhibiting one or more strongly developed spines, and the Eagle or Whip Rays with a slender whip-like tail, appear to be wholly destitute of electric organs.

Turning now to the South American electric eel, *Gymnotus*, we find electric organs differing much from those described. In these large creatures, five or six feet in length, they are lodged along each side of the body towards the under side, and mainly in the tail. Two pairs occur, the upper much larger than the more central pair. Each organ is divided into vertical plates by fibrous septa, and again into a countless number of small cells, arranged horizontally, instead of vertically as in the torpedo. The shock passes laterally from the head to the tail, and no less than two hundred pairs of spinal nerves send electric rami into the organs. The combined result is exceedingly powerful. A captive *Gymnotus* exhibited in London some time ago, was able to kill its victims at a considerable distance. It fed upon fish, and when one of the victims was dropped into the tank, the *Gymnotus* simply curved slightly, stiffened its body, and a shock was communicated through the water which struck the introduced fish lifeless with lightning rapidity.

Another form of electric organ is that found in the African siluroid, *Malapterurus*, a fish not remotely related to our mud-pouts and cat-fishes, to which it bears much external resemblance. A layer of cells, lozenge-shaped and about one-sixteenth of an inch in diameter, extends between the skin and the underlying muscles except in the region of the head and the fins. Just as in *Gymnotus*, the current passes from the head to the tail. It is comparatively feeble, and probably only defensive. Instead of a nerve supply consisting of many thousands of fibres, a single nerve trunk passes from the spinal cord to the organ on each side of the body. The Nile is the home not only of the electric Siluroid *Malapterurus*, but of the electric Nile pike *Mormyrus*. There are many species of *Mormyrus* and, in all, the electric organs are somewhat feeble and located mainly in

the tail. The thick lateral muscles present no unusual features and the electro-motive property is purely superficial, being confined to a glandular layer in the skin and best developed in the caudal region. *Mormyrus*, it may be added, is allied to the herring and pike families, and belongs to the same order as *Gymnarchus niloticus* which exhibits like *Mormyrus*, rather feeble electric powers.

Some researches recently conducted in Scotland by Dr. E. Waymouth Reid have yielded the remarkable discovery that a series of scattered cutaneous glands in the common eel, *Anguilla*, constitutes an electric organ of great interest. Eel-skin has long been an old wives' remedy for sprains and rheumatic affections, and carefully devised experiments have quite recently shown how an electric discharge (the electro-motive force of the tissue's "current of rest") results from the activity of the gland cells in the integument by which the body of the eel is enveloped. We have in this remarkable discovery another illustration of the fact that the commonest of common objects may yield scientific results of rare interest and profound importance. The French-Canadian peasant who wrapped around his sprained wrist a piece of eel-skin had little notion that the dried tissue of the fish really possessed some of the most marvellous and mysterious properties exhibited by the finny tribes.

That activity in the skin-glands of the eel is associated with an electric discharge of appreciable power is a fact which considerably enlarges our ideas as to the nature of electric organs. In the electric organs of the Torpedo, the Skate and *Gymnotus* there is full evidence that we have examples of transformed muscular tissue. The organs may differ in situation, arrangement and general anatomical features, but they have this in common that they have a direct nerve supply from the central spinal system and are under the immediate control of the animal. We know that in many lowly animals, tissues are found which are neither muscle nor nerve, but a union of both. The neuro-muscle cells of the jelly fishes (Medusæ) are an example. These cells are so primitive in structure and function that they

have not yet exclusively taken up either muscle or nerve functions, but perform the purposes of both. The metamorphosed substance, soft, transparent, and homogeneous, of the electric organs referred to recall this remarkable tissue as though the muscular tissue in the fishes in question were retrograding as it were, and returning to the early neuro-muscular condition.

On the other hand, in the eel and the Nile-pike, we have another type of tissue no less interesting and curious. The gland cells of the skin, instead of devoting themselves solely to secretion, have metamorphosed their energy in such a way as to be effective in the production of electricity. They are so well developed in *Mormyrus* as to form quite a compact layer beneath the integument. In the eel they retain their more primitive scattered character. It may be that an unsuspected number of common fishes are possessed of powers similar to those of the eel. A mysterious tremor is said to be felt by the patient when a piece of eel-skin is applied to an affected part of the body. Can it be that the electro-motive force in the dried fishes' integument can be again aroused by the damp acid exudations of the human skin? At any rate we have in the surprising properties of the eel's glandular integument not only a key to the interpretation of many forms of electric organs in fishes, but possibly an explanation also of the luminous or phosphorescent features which many fishes exhibit. Biologists have perhaps not fully realised the large place which electrical phenomena fill in the complex vortex of animal life. All muscular contractions involve more or less marked electric phenomena. Muscle we have seen may become essentially electric in its properties, and it now appears that glands may assume the *role* of electric and possibly phosphorescent organs in fishes.

THE ROYAL SOCIETY OF CANADA.

The fifteenth meeting of the Royal Society of Canada was held in Ottawa on May 18th, 19th, 20th and 21st of this year, and although somewhat tardy, this brief review of work done, more especially with reference to Natural History and the sciences in general, may not be deemed out of place.

The sessions were held in the Provincial Normal School building on Lisgar street. The evening public meetings were very well attended, but the meetings of the various sections which are also public were not as well attended perhaps as on former occasions. The presiding officer of the year was Dr. A. R. C. Selwyn, late director of the Geological Survey of Canada, who took as the subject of his inaugural address at the evening session of Tuesday, the 19th, "The Origin and Evolution of Archæan Rocks, with remarks and opinions on other Geological subjects; being the results of personal work in both hemispheres from 1845 to 1895." We hope to receive an abstract of this paper for the NATURALIST at a future date.

Amongst contributors of articles are several members of the OTTAWA FIELD NATURALISTS' CLUB. The following is a list of some of the papers read by title or *in extenso*, or presented in abstract by the authors or substitutes during the meetings of the sections:

"*A Theory of the Morphology of Stellar Structures.*" By E. C. Jeffrey, B.A., communicated, presented and read by Prof. Ramsay Wright.

In this paper the author sought to adduce Ontogenetic and Phylogenetic evidence to show that the cylindrical fibro-vascular complex of the Phanerogamia and certain of the Vascular Cryptogamia, is derived by formation, first, of a channel and then of a tube, from the circumflexion of the oval pithless *stele*, presented by certain of the lower Pteridophyta.

The tubulation of the *stele* when complete is generally accompanied by the isolation of a medulla from the external fundamental tissue, and the more or less marked atrophy of the internal bast.

The writer further proposes the term *cœlostelic* as descriptive of the morphological nature of the medullate stelar structures of the higher vascular plants, and the term *Protostelic* as indicative of the Phylogenetic status of the pithless steles of the Selaginellæ, etc. He considers that the cœlostelic type of stem presents a mechanical adaptation to enable comparatively slender axial organs to support large leaves. This paper was accompanied by excellent micro-drawings and micro-photographs of stelar structures in *Pteris aquilina* and other cryptogamia.

"*Past Experiences and Future Prospects of Fruit Growing in the Canadian North-West.*" By Dr. William Saunders.

This eminently practical paper contained many facts and notes of observations recorded as guides for subsequent research in this line. We hope to see the reports on successful trials in fruit culture in our great North-West soon published and distributed broad-cast amongst the farmers of that region. The work conducted by the Experimental Farms of Canada is undoubtedly of inestimable value to the country.

"*Contributions to the Pleistocene flora of Canada.*" Prof. D. P. Penhallow, M.A. Sc., etc.

This very interesting paper sums up to date our knowledge of the flora of pleistocene times in Canada. Several new species are described from the St. Lawrence (or Great Lakes) and Ottawa River valleys. Many of the species referred to were obtained in the so-called interglacial beds of Scarboro Heights, near Toronto, and others from the calcareous nodules of Green's Creek and Besserer's, below Ottawa, of Leda clay (marine) age. A very interesting discussion followed this paper in which Sir William Dawson, Prof. Macoun, Mr. H. B. Small, Prof. Penhallow, Dr. Ami and others took part. Sir William pointed out that the association of species representing the flora of Scarboro Heights horizon indicated a climate even less severe than there exists now at Toronto and along the north shore of Lake Ontario in that vicinity.

"*Generic Characters of the North American Taxaceæ and Coniferæ.*" By Prof. D. P. Penhallow.

In 1894 the author presented a preliminary outline of the diagnostic characters derived from a study of the woody portion of the

stem, which would serve as a basis of classification for the North American Coniferæ. Since then, somewhat extended opportunities for verification and comparison have been offered, and the present synopsis is now given in the belief that it embodies what may be regarded as final deductions.

The classification as at present outlined, indicates that the Taxaceæ and Coniferæ must be regarded as distinct families. It also shows that among the Coniferæ, the genera heretofore recognized as distinct, are separable from one another on anatomical grounds with the exception of Cupressus and Chamæcyparis, between which there is no adequate ground of differentiation. They are, however, combined in the former genus, of which there are two sections, Cupressus proper and Chamæcyparis.

Additional Notes on Fossil Sponges and other Organic Remains from the Quebec Group at Little Metis. By Sir J. William Dawson, LL.D., F.R.S., with descriptions and remarks on some of the specimens, by Dr. G. J. Hinde, F.G.S., etc.

This paper is intended as a continuation of that on the same subject published in the transactions of the Royal Society of Canada for 1889.

It notices, in the first place, the present state of our knowledge of the rocks of the Quebec group of Sir William Logan, as developed on the South shore of the St. Lawrence, below Quebec, and especially at Little Metis Bay, with the sub-division of these rocks resulting from the recent observations and collection and study of fossils by the officers of the Geological Survey of Canada, and by Prof. Lapworth. From these it would appear that the beds at Little Metis which have afforded so many interesting species of fossil sponges, may be referred with some certainty to the upper part of the Sillery series, the lowest member of the Quebec group; and which should probably be regarded as equivalent to the lower Calciferous of the interior of the continent, and may therefore be held to be on the confines of the Cambrian and Ordovician Systems.

That the beds of the Lower Cambrian were already hardened and in process of denudation at the time when the Sillery Series was laid down, is evidenced by the fact that in the conglomerate almost immediately overlying the sponge-beds, boulders occur holding *Obolella* and other characteristic Lower Cambrian fossils. This fact, observed last summer, is noticed in the paper, with a list of these fossils.

Attention was then directed to the results of recent excavations in the sponge-beds, revealing some new forms and new facts with reference to those previously known; special mention is made of the giant sponge referred by Dr. Hinde to a new genus *Palæospongia*, and described by him in the London Geological Magazine; and to the occurrence of a

species of *Stephanella* resembling that discovered by Dr. Ami in the Utica shale at Ottawa. A new species of *Chondrites* is also noticed, and illustrations are given of the varied and curiously constructed anchoring-rods of some of the species.

In an appendix, a complete classified list is given of species discovered at this place, with figures and short characters.

Palæozoic Outliers of the Ottawa River Basin. By R. W. Ells, LL.D.

At many points throughout the area drained by the Ottawa, but more particularly to the south of that river, outliers of fossiliferous rocks, largely calcareous, are found. Some of these areas are quite extensive, embracing several square miles, while others are limited to a few hundred square yards. The area from the vicinity of Ottawa City to the south and east is continuous with the great series of deposits found throughout the St. Lawrence River basin.

In most of these rocks an abundance of fossil forms are found. Collections of these have been made from time to time, both by members of the staff of the Geological Survey and by other gentlemen interested in their study. These collections have been carefully examined and show that the formations represented in this basin range from the Potsdam formation upward to the Lorraine shales, both inclusive, thus embracing the entire series of formations pertaining to the Cambro-Silurian system as now understood by the Canadian Land Survey. Black River and Trenton forms are particularly well represented at several points. These outliers are presumably the remains of a once largely developed series of fossiliferous rocks which rested upon the older Crystallines, and which probably occupied much of the area between the St. Lawrence and the upper Great Lakes.

" *On the Fossil Remains of the Ottawa Palæozoic Basin.* By H. M. Ami, M.A., F.G.S.

This paper which accompanied the preceding one by Dr. Ells, contained an extensive series of succinct reports upon the palæontological characters of the various geological formations comprised in the Ottawa Palæozoic Basin. Useful systematic lists of fossils from the Lake Temiscamingue outlier, from Paquette's Rapids, Bonnechère River, from Ottawa and vicinity, as far east as Lachute, have been prepared and afford a means of ascertaining the faunas and faunal relations of the various members of the Palæozoic formations included in the Basin. The Silurian and Ordovician or Cambro-Silurian systems are the only two systems recognized.

Catalogue of the Phytophagous and Parasitic Hymenoptera of Vancouver Island, B.C. By W. Hague Harrington.

The species enumerated in this list are in large proportion represented in the valuable collections made by the Rev. G. W. Taylor during his residence at Cedar Hill, near Victoria, and the list is offered as a contribution toward a better knowledge of the rich fauna of the Island. Much extensive and systematic collecting must be done, however, before anything approaching a satisfactory catalogue can be compiled. At present many of the families are almost, or entirely unrepresented in collections from this region; the larger and showier insects have naturally been first collected, while the much more numerous minute and obscure forms have been neglected.

PROF. E. E. PRINCE, Dominion Commission of Fisheries, contributed a very interesting series of papers as follows—In Section IV.:

"*Further Observations on Trophoclasts in Fishes' Eggs.* By Sir James Grant, M.D., K.C.M.G., etc., and Prof. Edward E. Prince, B.A., F.L.S.

In continuance of the paper presented at the Society's meeting in 1894, the authors now bring additional evidence to show that the Trophoclasts are not nuclei of the germ or of the yolk, but by difference in size and details of structure they are demonstrated to be, like the osteoclasts, in an ossifying matrix, nuclei with special functions and characteristics, and chiefly active in breaking down the crude yoke of the egg.

"*A Study of the Pelvic Girdle of the Pike* (Esox) *in its Bearing on the True Interpretation of Paired Fins.* By Prof Ed. E. Prince. Communicated by Dr. G. M. Dawson.

The author states his grounds for regarding the so called girdle as not really a girdle at all. His former studies on the shoulder girdle in fishes led him to the view that certain elements generally held to belong to the shoulder, are really arm elements and belong to the free limb. They originate in a horizontal plate of cartilage, which is drawn in towards the clavicle, and becomes altered in position and relation. The Pelvic Girdle is really composed wholly of free limb elements and is not truly pelvic.

This paper elicited a spirited discussion, Professor R. Ramsay Wright, among others, criticizing the position taken by Professor Prince.

"The Spawning Habits, Coloration and Form of the Sockeye Salmon of British Columbia" By Prof. Ed. E. Prince. Communicated by Dr. G. M. Dawson.

The author from personal observations on the spawning-beds of the Pacific Salmon, states that recorded observations are wholly erroneous, and gives a detailed account of the actual facts as observed by him in the summer of 1895.

In section II. :—

A New Suggestion for a New Psychological Basis of Belief. By Prof. Ed. E. Prince. Communicated by Dr. Bourinot.

The Ego and the Non-Ego are not given in the primary act of consciousness. The apprehension of the sensible world is gradual. It develops from the primitive sensation, not, as is generally supposed, of resistance to voluntary movement, but of non-resistance (*i.e.*, space), and of duration (*i.e.*, time). The consciousness of voluntary power affords the original ground to which is added the consciousness of space and time as the true psychological basis of belief.

Sense Deception a Secondary Acquirement. By Prof. Ed. E. Prince. Communicated by Dr. Bourinot.

A study of the exercise of the senses in animals and young infants shows that the reports of the senses are normally true : but that an intellectual element is added by education and secondary conditions, and sensations originally simple and true, become complex and false. The sensations of a trained organism are thus found to involve not only sensory perception but intellectual judgment, hence sense-deception arises.

The Present Low Water in the Great Lakes. By Robert Bell, B.A. Sc., M.D., LL.D.

Periods of high and low water of these lakes in recent historical times. Comparison with levels of other lakes in North America at corresponding periods. Evidences of higher levels in recent geological times. Some striking examples of terraces and beaches of moderate elevation. Ancient terraces of higher elevation. Some of the more lasting of the old high levels. Inclination of terraces and differential elevation or canting of the land. Former connections, separations and discharges of the great lakes. Much greater extent of the lakes in former times and their gradual contraction to the present dimensions. Differences in origin and in the probable duration of the different

lakes. Transient characters of fresh-water lakes in general. Questions as to the effects of dredging channels in outlets, also as to rain fall and evaporation in effecting the levels. Present and future effects of the low water effects on navigation and commerce. Means of relief. Experiments in damming lakes. Possibility and advantage of damming the outlets of some of the great lakes. Conclusions.

Geraeus Tubifer. A New Thysanuran of the Little River Group, St. John, N.B. By G. F. Matthew, D. Sc.

This anomalous insect is referred to the Thysanurans because the joints of the thorax are separated, and there are no wings, and because of the uniformity of adjoining somites. The head is reduced to a small conical projection, terminating in a prolonged tube or proboscis. Apparently the nearest ally is a tube-bearing, few-jointed (aquatic?) insect found by Dr. S. H. Scudder in the Oligocene beds of Florissant, which he has referred to the Thysanurans. The reduction of the head to little else than a sucking tube is not easily paralleled among these lower insects, and gives the head somewhat the appearance of that of a weevil. The fossil is from a bed which has already yielded a large number of insect remains.

Coal Mining in Pictou County, N.S. By E. Gilpin, Jr., LL.D.

The paper gives the principal facts in connection with the pioneer workings carried on by the Grand Mining Association in this county, the dates of the various finds, workings, railway construction, etc.

On the Sequence of Strata Comprised in the South-west quarter-sheet Map of the Eastern Townships of the Province of Quebec, and their palæontological relations. By Henry M. Ami, M.A., F.G.S., of the Geological Survey of Canada. Communicated by Dr. R. W. Ells, F.R.S.C.

The recent investigations of Dr. Ells, of the Canadian Geological Survey, in the "South-west Quarter-sheet Map of the Eastern Townships of the Province of Quebec," serve to throw a great deal of new light upon the various problems involved in that district on which so much has already been written. As the strata in question are highly fossiliferous, and the numerous fossils collected serve as excellent material with which to ascertain the sequence and age of the strata in these disturbed regions, the results thus far obtained will be discussed and the various faunas and zones indicated.

There are many and intricate problems involved in a detailed study of the geological formations of the Province of Quebec. Particularly so is this the case respecting the sedimentary formations of the south and eastern portions of this Province.

Leaving out of consideration the unfossiliferous rocks of the district, the paper deals with the more recent discoveries that have been made in this region, and discusses their bearing upon the problems involved.

To the sum of palæontological evidence adduced by the late Mr. E. Billings, in effecting a correlation of the strata in question with their equivalents in other and undisturbed regions of Canada and elsewhere, there has recently been discovered a fauna which may now well be designated the Fauna, (for a description of which the reader is referred to the writings of Prof. Whitfield, by Profs. H. M. Seely and Ezra Brainerd, of Middlebury College, Vt.) and the relation of this remarkable fauna to the faunas described by Mr. Billings from the Phillipsburg district as well as from the Stranbridge and intermediate regions are herein discussed Thus far the views promulgated by Billings and by Sir William Logan regarding the existence of a series of geological formations deposited under peculiar conditions, and all capable of being brought under the one continuous group or series (designated by them the "Quebec Group") are found to be correct.

From the above it can readily be seen that in section IV. of the Royal Society which deals with geological and biological science generally, there was considerable activity. Besides the presidential address, which, owing to its special nature, did not come in for a share of discussion, there were general geological papers, and some of these led to most important as well as interesting and lengthy discussions. On Prof. Penhallow's paper relating to the Pleistocene Flora of Canada, a most interesting discussion followed, in which were involved numerous problems touching upon the climatic conditions at the time in question. Subsequent to the reading of Sir William Dawson's paper on the Metis Sponges and the Quebec Group of the Lower St. Lawrence—as also after Dr. Ami's paper to the same section on a similar subject to Sir William's —there were important discussions in which Dr Ells, Dr. Selwyn, Mr. Whiteaves, besides the authors of the papers took

part. Without wishing to dogmatize upon the validity of the term "Quebec Group"—as established by Sir William Logan and Billings—the sum of evidence adduced, stratigraphical and palæontological, leads one to conclude that so far, at least, as the fossiliferous portion of that group is concerned, it is characterized and easily recognized as forming a truly natural group oceanic in its origin, related to Atlantic formations, and essentially differing in its details from the Continental formations of undisturbed American central plateau. Amongst other interesting features of the May, 1896, meeting of the Royal Society, may be mentioned :—

PROF. PRINCE'S public lecture on "*The Fishery Industries and Resources of Canada*," illustrated by a fine series of lime light views of the Atlantic and Pacific coasts, of the various inland lakes and rivers, of nets and fishing apparatus, and of the more remarkable species of fish with their eggs and young. Prof Prince entertained his unusually large audience for nearly two hours, and gave a more complete and concise review of our vast resources and fishing industries in Canada than had ever been presented before any audience.

PROFS. COX and CALLENDER, of McGill University, presented a most timely and attractive paper entitled, "*Some Experiments with X Rays*." These were illustated with interesting negatives taken in the laboratories of the Macdonald Physics building.

MR. BARNES' paper, "*On Some Measurements of the Temperature of the River Water opposite Montreal, made during the winter with a differential platinum thermometer*," brought a most practical question before Section III of the Royal Society. The conclusions with regard to the formation of "fragile" and "anchor" ice are discussed at length in the paper, which we hope to see published at length in the annual volume of the transactions of the Royal Society.

DR. BOURINOT contributes two important papers to section II.—one an historical one, the other a constitutional study. These and another historical paper by DR. S. E. DAWSON, also an honored member of our club, on the "*Voyages of the Cabots*," together with papers by DR. DOUGLAS BRYMNER, by MR. W. W. CAMPBELL, by CAPT. E. DEVILLE, by BENJAMIN SULTE, by DR. FRECHETTE, HON. MR. MARCHAND and others, serve to show what great activity is displayed in Canada, both in the fields of letters and science.

THIRD EXCURSION OF THE SEASON.

The third general excursion of the club will be held on Saturday the 26th September. The council are now considering the best locality to visit, and due notice will be given to the members by post cards when the arrangements have been completed.

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AN OTTAWA NATURALIST'S JOURNEY WESTWARD.

By ANDREW HALKETT, ESQ.

Having recently taken a journey across the great plains of the far west and through the Rocky Mountains, it has occurred to me that a short account of certain animals and plants which were observed along the line from the car windows or at the railway stations would be of interest to the readers of the OTTAWA NATURALIST. The journey was rendered the more pleasant by the presence on the train of Prof. D. Thompson, of Dundee, Scotland, Mr. James Macoun and Mr. McEvoy, of the Geological Survey, Ottawa. Mr McEvoy got off at Kamloops, leaving Prof. Thompson, Mr. Macoun and myself to continue the journey by rail to New Westminster, and thence by boat to Victoria.

To the student of nature a journey by rail across the prairie is full of interest. Such, it is true, does not afford an opportunity for close observation of the numerous faunal and floral forms existent on every hand, but as the train moves on there is much to attract the attention from the car windows and at the stopping places along the line.

Before reaching the great plains there are districts where the train pursues its way for long distances without stopping, the country being almost entirely unsettled. There are conifers, but otherwise the vegetation is low and scrubby. At Otter, specimens of the Yellow Swallow Butterfly (*Papilio turnus*) were seen. At White River, a small frog, presumably *Rana halecena*, was found. At Cache Lake, we saw an encampment of Indians—men, women, and children—with wigwams and birch-bark canoes. At Jack Fish Bay, where the train makes a tremendous sweep in shape like the letter U, I observed some Herring Gulls

(*Larus argentatus*, Brunnich) swimming on the water and flying about. Farther on, at Vermilion Bay, were two bears (*Ursus Americanus*, Pallas) chained near the railway station, a medium sized one and a very small one, the latter about the size of a Newfoundland dog pup; these occasioned much amusement, especially among the colonist passengers. On the prairies some of the barns are rudely thatched, and, as the cattle often stand out of doors, smudges are built for them. Regarding mosquitoes, judging from size and colour, it would seem there are several species, and one has only to step off the train to pluck a few flowers or look for insects, when he will soon have multitudes of those unbidden dipterous on his back and sleeves. One morning early I looked out of the pullman window and saw a Cow-bird (*Molothrus ater*, Boddaert) alight on a horse's back, and the horse was quite willing to allow it, for doubtless the bird is a great boon to horses and cattle in devouring the insects which torment them. At Moose Jaw the train stopped for some time. Here I caught a specimen of one of the Garter Snakes, probably the variety known as the Riband Snake (*Eutainia saurita*, L.) Not having access to boxes at the time I managed to get him into my razor case, awaiting an opportunity of attending to his interests as a Natural History specimen, and am happy to say every thing possible has since been done for him, and he is now in excellent spirits. When caught he was minus the tip of the tail. Here also we saw a Kill-deer Plover (*Ægialitis vocifera*, L.), and two Marsh Harriers (*Circus hudsonicus*, L.) The kill-deer acted as if it designed to draw us away from its nest; and the female hawk floated about like a boy's kite just over our heads, and did not appear inclined to get out of the way. After leaving Boharm, those interesting little Rodents, the Gophers (*Spermophilus* sp.), were to be seen sitting up straight or jumping about. At different places heaps of Buffalo (*Bison bison*, L.) bones are exposed to view. I collected

a few teeth, a vertebra, and a rib, noting the localities with the intention of getting more on my return. After leaving Swift Current I saw a Hare, which may have been the Jack-rabbit or Prairie Hare (*Lepus campestris*, Bachman), also beautiful ducks on the water, and heard the croaking of frogs. Farther on I had the good fortune to observe, but just for an instant, a Coyote (*Canis latrans*, Say) running over the prairie, and at the Medicine Hat Station another Coyote was seen in a cage with a bear (*Ursus americanus*, Pallas), also a fine White Pelican (*Pelecanus erythrorhynchus*, Gmelin).

The foregoing is a meagre account of some of the forms of animal life to be seen on the prairie. The plains have nothing wherewith to hide them, therefore they are fully exposed to view, but—as we approach the mountains with their summits covered with snow, whilst beneath them flow rivers beautifully clear - the scene is all changed. Whatever may be there of animated nature is mostly hidden, and the mind becomes, in a direct way, attracted to the scenery. However, right beside the terrible gorge of a canyon, where the mountain towers high overhead, and the river flows far beneath, there was seen a specimen of "the Ouzel or Dipper (*Cinclus mexicanus*, Swainson), an aquatic thrush which swims (or rather flies) freely *under* water, although not web-footed. It is a fine singer, living about mountain torrents in the Rocky Mountain regions." Jordan.

At New Westminster we left the Canadian Pacific Railway and got on board the steamer for Victoria. Whilst we are passing down the Fraser River, an opportunity was afforded of seeing the Salmon Canneries, and it was very interesting to observe the Chinamen making the tin cans. As each had his especial work assigned him, it was like the ten men to make a pin story over again. As the steamer stopped at Mayne Island, Plumper's Pass, I got off at the wharf for a little while to look around. Here I saw a lot of fresh halibut and cod-fish ready

for the market, but what really attracted my attention most was the innumerable crabs under stones, sea-weed, etc. I forthwith transported eight or nine of them to my pocket, but they kept running over my arms and jacket so persistently that by the time I reached Victoria they had all managed to escape save one. I may here say that one thing very characteristic of the British Columbia fauna is the omnipresent crab.

At Victoria I took a walk along the sea shore and was charmed by the varied living creatures in the pools at low tide. Besides crabs I noticed a species of *Cottus*, Limpets (*Acmæa*), and lovely Anemones (*Actinia*). The first mentioned were very active and persistently endeavoured to catch crustaceans ; the limpets held on tenaciously to the rocks so that it was difficult to remove them without breaking the edge of the shell, whilst, in the language of M. Louis Figuier the anemones expanded "their tentacles as the daisy displays its florets."

While in the vicinity of Victoria, my attention was drawn to the marked difference in the colour of the tent caterpillar, *Clisiocampa californica*, from that of our eastern form. It is decidedly of a red colour, and was found feeding near its tent on an oak and wild rose, or crawling along the fences. I collected a few and have now the cocoons with the pupæ in a box in my cabin.

A model of its kind is the provincial Museum at Victoria. It would be out of the question to try to describe the numerous mammals, birds, crustaceans, insects, etc., in this institution, but I must call attention to three specimens of the land-crab (*Birgus latro*) of Columbus Island.* These very large crustaceans are said to be entirely terrestrial, living principally on a small species of cocoa-nut, to obtain which they climb trees. If such be the case, it necessarily follows that there must be some very marked modification of the respiratory organs.

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*A tropical island.

I append a short account of some of the plants observed between Ottawa and Victoria. The names of these and indeed any information about them have been furnished me by Mr. James Macoun; and have to add that they are simply some of the more common kinds which were readily seen during the journey.

The showy Philadelphia lily (*Lilium philadelphicum*) was the first flower to attract my attention. It, with *Cypripedium spectabile*, was very abundant between Bell's Corners and Stittsville within the fences that bound the railway track. Between Dog Lake, which was crossed at Missinabie station, and Winnipeg the plants observed were mostly those peculiar to swamps and boggy woods—the most conspicuous being *Ledum latifolium*, Ait., and *Kalmia glauca*, Ait. *Caltha palustris*, L., was common in ditches; and near Port Arthur the beautiful large white-flowered *Rubus nutkanus*, Moc., was first seen, but was most abundant in thickets along the railway embankment in the interior of British Columbia. Upon entering the prairie, a marked change was observable in the floral species. Two species of *Astragalus* are very common—*A. hypoglottis*, L., and *A. pectinatus*, Dough. The predominating colour among the flowers of the prairie is yellow. This, however, is owing to the conspicuous character of that colour, and not indicative of the species of plants, as was evident whenever there was an opportunity to step off the cars and look about. One such conspicuous flower is *Thermopsis rhombifolia*, whilst the genera *Arnica*, *Senecio*, and *Potentilla* are well represented. Some of the most beautiful of the flowers plucked on the prairie were *Linum perenne*, L.; *Oxytropis Lamberti*, Pursh; *Castilleia miniata*, Dougl.; *Malvastrum coccineum*, Gray; and *Campanula rotundifolia*, L.

"At the Glacier hotel a large bunch of *Erythronium grandiflorum* graced the centre of each table. This species is very

much more beautiful than the common Adder's tongue of the east—the flowers being larger and brighter and as many as seven are sometimes found on one stem. As the coast was approached the western flowering dogwood (*Cornus Nuttalii* Aud,), still in bloom, was seen here and there through the woods"

During my few days' stay in Victoria I was pleased to see the Whin (*Ulex europæus*, L.) of my native country, Scotland, growing in great abundance. It with the Broom (*Sarothamnus scoparius*, Koch) displayed their gay yellow all around the suburbs of the city.

Unalaska, 21st July, 1896.

OBITUARY.

SIR JOSEPH PRESTWICH—Foremost in the rank of geological science in England for the past fifty years Joseph Prestwich has stood. He was born at Pensbury, Clapham, near London, in 1812; was educated both on the Continent and at University College. His writings are very numerous but his crowning work will ever be the princely "Manual of Geology" which he was fortunate enough to see finished. In 1874 Prestwich succeeded Prof. John Phillips in the chair of Geology at Oxford. This position he held until 1888. On the first of January, 1896 he was knighted by H. M. the Queen. He died at his charming home at Shoreham, Kent, on the 23rd day of June, 1896.

G. A. DAUBRÉE—It is not long since geology had to mourn the loss of James D. Dana and now France has lost one of its most eminent scientists in the person of Gabriel Auguste Daubrée the great physicist and experimental geologist. He was born at Metz in June, 1834, educated in Paris and was successively Mining Engineer and professor of geology in Strasbourg. In 1861 he obtained the chair of geology at the Muséum d'histoire naturelle in Paris. Among his chiefest works we note, "Eaux Souterraines" and "Etudes Synthétiques de géologie expérémentale" which will more than keep his memory green in the minds of fellow-workers in the realm of Geological Science.

THE CHEMICAL LABORATORIES AT THE CENTRAL EXPERIMENTAL FARM.

On the 6th of July last fire made sad havoc with the comparatively new and finely equipped laboratories of the chemical branch at the Central Experimental Farm, Ottawa.

Shortly after 6 p.m., when nearly all the staff were out, an explosion took place, due to the bursting of a flask containing boiling sulphuric acid and used in a method of nitrogen determination. The fire spread rapidly but with a great deal of labour and toil the flames were confined to the eastern end of the building, otherwise the museum and all the invaluable collections of the Botanist, of the Entomologist, the Horticulturist as well as of the Director would have been destroyed.

We have no doubt that the Government will restore the Chemical Laboratory at the Farm to the degree of usefulness

and efficiency to which it had reached in the hands of our friend Mr. F. T. Shutt, the able chemist and we venture to hope that on the grounds of efficiency, economy and safety the new laboratories will occupy a distinct and separate building.

The large amount of useful work that has already been done in the laboratories of the Central Experimental Farm more than justifies the Government spending a liberal amount upon their restoration. It would be a serious loss if the important researches made in the growing interests of our agricultural community were allowed for a length of time to be discontinued.

In order to succeed agriculture must be carried on under proper scientific and approved methods and these methods can only be the outcome of scientific experiments in the domain of agricultural chemistry.

H. M. A.

NOTES, REVIEWS AND COMMENTS.

GEOLOGY.—ADAMS, FRANK D., and HARRINGTON, B. J. —"On a new Alkali hornblende and a Titaniferous Andradite from the Nepheline-syenite of Dungannon, Hastings Co., Ontario." *Amer. Jour. Science*, Vol 1, pp. 209-218, March, 1896.

AMI, H. M.,—"Preliminary lists of the organic remains occurring in the various geological formations comprised in the south-west quarter sheet map of the Eastern Townships of the Province of Quebec." *Geological Survey of Canada, Annual Report, Vol. VII., New Series, Report J., pp. 113-157, Ottawa, 1896*; being Appendix A to Dr. Ells's Report J of same volume. Reprint pp. 1-54, Ottawa, June, 1896.

SARDESON, F. W.—"The Saint Peter Sandstone," *Bulletin of the Minnesota Academy of Natural Sciences, Vol. IV, No. 1., Minneapolis, Minn., Feb. 28th, 1896.* This is certainly the clearest description and exposition of this important formation that we know.

SARDESON, F. W.—"*The fauna of the Magnesian series. Description of fossils.*" Bulletin of the Minnesota Academy of Sciences. Paper F., Vol. IV., No. 1, pp. 92-105, Pl. V and VI, Feb. 28, 1896. In this paper Prof. Sardeson has done much to clear the veil of obscurity which lay over the palæontological characters of the "Lower Magnesian" and "Potsdam" formations. The former is treated of in this important paper.

CHALMERS, R.—"*Pleistocene marine shore-lines on the south side of the St. Lawrence Valley.*" Amer. Jour. Sc. Vol. 1, pp. 302-308, New Haven, 1896. In this paper Mr. Chalmers brings together a number of observations which seem to correlate and possibly identify the St. Lawrence Valley beach, which is certainly marine, with the Iroquois beach of other authors, and thus reaches the same conclusion arrived at by Taylor, that the marine terraces of the Lake Champlain district coincide with Iroquois, Chippewa and Huron beaches.

WESTON, T. C.—"*Notes on the Geology of Newfoundland.*" Trans., Nova Scotia Institute of Science, Vol. IX, pp. 150-257, Halifax, 1896. This paper contains notes of observations made by Mr. Weston in that island during the summer of 1874. A clear statement of the author's non-belief in the organic origin of "*Eozoon Canadense*" accompanies his notes on the Laurentian System. With reference to the Huronian, the Cambrian and Quebec group of the island, Mr. Weston gives numerous lists of the organic remains comprising species described by the late E. Billings.

Notes on the Devonian, Carboniferous follow the above and thus bring a number of interesting facts together.

JAMES, JOSEPH F.—"*The first fauna of the earth.*" The American Naturalist, Vol. XXIX, No. 346, pp 879-887 and pp. 979-985, October, 1895

This paper comprises notes on fossil organic remains from New Brunswick, Newfoundland, Quebec and other portions of British North America. It is copiously and fairly-well illustrated, thus affording a graphic representation of some of the earliest types known up to the present time.

WINCHELL, N. H.—"*The Black River limestone at Lake Nipissing.*"—Amer. Geologist, Vol. XXIII, No. 3, pp. 178-179, Sept., 1896. In this paper Prof. Winchell records Prof. E. O. Ulrich's determinations of 12 species of fossils from the Islands of Lake Nipissing. The collection was made by T D. Ledyard, Esq., of Toronto and are as follows :

Esharopora subrecta, Urich ; *Helopora mucronata*, Ulr ; *Esharopora (?) limitaris*, Ulr ; *Rhinidictya nutabilis*, var. *major* Ulr ; *Phyllodictya varia*, Ulr ; *Batostoma Winchelli*, Ulr ; *Callopora multitabulata*, Ulr ; *Columns of an undetermined Glyptocrinus. Rhynchotrema inæquivalvis*, Castlenau, *Leperditia fabulites*, Con.? *Aparchites neglectus*, Ulrich.

Prof. Winchell adds that the above species "show the probable former prevalence of the Trenton Ocean far to the north and taken in connection with the small known area of the Trenton in Northern Michigan, near the base of Keweenaw Point, indicate that in the Trenton age a continuous sea occupied the area from Lake Nipissing to Lake Winnipeg.

BEECHER, CHAS. E.—*On the validity of the family Bohemillidae Barrande.*" Amer. Geol. Vol. XVII, No. 6, pp. 360-362, June, 1896.

Dr. Beecher has cleared the mist away from the trilobites of this family and recognises *Bohemilla* as a synonym of *Æglina*

"unless," he says, "the location of the glabella and axes should be considered as of generic importance," a feature which is or is not present in so many forms from rocks in the Girvan succession. Æglina occurs in Ordovician strata of Quebec group age in Canada.

TRAQUAIR, R. H.—"*Fossil fishes of the Moray Firth area*" being a reprint from the "Vertebrata of the Moray basin" by Messrs Hardie, Brown and Buckley. As Prof. Claypole remarks (Amer. Geol. July 1896, p. 31): "Prof. Traquair has here summed up to date our knowledge of the fossil fishes, chiefly Devonian, of Scotland, etc."

The oldest fish remains were found in the Orcadian lower old Red beds of Cromarty and occur in limestone nodules. A note goes on to say that this Orcadian series was deposited "in a large lake of Lower Devonian age." The Baie des Chaleurs basin in Eastern Canada is probably similar in origin to this.

HINDE, G. J.—*Descriptions of new fossils from the Carb. limestone.* Q. J. G. S. London, Vol. LII, pp. 438 to 450 and plates XXII and XXIII, August, 1896.

Contains interesting descriptions and notes on the structure, affinities and geological relations of (I) *Pemmatites constipatus*, N. sp.; (II) *Palæacis humilis*, N. sp.; (III) *Eunicites Reidiae*, N. sp., a lithistid sponge, a perforate coral and the jaw apparatus of an annelid.

MATTHEW, G. F.—*Notes on Cambrian Faunas—the Genus Microdiscus.* Amer. Geol., Vol. XVIII, No. 1, pp. 29-31, July, Minneapolis, 1896.

SELWYN, A. R. C. (Dr.)—C.M.G., F.R.S.—"*On the origin and evolution of Archaean Rocks with remarks and opinions on*

other geological subjects; being the result of personal work in both hemispheres from 1845 to 1895.
Trans. Roy. Soc. Can. (Presidential address.) Extract from Volume II second series, 1896-97. Ottawa, 1896.

MILLER, W. G. and BROCK, R. W.—"*Some dykes cutting the Laurentian series in the counties of Frontenac, Leeds and Lanark, Ont.*" Can. Rec. Sc., 8 pp., 3 plate, October, Montreal, 1895.

MILLER, W. G.—"*Minerals and the Roentgen Rays.*" Amer. Geol. Vol XVII, No. 5, pp. 324-325, Minneapolis, May, 1896.

Thin sections of granite, hornblende gabbro, quartz, beryl, garnet corundum and diamond, together with a small grain of glass were subjected to the X rays and it was found that carbon and its compound are "more transparent than inorganic substances" Crystals of hydrated compounds appear to be generally less opaque than those of the corresponding anhydrous materials. Experiments on relative transparency of a number of liuqids were also made and these prove very great. H_2SO_4 was found to be the most opaque of any examined by Dr. Miller. An excellent figure accompanies the paper.

WIMAN, CARL—"*Ueber die Graptoliten.*" Bull. Geol. Inst. Upsala No. 4., Vol. II, Pt. 2, 74 pp. plates 9-15, 1895.

CLAYPOLE, E. W.—"*The ancestry of the Upper Devonian, Placoderms of Ohio.*" Amer. Geol. XVII, No. 6 pp. 349-360, Minneapolis, June, 1896.

SAPPER, CARLOS D.—"*Sobre la geografia Fiscia y la geologia de la Peninsula de Yucatan.*" Instituto Geol. Mexico, 1896.

This treatise deals with the geology orography and hydrography of the peninsula of Yucatan to which is appended

a long list of altitudes in metres and a series of five geological maps prepared under the direction of the late Antonio del Castillo. (Government Report).

TODD, J. E.—"*Log-like Concretions and fossil shores.*" Amer. Geol., Vol. XVII. No. 6. Pl. XII, p. 347-349, June, 1896.

The concretions in question belong to the Laramie formation of Western Dakota. They are log-like in shape, composed of fine sand cemented together with calcareous matter and showing wavy lamination or ripple marks. One block was about twelve feet in length and two feet in diameter. No fossils were found in them. The hypothesis is that such concretions mark ancient beaches.

This interesting paper calls to mind certain log-like concretions collected by Mr. N. J. Giroux in the Trenton (*Ordovician*) of Eastern Ontario last summer and communicated to the Director of the Geological Survey of Canada and to ourselves.

DODGE, R. E.—"*Geography from Nature.*" Bull. Am. Geog. Society, XXVIII. eleven pages.

An interesting appeal for the study of Geography in the field, on excursions, where the various forces of Nature that are at work can be readily observed in their great form-producing processes. We recommend this paper to all teachers and students of geography.

TAYLOR F. B.—"*Notes on the Quaternary geology of the Mattawa and Ottawa Valleys.*" Amer. Geol. Vol. XVII, No. 2, pp. 109-120, August, 1896.

This paper is of special interest to all students of Pleistocnee geology in North America and describes numerous points observed by Mr. Taylor during his visit and study of the region

in question. We look forward with interest to Mr. Taylor's paper which is to follow this one in which an account of the submergence phenomena at lower levels in the Mattawa and Ottawa River Valleys will be given.

UPHAM, WARREN, "*Origin and Age of the Laurentian Lakes.*" Amer. Geol., Vol, XVIII, No. 3, pp. 169-177, Sept., 1896.

In this paper the author discusses the pre-glacial condition of the St. Lawrence basin, the changes which brought in the ice age and the subsequent recession of the ice-sheet. The glacial lakes in the St. Lawrence basin are then described: Lakes Warren, Algonquin and Iroquois. Niagara River and its history, as well as that of the gorge below the falls, are given, whilst the hypothesis of the Nipissing and Mattawa outlets from Lakes Hnron, Michigan and Superior is followed by a computation of the probable duration of Niagara Falls and the past glacial period.

THE ALGONQUIN AND NIPISSING BEACHES.

Students of pleistocene geology will do well to read the correspondence by Messrs. F. B. Taylor and Warren Upham on the above subject in the June number of the *American Geologist.* In a terse and taking manner the two writers present the evidence on which they pin their faith. Until the topography of the higher abandoned strands of the modern great lakes is better known and the relative heights of the various orographic features adjacent are ascertained it seems premature to dogmatise. It seems to us that the natural and commendable method of reaching more satisfactory and definite conclusion would be to begin with the present level of the lakes and proceed in delineating all the abandoned shore lines now visible all around these lakes, map them out; then, begin to draw inferences.

OTTAWA E. D. AGRICULTURAL SOCIETY.

This Society has been doing a great deal of good work in our midst towards stimulating Horticulture in the highest sense of the term. The success which has attended its efforts have been marked and the results already obtained more than warrant the expenditure. $450.00 in prizes are offered for competition to growers in the Ottawa District.

The following are the officers of the society :—President, John Craig, Esq., Dominion Horticulturist, Central Experimental Farm ; 1st Vice-President, R. B. Whyte, Esq., leader in Botany, O. F. N. C.; 2nd Vice-President, Alex. Stewart, Esq.; Secretary-Treasurer, P. G. Keyes, Esq.

FACTS ABOUT THE GREAT LAKES.

Mr. P. Nedel has tabulated the physical features of the Great Lakes in a late number of the Journal of the Western Society of Engineers as shown below.—Ex. *Amer. Geol.*

	Length, miles.	Average width, miles.	Maximum width, miles.	Short line, miles.	Water area, (including islands) square miles.	Average depth, feet.	Maximum depth, sounded, feet.	Surface above tide-water, feet.	Deepest point, above tide-water, feet.	Water volume, cubic miles.	Land area of water-shed, square miles.	Aggregate water and land area of water-shed, square miles.
Lake Superior	390	70	160	1300	31200	475	1008	602	—406	2800	51600	82800
St. Mary's river	53 40	2½ 2	5 4	100	200	....	53	....	.....	....	800	1000
Lake Michigan	335	58	85	875	20200	335	870	581	—289	1290		
Green Bay	115	15	21	260	1700	95	144	581	+437	30	37700	60100
Mackinac straits	30	10	23	60	500	75	234	581	+347	7		
North channel	110	12	18	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		
Lake Huron	250	54	100	725	17400	210	702	581	—121	650	31700	55700
Georgian Bay	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		
St. Clair river	37	1	—	70	[illegible]	.					[illegible]	[illegible]
Lake St. Clair	19	25	29	90	410	....	21	575	+554	1	3400	3810
Detroit River	27	2	3½	54	60	....	....	....	.....	....	1200	1260
Lake Erie	250	40	58	590	10600	70	204	573	+369	130	22700	32700
Niagara river	34	1	2	70	60	....	....	....	.....	....	300	360
Lake Ontario	180	40	58	600	7300	300	738	247	—491	410	21600	28900
St. Lawrence river	760	20	95	....	.....	....	....	....	.....	....	.....	.....
Totals	....	....	....	5404	95660	....	....	....	.....	5508	174800	270460

INTERNATIONAL GEOLOGICAL CONGRESS.—1897.

We have just received the propectus for the Seventh Session of the *International Geological Congress* to be held in St. Petersburg during the summer of 1897. His Imperial Highness, Mgr. the Grand Duke Constantin Constantinovitch, President of the Imperial Academy of Sciences, has accepted the position of Hon. chairman of the reception committee and Mons. A. Karpinsky, Director of the Geological Survey, that of President. Amongst other well-known celebrities are :—MM. N. Audroussow, V. Moeller, Nikitin, Romanovsky, Fr. Schmidt, Baron E. Toll, Th. Tschernyschew and Von. C. Vogt of St. Petersburg, V. Amalitsky of Varosvia, D. Anoutschin, E. Fédorow, A. P. Pavlow, and V. Sokolow in Moscow, besides J. Sederholm and A. Tigerstedt of Helsinfors.

SUPPOSED PRE-CAMBRIAN ORGANISMS.—In a very brief editorial comment,* quite a number of so-called species of organic remains from rocks of "pre-Taconic" or pre-Cambrian age have been wiped off the palæontological slate as if with a sponge. We prefer to await the result of more extended researches, more careful and more critical study in the field and in microscopy, biological and petrographical, before making such a clean sweep. Certain it is that there must be somewhere in some rock formation of the globe, some organisms older than what are to-day the oldest known Cambrian fossils, all of which will serve to throw light on what are now doubtful forms.

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*Am. Geol. Vol. XVIII, No. 3, September, 1896.

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PETROGRAPHICAL NOTES ON SOME ARCHÆAN ROCKS FROM CHELSEA, QUE.

By JOHN A. DRESSER, M.A.

Principal of St. Francis College, Richmond, Que.

No. 1. SERPENTINE LIMESTONE.*

By the aid of the microscope this rock is seen to consist essentially of the minerals calcite and serpentine, and to have muscovite and a few grains of iron ore as accessory constituents.

The calcite is wholly crystalline and shows rhombohedral cleavage throughout. It is more or less turbid in some parts, evidently from the presence of small inclusions of graphite-like matter, which are elsewhere absent. Such inclusions, when they occur in well-defined areas, are indicative of fossil origin, and even their presence in irregular aggregations may be so interpreted.

In this specimen, however, the inclusions appear in gradually varying quantities in a part of the section, but nowhere in areas having any definite boundaries. They are in fact, only more or less freely disseminated through parts of the rock, but not in such a way as to give any satisfactory evidence of an organic origin of the calcite, which may therefore be considered a secondary constituent.

The serpentine is colorless, except in polarized light, when it shows dull colors and aggregate polarization. It occupies somewhat rounded areas, which have rather uniform boundary lines.

*Nos. 1 and 3 are from "the Ravine," Old Chelsea, Que. No. 3 rock is from a 4 to 7-inch dyke cutting No. 1. No. 2 is from the first railway cutting north of Chelsea Station, Gatineau Valley Railway. These specimens were all collected by Dr. Ami. The microsections were prepared by Mr. McNamee, of Buffalo, N.Y.

As serpentine is a secondary mineral, that is it has been formed by the decomposition of some constituent of the rock, its origin must always offer a question of interest. This can only be determined by finding a part of the parent mineral still remaining in or around it, or by recognizing the crystallographic outline or traces of its cleavage form, in the pseudomorphic serpentine. A careful examination in this case shows the alteration to serpentine to be complete. This fact together with what has been said of the outlines of the serpentine areas, precludes all evidence from the first and second sources that have been mentioned.

The serpentine, however, shows in polarized light series of white lines often intersecting and thus forming what is known as "grating" or "window" structure.

These lines are narrow bands of fibrous serpentine running along the lines of cleavage of the original mineral whose position and direction they thus indicate.

In several grains of serpentine these lines are seen to intersect quite regularly at an angle of 120°-130°, thus strongly suggesting a basal section of hornblende, whose cleavage lines intersect at 124°-125°. Hornblende is not an unusual source of serpentine although its more common origin is olivine.

Muscovite appears in several smaller grains, sometimes enclosed in the serpentine or calcite, but more frequently lying between them.

A few grains are present possessing a bright metallic lustre in incident light, and surrounded by yellowish-brown rims. They are probably pyrite. Magnetite is also probably present. All, however, are so small in size and so few in number as to be relatively unimportant.

With regard to the origin of this rock, two alternatives present themselves:

(1) If the inclusions before mentioned could be accepted as evidence of organic origin, the calcite would be regarded as a

primary constituent, and the whole, a sedimentary rock. We should then have only to account for the presence of the serpentine.

(2) On the other hand, as the calcite does not offer such evidence, the better explanation seems to be that the calcite has been produced by the decomposition of some of the feldspars, and, the serpentine having been derived from hornblende, (which again, may have been primarily pyroxene), the original rock had the composition of hornblende—(or augite)—diorite or syenite.

This view is also in a measure corroborated by a reference to the investigations of Mr. Ingall, (Can. Rec. Sci. Vol. VI, No. 2) in the pure limestone beds of the Laurentian system.

Serpentine limestones are well-known members of the Grenville series in Canada, and of its equivalent in the Adirondack Mountain region of New York.

Their occurrence in the latter district has been fully described by Prof. Kemp, while the Canadian localities have been made well-known by the officers of the Geological Survey Department.*

NO. 2. SILLIMANITE GNEISS.

The essential constituents of this rock are feldspar, biotite quartz and sillimanite; the accessory, garnet and pyrite.

The feldspar is much decomposed and seems to be mostly orthoclase. No plagioclase can be surely identified. Biotite is very prominent in the thin section.

Both prismatic and basal sections are abundant. The former show well-marked cleavage and parallel extinction, and all have distinct pleochroism.

Quartz is present in grains of various sizes several having a rounded or somewhat elongated form. Some of the larger

*See "Catalogue of Stratigraphical Collection of Canadian Rocks," by W. F. Ferrier—1893.

show a slight undulatory extinction thus indicating that the rock has been subjected to pressure since their formation.

Sillimanite presents some of the largest individual crystals of the section. It occurs in longitudinal sections some of which show parallel cleavage, and all, parallel extinction. Both the single and the double refraction are high, which give it a prominent appearance in the slide. No distinct pleochroism has been observed. Several of the crystals are broken. One basal section is present with a nearly rectangular outline and showing distinct diagonal, (*i. e.* parallle to the macropinacoid), cleavage.

A few grains of red garnet and pyrite are enclosed by biotite.

The structure of the rock is schistose and it may be termed a sillimanite gneiss.

A rock of this class from St. Jean de Matha, Que., recently described by Dr. F. D. Adams, (Am. Jour. Sci. July, 1895), has been determined by him to be in all probability an altered sedimentary rock of a very old formation. It differs from the present specimen chiefly in having a greater amount of garnet and less biotite.

This rock is also a common constituent of the Grenville and other metamorphic series.

NO. 3. OLIVINE DIABASE.

This rock consists essentially of plagioclase, augite and olivine, with a few grains of iron ore as an accessory constituent. While apparently semi-crystalline it probably possesses an ophitic or true diabasic structure.

The feldspar is for the most part fresh and well preserved and occurs both as lath-shaped crystals enclosing triangular areas of augite and other minerals, and as minute individuals of the same form in a dark groundmass. A few of the larger

crystals show incipient alteration to calcite. These may be orthoclase, but the rest are undoubtedly plagioclase.

Augite is also present in considerable quantity, generally in larger individuals. They are often penetrated by crystals of plagioclase thus proving the earlier crystallization of the latter.

One basal section is seen showing the characteristic cleavage nearly at right angles, and extinction parallel to the diagonals.

Some of the olivine crystals have been completely altered to serpentine. Both the olivine, and the serpentine which replaces it, contain inclusions of some kind of iron ore in small grains.

What is apparently the groundmass of the rock consists of minute slender plagioclase crystals, fine opaque grains probably of iron, and a light-brown glass. This is isotropic in polarized light and tends to give the rock, which has otherwise an ophitic structure, the appearance of a melaphyre.

On the other hand, while the section examined is in no part quite holocrystalline, it is very nearly so in several places and is therefore, probably, better classed as an olivine diabase.

This is a volcanic rock which commonly occurs amongst rocks of all ages from Pre-Cambrian to Mesozoic.

St. Francis College, Richmond, Que., July 29th, 1896.

NOTES ON BIRD LIFE IN AUTUMN.

By Miss A. C. TYNDALL.

Through the late summer and autumn months, there are always odd specimens of our summer visitants to be found in the woods, whom various mishaps and accidents have prevented from going south with their fellows, and though some of them may be able to join their comrades later, the question of the future with the majority resolves itself into that of a lingering death of

cold and starvation, with the pleasant alternative of furnishing a meal for an owl or hawk.

The thrushes, as a rule, appear very unfortunate in getting left behind thus, perhaps owing to the fact that they for the most part, are not as careful for their personal safety as the greater number of birds. although the robin, with all his wariness and settled distrust of his fellow creatures, is to be found as often as any on the list of the disabled ; the woodpeckers, whose variegated plumage affords such a tempting target for the small boy with the gun, are not seldom to be met with among the wounded, and even the quickwitted little house-wrens, with all their nimbleness, are not always able to avoid mishap. Some of our native sparrows are always to be found among the unseasonable sojourners in the dreary month of November, but with them it appears to be more often late moulting and its consequent ill health than any other reason, that keep them here.

As I go out on a late autumn morning to see what the birds are doing, one of the first I find, down in a little thicket on the edge of the fields, is a white-crowned sparrow, sleek and well kept as usual, with not a feather out of place; but he is a belated traveller, who was due at southern resorts, where his friends have gone, some time since, yet owing to some cause or other of detention he is only on his way there now.

A little distance away, on a fence rail, is a shivering ball of feathers which turns out on a nearer view to be a song sparrow minus the tail. He is an old bird, who is late with his moulting, and is evidently feeling far from well. The cold affects him as it does not his fellows who are in possession of their winter coats; if a shrike or sparrow-hawk should happen along now he would fall an easy prey, for he looks dull and stupid, and rustles slowly off through the dead leaves on my approach, as if he does not much care whether danger is near or not.

I found a robin in the woods one autumn day, who appealed strongly to my sympathies. He had been brought down from

his high estate as one of the birds of the air by a broken wing, and had nothing else to look forward to than spending the rest of his life on the ground, enduring the increasing cold, and keeping out of the sight of hungry birds and beasts of prey as best he might. Poor Robin, he was perched on a dead branch projecting from a pile of brushwood on the sunny side of when I found him, and looked very forlorn and disconsolate, as well he might. He was comparatively comfortable then, the day not being very cold, but later, when the keen winds of November would penetrate to even the snuggest nooks and corners of the thickets, this lone waif of the woods might have reason to look even more sorrowful than he did then. I captured him after a long chase, for the instinct of self preservation was still strong in him despite his hopeless look, and he ran nimbly and well. The large bone of the wing, near the joint where it curves downward, had been broken by birdshot, and for his misfortune there was no cure.

Another unfortunate that I met with in a late summer's tramp, was a crippled olive-backed thrush, who seemed as far as I could judge to be suffering from paralysis, or some such affliction, the one side of the bird being shrivelled and withered to mere skin and bone while the other was plump and well proportioned, and a post mortem examination revealed not a wound or bruise that might have caused such a condition, not even a feather being out of place; though his means of locomotion were confined to one leg and one wing.

Such a case a this is rare, but most of the birds to be found in the woods at this time of year appear to suffer more or less from the changed conditions of life at this season, and to feel the dreariness of the short days and long cold nights much as we ourselves do. The most cheerful sounds to be heard in the woods at this time of year, are the clear, if somewhat shrill, notes of the woodpeckers, which have in them a suggestion of

health and strength to meet winter's hardships to be heard in few other bird voices.

The various little finches, and most of the smaller birds who pass the winter with us, are more or less plaintive-voiced, and even the notes of the ever busy and lively little chickadee, coming through the deserted woods on a late autumn day, never fail to remind one of the gloomy season.

SOIL INOCULATION BY NITRAGIN.

By F. T. SHUTT, ESQ., M.A., F.C.S.

Discoveries of the greatest importance to the farming world have of late years resulted from the application of chemistry and bacteriology to the solution of agricultural problems. Notable among these has been the demonstration by the celebrated German scientist, Hellriegel, that the free nitrogen of the atmosphere may be utilized by members of the leguminosæ (clover, peas, beans, etc.) through the agency of certain micro-organisms present in the soil. As far as we are aware, only plants of this botanical order can make this use of atmospheric nitrogen, and their ability to do so depends on the presence of these minute organisms that live in nodules upon their rootlets. The establishment of this fact is not merely of scientific importance; it has a practical and commercial aspect of great value. It has shown the way to soil enrichment in one of the essential and indeed the most costly element of plant food.

Perhaps the most economical method of increasing the percentage of available soil nitrogen is at present by plowing under a growing crop of one of these plants, for the nitrogen they possess has for the most part been gathered from the air. Day by day they have stored this nitrogen in their roots, stems and

leaves, and this they furnish, when plowed under, in an available form as food for succeeding crops—a princely legacy to future generations of plants.

When the nodules and their inhabitants are not present, clover, peas, etc., must, like all other plants, obtain all their nitrogen from the soil. Further, it is to be noted that these micro-organisms are not to be found in all soils. The question of introducing them economically, therefore, naturally presents itself as one worthy of research.

The first experiments towards this end consisted in taking soil from a field upon which a legume possessing an abundance of nodules had been grown, and sowing it on the field to be impregnated. This was practically soil inoculation and, though the plan proved eminently satisfactory, the carrying out of it was in many instances costly and cumbersome. Dr. Nobbe, of Tharand, Saxony, was the one who first made this practical application of Hellriegell's discovery. He, however, did not stop there, but as we now have to chronicle, he prepared "pure cultures" of these nitrogen-converting organisms, by methods well known to bacteriologists. These cultures or preparations are now made on a commercial scale, so that a sufficient quantity to inoculate an acre can be bought in Germany for $1.25. The members of the leguminosæ have, it would appear, each their own peculiar bacteria or micro-organisms; and it has been shown that those influencing the assimilation of nitrogen in the clover plant are of no value for the pea crop, and vice versa. Hence the necessity for the preparation of cultures of clover bacteria, pea bacteria, and so on; and these must be used according to the effect desired, or, in other words, according to the crop to be sown.

These cultures consist of "colonies" of these organisms and the preparation has been named *Nitragin*. The practical application of *Nitragin* has been tried in two ways: first, by

diluting it with sufficient water and sprinkling the seed with the fluid ; and secondly, by treating a quantity of soil with a dilute solution of the preparation, allowing the soil to dry and then spreading it evenly over the field to be inoculated, which is then deeply harrowed

It is yet too soon to speak of results, but the probabilities are that the experiments now being carried on in Germany and England with this agent will prove successful. The knowledge of the conversion of inert nitrogen by the instrumentality of bacteria and the legumes into a form readily convertible for the growth of cereals, root crops and fruits, is certainly the most valuable gift that science has made to agriculture this century, and Dr. Nobbe, if successful in his experiments, will have earned the thanks of the farming community for giving them a practical application of this knowledge—a cheap method of entrapping this, as far as most farm crops are concerned, valueless nitrogen.

BOOK NOTICE.

ECONOMIC ENTOMOLOGY *for the Farmer and Fruit-growers and for use as a text book in Agricultural Schools and Colleges ;* by John B. Smith, D. Sc.

Practical Entomology, or the study of insects and their life-histories with a view of controlling or preventing altogether the ravages of such species as injure cultivated crops, may be called a new science. In no country has so much good work been done in this line as in North America so that to-day it may be fairly said that any farmer or gardener in the United States or Canada who finds his crops are being injured by insects pests can, upon applying to accessible authorities, be pretty sure of receiving reliable information as to the best methods to adopt to

save loss. Extensive as the losses from insects undoubtedly are every year, there was not until the present time any one book in which a farmer could hope to find mentioned all the common pests that come before him in his yearly operations. This conspicuous want has now been supplied by Dr. J. B. Smith, the Entomologist to the New Jersey Agricultural College and Experiment Station, and Professor of Entomology at Rutger's College. Dr. Smith has been for many years one of our leading authorities on practical entomology so that the present work gives not only what is well known about the insects treated of, but contains also the latest results of his own long experience. In his introduction the author points out that Economic Entomology is a science as yet hardly systematized, made up of fragments published in different places and frequently contradictory as to remedial measures suggested.

There have been books of information concerning insect enemies of certain crops or kinds of crops, but no one work gave the agriculturist and the student of economic entomology the basic knowledge that would enable him to recognize the nature of an insect he found causing injury or to decide what kind of remedies against it should be applied.

The present work consists of three parts: the first is devoted to Structure and Classification of Insects, and contains a chapter on their Growth and Metamorphoses. The second and main part of the volume is entitled the Insect World, and gives a succinct and well-balanced account of all the different natural orders into which insects are divided. Here are found mentioned in their proper places and for the most part illustrated with excellent figures, all the well-known injurious species, together with indications of the best remedies. In this division the author acknowledges assistance in the preparation of the chapter on Hymenoptera from Dr. L. O. Howard, the U. S. Entomologist, and in that on Orthoptera from Prof. Lawrence Bruner. The

third part is given up to a consideration of Insecticides, Preventives and the machinery used by the economic entomologist. An interesting chapter treats also of Predaceous and Parasitic Insects and Fungous Diseases.

Prof. Smith's book is an octavo volume of 481 pages published by the J. B. Lippincott Co., of Philadelphia, and therefore well printed on good paper and well got up generally. There is a profusion of excellent illustrations (483), many of which were prepared specially for this work.

We feel assured that this useful work by our esteemed corresponding member will be gladly welcomed by the large number of farmers, gardeners and students who are so frequently applying to booksellers and others for a work of this nature upon economic entomology. J. F.

NOTES, REVIEWS AND COMMENTS.

A. A. A. S.—The forty-fifth meeting of the Amer. Assoc. Adv. Sc. was held in the City of Buffalo, N. Y., on August 22nd to 29th, 1896, but was not as well attended as usual. The meeting is reported an excellent one. Among the Canadians present were: Mr. J. F. Whiteaves, Palæontologist and Zoologist, Geological Survey of Canada, Ottawa; Prof. John Galbraith, University of Toronto, Toronto, Ont.; Dr. James Fletcher, F.R.S.C., F.L.S., Entomologist, Central Exp. Farm, Ottawa; Dr. Bethune, Port Hope, Ont.; Mr. A. F. Hunter, Barrie, Ont; Henry Lampard, Esq., Montreal; John Craig, Esq., Central Exp. Farm, Ottawa.

One of the most interesting features of the meeting was the tribute paid to the venerable geologist and palæontologist, Prof. James Hall, State Geologist of New York for the past sixty years.

We extend to Prof. Hall our sincere congratulations from this side of the line and do ourselves much honour in joining the number of those who have testified to the marvellous amount of work done so well by such a distinguished student of science. His is an unprecedented career in which we all rejoice. H.M.A.

CANU. F.—"*Essai de Paleogeographie.*" Atlas, Paris, 1895. This is a very interesting volume giving the restoration of the contours of ancient seas in France and adjoining countries. It treats of the geographical outline of that country in each successive period beginning with the Devonian period through the Carboniferous, Permian and Triassic times on to more recent periods, shows the encroachment and recession of the Mediterranean Sea and Atlantic Ocean margins—also the various lands and islands of those bye-gone seas. It is a remarkably fine work of reference for similar researches and deductions in other countries. H.M.A.

OTTAWA FIELD-NATURALISTS' CLUB.

LAST EXCURSION OF THE SEASON TO GALETTA, ONT.

SEPTEMBER 26.—The third and last excursion of the season was held to Galetta and Marshall's Bay on the Mississippi and Ottawa rivers respectively, where a pleasant and enjoyable time was spent in the untrodden paths of nature. The party left Ottawa by 8 a.m. train over the Ottawa Arnprior & Parry Sound Railway, and passed through the townships of Huntley, March and Fitzroy. At Carp station a short halt was called to allow the members present to examine the Pleistocene gravels occurring immediately south of the station and to collect some of the fossil remains entombed in them. Shortly after this the pretty little village of Galetta was reached and the road taken

leading to the left bank of the Mississippi river which was followed down to its mouth, at Marshall's Bay. In the absence of the president, Dr. H. M. Ami was in charge of the party, and before scattering in the woods and forest adjoining gave out the programme of the day, pointing out the leaders who would take charge of the various branches of the Club's work. Mr. W. J. Wilson of the Geological Survey led the geologists and before evening was able to report some very good finds. Principal Honeyman, of the Aylmer Academy, led the botanists and furnished the Editor of the OTTAWA NATURALIST with an interesting list of the species of plants observed and collected during the day. Miss G. Harmer took charge of the department of Ornithology and answered any question put to her regarding the feathered denizens of the forest observed. The Mississippi river was found to teem with recent shells, several species of Unios and other forms having been noted. At noon a halt for lunch was made on the shore of Marshall's Bay. After a tramp of between five and six miles the party reassembled at the lovely pine grove just west of the village Here the customary remarks on the finds of the day were made by the leaders. Dr. Ami congratulated the members present on the result of the day's outing inasmuch as the contents of the collecting basket, vasculum and press were numerous and interesting. He remarked that this was a truly naturalists' excursion because every member present had been an ardent naturalist and had collected specimens or done something to promote the object of the Club.

Mr. W. J. Wilson was then called upon and described the geological formations characterizing the Post-Tertiary System met during the day. The species of marine shells obtained at Carp station comprised the following: *Saxicava rugosa*, Linnaeus; *Macoma fragilis*, *Fabricius*, besides the cirripede: *Balanus crenatus*, Bruguière.

These were found in a coarse gravel made up, for the most part, of Archaean débris. Boulders of crystalline lime-

stone, of diorite, granites and gneisses were seen imbedded in an arenaceous matrix and associated with the remains of marine shells above enumerated. At Moore's Corners, a little to the south-east of Galetta, the Geological section examined an interesting sand and clay terrace which was found to hold also remains of sea shells. *Macoma fragilis*, Fabricius and *Saxicava rugosa* Linnæus were the only two species observed but they occur in great abundance. In the bottom of the valley of the Mississippi river, the Archæan rocks are beautifully striated and glaciated wherever a fresh outcrop occurs. These glaciated Archæan rocks are themselves overlain by "boulder clay" or "till." Over the "boulder clay" we found stratified sands, probably of marine origin, and these sands in turn overlain by marine clays. No fossil remains were found in the clays or underlying sands but in the uppermost sands the marine shells occurred. Below the village of Galetta the glacial striæ were observed by Mr Wilson to run in a general north-west and south-east direction. The drift boulders were all Archæan.

On behalf of the section of botany Principal Honeyman followed and in the course of his remarks stated how pleased he was to be a member of the Club. It was the first excursion which he had attended as yet but he had enjoyed himself and obtained quite a series of plants which he had not formerly in his herbarium. His former field of botanical studies was in the Richmond district of the Eastern Townships of Quebec. The plants observed this day, were most interesting and comprise the following:

Ranunculaceae.

Anemone Pennsylvanica,	Ranunculus acris,
R. Pennsylvanicus,	R. Flammula var, reptans.

Compositae.

Artemisia vulgaris,	Bidens cernua,
Helenium autumnale,	Erigeron Canadense,
E. Philadelphicum,	Achillæa millefolium,
Anthemis Cotula,	Taraxacum dens-leonis.

Rosaceae :

Spiraea tomentosa,	Potentilla argentea,
P. fruticosa,	P. Norvegica.

Besides the above the following were noted, recorded or collected between Galetta and Marshall's Bay :

Solanum nigrum,	Gentiana Andrewsii,
Echium vulgare,	Euphorbia maculata,
Zanthoxylum Americanum,	Hypericum mutilum,
Ilex verticillata,	Cephalanthus occidentalis,
Viburnum lentago,	Oenothera pumila,
Portulaca oleracea,	Ampelopsis quinquefolia,
Vitis riparia,	Monotropa unifloram,
Trifolium pratense,	Cannabis sativa,
Xanthium Canadense,	Lepidium intermedium,
Capsella bursa-pastoris,	Osmunda regalis,

Myrica Gale.

Miss Harmer then addressed the members present on behalf of the leaders in Ornithology. The various species of birds observed during the day were noted ; for the most part as birds of passage. A number of questions were put to Miss Harmer who replied to each one in turn. The interest manifested in this branch of the Club's work is very encouraging.

Dr. Ami then gave a brief outline of the results obtained and described certain features in the geology of Galetta. The party left by the 17.27 train for home and arrived in the capital shortly after 18 o'clock, having thoroughly enjoyed the day's outing in the westerly limits of the County of Carleton.

H. M. A.

October 30th, 1896.

NEW MEMBERS.

Hon. G. W. Ross, M.P.P., Toronto, Ont.; Prof. Leigh R. Gregor, M.A., Ph. D., Montreal, Que.; D. A. Campbell, Esq., Ottawa Collegiate Institute, Ottawa ; Mrs. G. B. Burland, Montreal, Que.; Miss F. Morris, Ottawa.

THE OTTAWA NATURALIST.

VOL. X. OTTAWA, NOVEMBER, 1896. No. 8.

NEW SPECIES OF GRAPTOLITES FROM CANADA.

By HENRY M. AMI.

In the January-February issue of the "*Journal of Geology*," Vol. IV, pp. 63—102, IV and V, Chicago, 1896, Dr. R. R. Gurley of the U. S. Geological Survey gives an interesting list of the species of graptolites of North America. In this list are included several species of Canadian graptolites from various formations and localities, which are new to science. Two new species of Crustacea are also described by Dr. Gurley. The following notes indicate the locality and horizon from which these new species were obtained.

A—From Point Levis, Quebec, in the shales of *Levis* age (Arenig).

1. Dichograptus remotus,
2. Tetragraptus acanthonotus,
3. Didymograptus bipunctatus,
4. Leptograptus macrotheca,
5. Desmograptus macrodictyum,
6. Dictyonema perexile,

B—From Magog, Quebec (In the Upper Dicellograptus zone).

7. Dicranograptus ramosus, Hall, var,
8. Dicranograptus Nicholsoni parvangulus,
9. Climacograptus caudatus, Lapworth,
10. Climacograptus caudatus, var. laticaulis,
11. Climacograptus oligotheca,
12. Climacograptus kamtotheca,
13. Diplograpsis (*sic*) stenosus,
14. Dendrograptus unilateralis,

C—From Matanne, River St. Lawrence, Quebec, ("Upper Cambrian").

15. Bryograptus multiramosus,

Besides these fifteen new species of Rhabdophora and Cladophora, there are four more new species described, viz: two species of Nicholson's genus Dawsonia and two species of Crustacea, referable to the genus Caryocaris. There four are all from Point Levis, Quebec.

D—From Levis, Quebec, (in shales of the *Levis* formation).

16. Dawsonia monodon,

17. Dawsonia tridens,

Crustacea.

18. Caryocaris oblongus,

19. Caryocaris curvilatus,

With the exception of the last two above mentioned species, the new forms described by Dr. R. R. Gurley are well represented in the collections made by James Richardson, T. C. Weston, R. W. Ells, W. E. Decks, Sir William Dawson, A. P. Low, N. J. Giroux and the writer for the Geological Survey of Canada, Ottawa, and for the Peter Redparth Museum of McGill College, Montreal.

Our Canadian graptolites certainly need revision and it is earnestly hoped that before long some one will be allowed to undertake the task of bringing our knowledge of this most important group of palæozoic fossils and its classification up-to-date.

There are few classes of fossils in the Palæozoic sequence of strata which afford better evidence of the exact age to which to refer the formations from which they are derived than graptolites, and their study is of more than ordinary value for the proper understanding of the true relations of the older and greatly disturbed and at the same time very fossiliferous strata of the Lower St. Lawrence, in that series of strata better known as the "Quebec Group" of Logan and Billings, a series quite natural in its development and wide in its distribution. Furthermore, this Quebec series abounds with the remains of graptolites and the new species described by Dr. Gurley are evidence of the amount of new

material which has been brought to light within the last few years. There is perhaps no country in the world which can boast of as many and as well preserved species of graptolites, than Canada. Since Hall's magnificent Decade* the discoveries have afforded a great deal of new and interesting material which we hope soon to see put together in accordance with the latest approved classification. Just as the study of graptolites in Great Britain and Sweden by Prof. Lapworth, Fullberg, and others has been found most helpful in determining zones and horizons in the highly disturbed and problematical regions of those countries, so in Canada the proper understanding of our various zones of graptolites in the Lower St. Lawrence Valley would materially assist in settling the vexing, perplexing, and exceedingly intricate problems in stratigraphical geology.

NOTES ON THE FRUITING OF SOME TREES AND SHRUBS AT THE CENTRAL EXPERIMENTAL FARM, OTTAWA, 1896.

By W. T. MACOUN.

AESCULUS FLAVA, Ait. (Sweet Buck-eye).

One tree of this species has fruited quite freely at the Experimental Farm during the past two years. It is not at all iujured by our winters, although, according to Gray, its range does not extend north of the State of Ohio.

PLATANUS OCCIDENTALIS, L. (Button-wood).

Although this tree is not found growing wild anywhere in Canada except in Western Ontario, it is quite hardy at Ottawa One tree fruited last year and again this season.

JUGLANS SIEBOLDIANA, (Maxim.) Japanese Walnut).

This tree is perfectly hardy at Ottawa. It resembles the butternut very much in general appearance but the fruit is like

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*Can. Organic Remains, Dec. II., Geol. Survey, Canada, Montreal, 1865.

a walnut and about half the size of *Juglans nigra*, (Black Walnut). Quite a number of nuts were obtained off two trees eight years of age, this year.

JUGLANS NIGRA, L. (Black Walnut).

It is interesting to note that the first fruiting of these trees at the Central Experimental Farm occurred this year. The trees are nine years of age.

CASTANEA SATIVA, Mill., var. AMERICANA, Wat. and Coult. (American Chestnut).

The American Chestnut has proven fairly hardy at Ottawa and this year fruit was formed, though not fully matured, on a tree nine years of age in the Arboretum.

CALYCANTHUS FLORIDUS, L. (Carolina Allspice).

Though not quite hardy at Ottawa, this pretty little shrub, with its dark-red flowers and sweet-scented leaves, has fruited for the past two seasons. Seeds were sown this year and it is hoped that some hardier shrubs will be the result.

PYRUS JAPONICA, Thunb, var. MAULEI (Japanese Quince).

This is a smaller shrub than *P. Japonica* and much hardier than the species. It is a very free bloomer and sets its fruit well. A hedge of this variety was rendered quite attractive this autumn by the yellow quinces which were quite abundant and whose spicey odour when picked was very perceptible.

PYRUS BACCATA, L. (Berried Crab).

An attractive, compact little tree at all seasons of the year. In the spring it is a mass of pink-tinted blossoms and in the autumn the fruit hangs so thickly on the branches and is so well coloured that it remains quite ornamental even after the leaves have fallen.

ELÆAGNUS ANGUSTIFOLIA, L. (Russian Olive).

A small, hardy, ornamental tree, sometimes shrub-like, with silvery leaves and sweet-scented yellow flowers, which has fruited quite freely at the Experimental Farm during the past two seasons. The fruit somewhat resembles that of our native species *E. argentea*.

NOVEMBER NOTES FROM THE ARBORETUM AT THE CENTRAL EXPERIMENTAL FARM.

By W. T. MACOUN.

At this season of the year when the deciduous trees and shrubs have lost their foliage and much of their beauty, there yet remain in the fruit and bark colourings of some of them, interesting and delightful studies for the botanist, and means whereby, perhaps an otherwise unpicturesque landscape may be made more pleasing. The evergreens also are now thrown into greater relief by the bareness of the deciduous trees; their graceful forms are seen to the best advantage, and their charming and varied colours, while not so bright, perhaps, as during the growing season, yet they have their characteristics peculiar to winter and are more noticeable through contrast with their surroundings.

In the Arboretum at the Central Experimental Farm, a number of shrubs are looking very attractive at present, with their masses of bright fruit. Now that the leaves have fallen the Barberries are displaying their scarlet fruit; the little *Berberis Thunbergii*, DC., from Japan, outrivalling all others by the brightness and abundance of its berries.

That charming native climber *Celastrus scandens*, L. (Climbing Bitter-sweet), which, with its pretty green leaves, is so noticeable in our woods in summer is a mass of bright coloured fruit while a Japanese species, *C. articulatus*, Thunb, with smaller and more delicately shaded fruit is fully as attractive.

The so-called High-bush Cranberry, *Viburnum Opulus*, L. is now loaded with its bright red, tart berries and being a large shrub is very ornamental.

The several species of Euonymus are looking very pretty with their pink and crimson fruit, which hangs gracefully on slender peduncles. A quite striking species, *E. alatus* was added this year, with very rough or winged bark, and, if hardy, will prove a valuable acquisition to the ornamental shrubs.

Another shrub, very attractive at this season of the year, is *Lycium chinense* with much larger and brighter berries than

Lycium vulgare. Shrubs of this species planted in the arboretum last spring fruited this season, though sparingly.

Many trees and shrubs in the arboretum are too young yet to fruit well, but several more species recently planted should make the arboretum attractive at this season, next year.

The bark of several species of Dog-wood (*C. alba ; C. alba siberica, C. sanguinea, C. stolonifera*) has now assumed that bright red colour peculiar to these species during the winter months which makes them ornamental at that season of the year. A variety of *Cornus stolonifera* with yellow bark obtained from the Arnold Arboretum, Boston, is very interesting.

The bark of the willows also has now its winter colouring ; that of the species know as *Salix Voronesh* being particularly bright and ornamental.

OBITUARY.

CHARLES WACHSMUTH, Palæontologist—Fellow, of the Amer. Assoc. Adv. Sc., of the Geol. Soc. of America and of the Iowa Academy of Science ; a corresponding member of numerous domestic and foreign societies, died at Burlington, Iowa, Feb. 7th, 1896. He was born in Hanover, Germany, Sept. 13th, 1829. He came to America in 1852 and after 1865 devoted his attention to fossil remains and especially crinoids, in which group he was soon the recognised authority. Together with Frank Springer, a young lawyer at Burlington, they obtained a vast amount of fine material and gave the world the benefit of their researches which culminated in the handsome "Monograph of the Crinoidea Camerata of North America," published by the "Museum of Comparative Zoology," containing 800 pages and an atlas of 83 plates comprising upwards of 1500 illustrations, 1895. For a list of his principal scientific works the reader is refered to the *American Geologist*, p. 136, Vol. XVII, No. 3, March, 1896. Canada and Canadian students in *Palæocrinoidea* owe a great deal to the late Charles Wachsmuth, for the valuable notes and critical information received from time to time. He will be greatly regretted by a large circle of friends and acquaintances as well as by a large number who know him only by his "good works."—H. M. A.

ENTOMOLOGY.

A BUTTERFLY-CATCHING SPIDER.—Every one who is fond of flowers must frequently have noticed the pretty yellow or white spider with a red line down each side of the body which frequently lurks inside open flowers to seize the unwary fly, bee, or other insect, attracted by the nectar of the blossom, This spider known as *Misumena vatia* seems to have the power of changing its colour to some extent, for when found in a white Trillium it is nearly always white, but when in an Erythronium, the colour of the body is as yellow as that of the flower. It is seldom that an insect larger than a honey-bee is found in the fatal embrace of this insect; but Dr. Ami sent me in September two specimens of Argynnis Atlantis, a large, strong-winged butterfly expanding two and a half inches, which he found in the clutches of *Misumena vatia* at Hopewell, Nova Scotia. It is probable that these butterflies were in a somewhat weakened condition owing to the lateness of the season.

This interesting little spider belongs to the family of "Crab Spiders, (*Thomisidæ*), so called on account of the short broad form of the body and the curious fact that they can walk more readily sideways or backward than forward. The Crab spiders spin no webs, but lie in wait for their prey. They live chiefly on plants and fences and in the winter hide in cracks and under stones and bark Most of the species are marked with gray and brown like the bark upon which they live. Some conceal themselves in flowers where they lie in wait for their prey. One of the best known members of this family is the insect under consideration, the female of *Misumena vatia* (Comstock.)—J. F.

SPHÆRIDIUM SCARABÆOIDES.—This rare beetle has again been taken by me at Kingsmere, Que., this time in considerable numbers. Last season, when I took it for the first time, I sent a set to Dr. H. F. Wickham who is writing that

most invaluable series of articles on the Coleoptera of Ontario and Quebec for the Canadian Entomologist. In acknowledging receipt, he said :—" They are the first *native* specimens I have seen and form a very acceptable addition to my collection."

I shall be happy to supply, gratuitously, specimens of this beetle to any reader of the NATURALIST applying to me for the same, as long as my spare material lasts.—WILLIBERT SIMPSON.

NOTE.—Our Entomological readers will do well to accept Mr. Simpson's generous offer promptly. In the classification of the Coleoptera of North America by Drs. Leconte and Horn published in 1883, it is stated "a specimen of the European *Sphæridium scarabæoides* has been found in Canada The species is undoubtedly introduced, and accidental in occurrence." It is probable that it is now well established, for in 1894 I received a specimen fron Ste. Scholastique, Que., and on May 24th, 1895, in company with Mr. Harrington, I found it abundant at Casselman. Mr. Simpson now records it as in considerable numbers within ten miles of Ottawa. I have been so far unable to find it at Ottawa.—J. F.

EATON, LUCY C.—" *The Butterflies of Truro, N. S.*—Trans. Nova Scotian Inst. Science, Vol. IX, Part I, pp. XVII—XXI, 1896.

To this paper is appended additional notes on the same subject by Mr. Piers, pp. XIX—XXI, *(ibid).*—H. M. A.

BOTANY.

WAGHORNE, REV. A. C.—*The flora of Newfoundland, Labrador and St. Pierre et Miquelon :* Pt. II.

Part I. of this interesting contribution to our knowledge of the plants in Eastern British North America was published in the Trans. of the Nova Scotian Institute of Science, 1893, Vol. I., p. 359, including the Polypetalæ as far as the Leguminosæ. Part

II. completes the polypetalæ and adds forms recognised since the first paper was published. The list affords a few additions to those plants included in Prof. Macoun's "Catalogue of Canadian Plants" mostly from the collections of Moravian missionaries in Northern Labrador. Dr. Eaton, of Yale, New Haven and Prof. Fowler of Queen's Univ., Kingston, Ont., have named most of the 1864 collections. Part II. occupies pp. 84—100, of the Trans. Nova Scotian Inst. of Science, 1869.—H.M.A.

NOTES ON *Cyperus Esculentus* IN ONTARIO.

In the County of Elgin (Mount Salem) is grown a "nut"—Chufa—said to have been introduced from South America.

The nuts are the edible tubers of *Cyperus esculentus*, a native of the shores of the Mediterranean. The taste is a cross between a cocoanut and a chestnut. It is planted in hills like potatoes and is very prolific. Before planting it is soaked for a fortnight in water.

Mons. Vilmorin in his fine work the "Vegetable Garden" says of this plant: "Roots brownish, very numerous, tangled and intermixed with underground shoots, which are swollen into a kind of small scaly tubers of a brownish colour, and with white floury, sweet flesh. The tubers or "nuts" are gathered in October or November. They may easily be kept through the winter if stored in a dry place, sheltered from the frost, and in drying become sweeter and more agreeable to the taste than when eaten newly gathered. The tubers are eaten raw or parched."

It seems questionable whether this "*Cyperus esculentus*, Govan" of M. Vilmorin's book can be the same as *C. esculentus*, Linn. of Macoun's Catalogue, one of our native sedges formerly known as *Cyperus phymatodes*, Muhl. and growing in abundance at the base of Parliament Hill.

Chufa is a Spanish word applied to this plant and also to the pea-nut. In German the two plants are called respectively, *Erdmandel* or *Erdkastanie* and *Erdnuss*.—OTTO J. KLOTZ.

CUSHING, HAROLD B., (B. A.)—"*On the ferns in the vicinity of Montreal.*" Can. Rec. Sc., 76 pp. October, 1895.

Amongst the species recorded we note as of special interest :—

Dicksonia pilosiuscula, Willd. *Asplenium angustifolium*, Michx. and *Camptosorus rhizophyllus*, Link.—H. M. A.

PINUS BANKSIANA.—Several small trees or shrubs were found about half a mile south of Aylmer, in the pine grove between the railway track and the river.—H. A. HONEYMAN, Aymer Que.

ORNITHOLOGY.

Near St. Thomas recently a farmer shot in his orchard a Turkey Buzzard (Cathartes aura). Although met with in the extreme western part of the Ontario peninsula, this southern bird is seldom seen east thereof in Ontario.

Montague Chamberlain in "Canadian Birds" 1887, speaks of it as abundant on the plains and fairly common in the Southern portions of British Columbia. It occurs regularly at the St. Clair Flats but east of that is only accidental. A few specimens have been taken at Grand Manan and Mr. Philip Cox reported the occurrence of two at the mouth of the Miramichi River in the Gulf of St. Lawrence.—OTTO J. KLOTZ.

NUTTALL, THOS. AND MONTAGUE CHAMBERLAIN.—*Nuttall's Handbook of Birds. A Oopular Hanabook of the Ornithology of Eastern North America.* Vol. I., *Land Birds.* Vol. II. *Game and Water Birds.* Second edition, with corrections and additions. Little, Brown, & Co., Publishers, 254 Washington Street, Boston. Illustrated with one hundred and seventy-two beautifully engraved figures, two coloured frontispieces, and twenty exquisitely coloured plates, containing one hundred and ten full-length figures of the most important land and water birds. 8vo. Cloth, extra, gilt top, $7.50.

A series of twenty large coloured plates, containing one hundred a ten figuaes of birds, has been added to the present edition. The drawings have been carefully made from the best authorities, and the illustrations printed in colours by Koerner & Hayes, of Buffalo.

This handy and easily understood, as well as popular work, including all of Nuttall's delightful descriptions of bird-life was some time since fully annotated by

Montague Chamberlain, and will be found more useful and valuable than ever before.

One of our exchanges, *The Auk*, says of it :—"It is a work so charmingly written, and so true to Nature that it has never ceased to win admiration and serve as an inspiration to bird-lovers.

We commend this work to all our ornithological friends.—The Editor.

GEOLOGY.

MATTHEW, G. F.—"*On the occurrence of Cirripedes in the Cambrian rocks of North America.*" Trans. N.Y. Academy of Science, Vol. XV., pp. 137—140, 1896. The new species described are :—

(1) *Plumulites manuelensis*, from the sub-zone of *Paradoxides Davidis*, at Manuel Brook, Newfoundland.

(2) *Cirripedites Acadicus*, (new genus and new species), from the sub-zone of *Paradoxides Eteminicus*, St. John, N. B.

Dr. Matthew furnishes two figures of these species and promises a more extended description in the near future.

H. M. A.

MATTHEW, G. F.—*Traces of the Ordovician System on the Atlantic Coast and organic remains of Little River No. IV.*" Trans. Roy. Soc, Can. 2nd Sec., Vol. I., Sect. IV., pp. 253—279.

Dr. Matthew first reviews the discoveries of fossils made in older palæozoic strata in the maritime provinces by Gesner, Dawson, Honeyman, Hall, Salter and others. He draws attention to the fact that "no trace of an Ordovician fauna had been obtained" in Acadia until 1880, when "fossils of this age" were found in certain quartzite and siliceous slates on the Beccaguimic River in the North Western part of New Brunswick." In 1885 Mr. H. M. Ami gave a preliminary list of the fossils found and these were incorporated in Dr. Bailey's report.* Dr. Matthew then proceeds to describe the fossils "more recent than the Cambrian"

*Rep. Progr. Geol. Sur. Can. Rep. G. p. 25, Montreal, 1885.

for the most part from collections made by Messrs. Weston and Robert iu Cape Breton. These are as follows :—

1. *Lingulella Selwyni :* McFee's Point, George R., Cape Breton collected in 1886 by Messrs. Weston and Robert, late of the Geol. Survey.

2. *Lingulella Roberti :* McFee's Pt., George R., Cape Breton. Weston and Robert, 1886.

3. *Lingula Howleyi*, N. sp., Kelly's I., Conception Bay, Nfld. in eompany with Lingula Billingsi, Whiteaves.

4. *Lingulobolus affinis*, Billings sp. Great Bell Island, Nfld.

5. *Lingulobolus affinis, var. cuneatus*, N. var.; Great Bell Island, Conception Bay, Nfld.

6. *Sphærobolus spissus*, Billings sp. Great Bell Island, Nfld,

7. *Clitambonites (Gonambonites) plana*, Pander, var. *retroflexa*, de Verneuil. McFee's Pt., George R., Cape Breton, in company with Lingulella Selwyni ; collected by Messrs. Weston and Robert.

8. *Hyolithes* cf. *tenuiradiatus*, Linrs. McFee's Pt., George R., Cape Breton.

9. *Holasaphus centropyge*, N. sp. McFee's Pt., George R., Cape George, Weston and Robert, 1886.

It will thus appear that Dr. Matthew has added two new genera of brachiopoda and one new trilobite to the fauna of our early palæozoie seas. The exact age to which these fossils are referable is a point to be investigated and Dr. Matthew's excellent work is a decided step forward.—H. M. A.

TYRRELL, J. BURR—"*Is the land around Hudson Bay at present rising?*" Amer. Journ. Science, Vol. II, September, 1896, pp. 200-205.

The conclusions arrived at by Mr. Tyrrell may be summed up in his own words, as follows :—"After carefully considering what we know of the present and former height of the water . . . I am forced to conclude that evidence of the rising of the land

drawn from the fresh appearance of the post-glacial beaches from the height of driftwood, from the silting of the mouths of rivers that flow swiftly through alluvial plains or from the tales of the Indians who would doubtless regard the formation of a sand-bar as the receding of the the waters, is delusive, and that the post-glacial uplift of this portion of the shore of the Hudson Bay has virtually ceased, and that the land has now reached a stable or almost a stable condition."

In a previous issue of this magazine, (March No.), Dr. Bell holds the view that the shores of Hudson Bay are rising. His paper is entitled: "Proofs of the rising of the land around Hudson Bay."—H. M. A.

LAMBE, L. M.—*Description of a supposed new genus of Polyzoa from the Trenton Limestone at Ottawa.*" Ex. Can. Rec. Science, Jan. and April, 1896.

In this short paper Mr. Lambe describes a fossil from the Trenton Limestone of Hull, P.Q., suggesting for it a new genus Astro porites, and giving it the specific name A. Ottawaensis. It is stated to "approach most closely to the *Fenestellidæ*," but at the same time to differ considerably from any other known Polyzoa. A plate with three figures beautifully drawn by Mr. Lambe himself illustrates the paper, and shows some of the principal characters of this interesting new form.—J. B. T.

VAN INGEN, GILBERT AND THEODORE G. WHITE—"*An account of the summer's work in geology on Lake Champlain.*"

Trans. N.Y. Academy of Science, XV. pp. 19—23 Oct. 28, 1895 re-issued as part of contributions from the Geol. Dept. of Columbia University, No. XXXIV. This part also contains.

WHITE, THEODORE G.—"*The faunas of the Upper Ordovician strata at Trenton Falls, Oneida Co., N. Y., (ibid.)* pp. 71—96. Plates II—V.

The *Calciferous Chazy*, as well as the *Trenton* and *Utica* formations have been studied *de novo* by Mr. White and form a most

interesting and timely contribution. These contributions are of special interest to Canadian geologists and palæontologists.

H. M. A.

CUSHING, H. P.—"*On the existence of pre-Cambrian and Post Ordovician trap dikes in the Adirondacks.*" (Reprint) Trans. N. Y. Acad. Sci., Vol. XV., Sept., 1896, pp. 248-252. This very interesting contribution follows up the good work done by Prof. J. F. Kemp in the classification of the rocks of the Eastern Adirondacks. In the "Rep. N. Y. State Geol. for 1893, Vol. I. p. 144" Prof. Kemp gave the various series of rocks met within that region. In Prof. Cushing's paper a *new* series is described and added to the already known and described Archæan series.

GEIKIE, SIR ARCH.—*Annual Report Geol. Survey and Museum of Practical Geology for 1895.*"

Contains a summary of the field work of British geologists in England and Wales, Scotland and Ireland.

ENGLAND AND WALES.—The progress made in mapping out England and Wales under their respective formations and systems is given from the Pre-Cambrian to the Port Tertiary, including work performed by Messrs. Howell, Forbes, Strangways, Watts, Bonney, E. Hill, Lamplugh, Strahan, Dakyns, Ussher, Gibson, De Rance, Gunn, Jukes-Browne, Cameron, Clement Reid, comprising most of the staff of field geologist. Appended, there is a list of papers and memoirs published by members of the Geol. Surv. of England and Wales during the year.

SCOTLAND.—Messrs. Howell (Director), Horne, Peach, Clough, Harker, Kynaston, Hugh Miller, Gunn, Grant, Wilson, Symes, Wilkinson, Hill, Barrow, Hinxman, McConnochie comprised the staff of field geologists for Scotland in 1895.

MR. TEALL has been acting Palæontologist and determined the fossils obtained by the collectors as heretofore. Mr. Teall has continued his investigations of the Lewisian, Torridonian and later rocks of the N. W. Highlands.

The Geological Survey collections are in charge of Mr. Goodchild in the Museum of Science and Art, Edinburgh.

Constant enquiries are made at the Geological Survey Headquarters for information on the distribution of minerals in different parts of the United Kingdom.

Mr. Teall's subdivisions of the "Lewisian gneiss" are worthy of note and indicate the five groups into which the various masses are referable in the so-called "fundamental complex." His scheme of classification will be found on page 18 of the "annual report."

Mr. Peach's excellent work is then described in detail regarding the Lewisian, Torridonian and Cambrian areas. The progress made in mapping the geological formations of Scotland are then given, from the oldest rocks, upwards.

IRELAND.—Messrs. McHenry, Egan, Sollas, Kilroe, Nolan, and Clark have been engaged in the revision of the geology of this part of the United Kingdom. The general map of Ireland on a scale of four miles to an inch has been completed."

Messrs. McHenry and Watts have prepared a "Handbook of the Geol. Sur. collections deposited in the Dublin Museum, which proves very useful."

PALÆONTOOLGY.—Messrs. Sharman and Newton, palæontologists and curators of fossils, report many additions. They undertook the special task of "preparing material for a revision of the geological map of Wales." Collections of fossils from Dorsetshire, Skye, Isle of Man, Cumberlandshire etc. were determined and their age ascertained.

Arctic fossils from Franz Josef Land, Antarctic fossils from Seymour Island were described by Messrs. Sharman and Newton.

A guide to the collections in the Museum is in preparation.

Mr. Rudler is the Curator of the Museum on Jermyn St., London, who reports that there were 35,228 visitors during the mornings and 14,790 during the evenings. The museum is now open every week day.

A course of lectures to workingmen in connection with the Royal College of Science was given in the "Theatre" of the Museum by Prof. Howes, Dr. Willis and Prof. Judd. The usefulness of the Geol. Survey in Great Britian is very great.

H. M. A.

LAMPLUGH, E. W.—"*The Crush Conglomerates of the Isle of Man.* Q. J. G. S. Vol. LI., Nov., 1895.

The crush conglomerates of the Isle of Man form a part of the Skiddaw slates of that island. Their stratigraphical relations and physical characters in the field are carefully described. This is accompanied by an appendix viz:

WATTS, W. W.—"*Ibid*"—Petrographical appendix; same Journal, description of thin sections, exhibiting movement structures, such as strainslip, cleavage, partial and complete granulation, distortion, ragged edges, phacoidal outline of quartz, gneiss, shredding, etc.

These features suggest very forcibly such as are present in many of the conglomerates of the fossiliferous "Quebec Group" of Logan in the valley of the St. Lawrence.—H. M. A.

BAILEY, DR. L. W.—"*Notes on the Geology and Botany of Digby Neck.*" Trans. Nova Scotian Inst. Science, Vol. IX, (Session 1894 1895), pp. 68-82, Halifax, 1896.

In this paper Dr. Bailey describes the topographical and geological features of "Digby Neck" proper, also its extension through Long and Briar Islands. Iron ores, martite, amethysts, zeolites, thompsonite, native copper, etc. are noted amongst the minerals of the district. The different zones of vegetation are then defined, and a list of 94 species of flowering plants is appended and serves to show the geographical distribution of the species in that part of Nova Scotia.—H. M. A.

SPENCER, DR. J. W.—"*The duration of Niagara Falls and the history of the Great Lakes.*" 2nd edition. The Humboldt Publ. Co., New York, date not given, but delivered to subscribers April, 1896.

Contains chapters on "The evidence of high continental elevation during the formation of the valleys of the Great Lakes, the origin of the basins of these lakes, ancient shores, boulder pavements, high-level gravel deposits; deformation of the Iroquois Beach, birth of Lake Ontario; Lundy Beach and birth of Lake Erie; deformation of the Algonquin beach and birth of Lake Huron; high level shores of Warren Gulf and their deformation." This is followed by a controversy on pleistocene subsidence *versus* glacial dams, closing with a chapter on the history and duration of Niagara Falls. Dr. Spencer estimates that 50.000 years have elapsed since the close of the "ice age."—H. M. A.

HOBBS, W. H.—"*A summary of progress in Mineralogy in 1895.*" From monthly notes in the "American Naturalist." (Dem. Print. Co., Madison, Wisconsin, 1896.)

This work forms a very comprehensive review of the progress of Minerological studies in 1895--giving the advances made in this field of research and a review of works by Fletcher, Fuess, Hecht, Behreen, Czapski, Klockmann, Groth, etc.

H. M. A.

HOBBS, W. H.—"*Die Krystallisirten Mineralien aus dem" Galena Limestone "des sudlichen Wisconsin und des nordlichen Illinois"* (Separat Abdruck aus:—Zeitschrift fur Krystallographie etc., XXV, 2 and 3.) Leipzig, 1895.

This paper is a study of the various crystalline types of minerals from the "Galena limestone" formation of the West. Calcite (Scalenohedra, rhombohedra, dog-tooth spar, nail head spar and other combinations); Zinc-blende, Lead ore, Cerussite, Gypsum, Barytes, Malachite, Marcasite and Pyrite are described and accompanied by three plates of figures and diagrams of crystalline forms of special interest.

As the galena limestones are well developed in Manitoba these crystalline forms and minerals may be looked for.—H. M. A.

GORDON, C. H.—"*Stratigraphy of the St. Louis and Warsaw formations in S. E. Iowa.*" Ex. Jour. Geol., Vol. III., 403, April, May, 1895.

BIOLOGY.

HYATT, ALPHEUS—"*Lost Characteristics*" Ex. Amer. Naturalist pp. 9—17, Jan. 1896.

This is practically a continuation of Dr. Minot's article "on Heredity and Rejuvenation"—in which the "work done by palæontologists on the loss of characteristics in the development of animals" is recorded by Prof. Hyatt. Prof. Hyatt states that the loss of characteristics is not so readily observed by the neobiologist, as by the palæobiologist, because the latter deals with series of forms often persisting through long periods of time. The limitation of palæobiological enquiry are not as great as they are sometimes held out to be, for one "does work out of the hard matrix the external skeletons or shells even of embryo corals, brachiopoda, mollusca echinodermata, etc. The work of Cope, Beecher, Schuchert and Jackson assist greatly in following such investigations.—H. M. A.

PRINCE, E. E., B. A., F. L. S.—*Special Reports on (I) Practical Notes on the culture of Trout. II Peculiarities in the breeding of Oysters. III. The Sardine Fishing Industry in New Brunswick.*" Government Report, Ottawa, 1896.

This bulletin gives practical hints on pisciculture in several directions. I. How to procure the parent trout, the number and size of the eggs, the process of artificial spawning, method of fertilizing or vivifying the eggs. Hatching trays and conditions for hatching, the time of hatching, the removal of dead eggs and management and feeding of the fry are all points carefully described and treated.

The enemies of the trout are also considered, and details of rearing ponds, the growth of salmon and the fish to be avoided by pisciculturists are given.

II. Regarding the oyster, its structure, eggs, male and female characteristics, vivifying of eggs, embryo oysters, features of the Pacific, Atlantic and English oysters are given. The fecundity of various oysters and their growth, together with breeding features are then summarised.

III. Of the Sardine Industry in New Brunswick, Prof. Prince makes interesting remarks on the method of capture of the sardines, their value, process of canning etc. and concludes by stating that in his opinion the sardines caught in the different rivers of New Brunswick and British Columbia belong to several species.—H. M. A.

BUREAU OF MINES, ONTARIO.

BLUE, ARCHIBALD—"*The Fourth Report of the Bureau of Mines*," 1894, published in Toronto, 1895, distributed May 1896. Contains a large amount of valuable information regarding the mineral production of the Province of Ontario. Gold in Ontaro forms a conspicuous chapter and includes notes on an examination of the northern part of Rainy Lake and Lake of the Woods region. The geological part of the report is prepared by Prof. A. P. Coleman who reviews and utilizes the work done by Lawson and other members of the Canadian Geological Survey. The Lake Nepigon, Lake Temiscaming and Lake Nipissing districts also come in for a share of attention and their mineral resources pointed out. Then follows a chapter on "Acetylene Gas and Calcium." It is with satisfaction that we note what is said regarding diamond drill explorations in Ontario. Care should be taken, however, to preserve the core in every instance. "Nickel and its Uses" constitute Section VI of the Report

whilst the remainder describes items of general or specific interest to mining men, such as accidents, mining schools, etc. The closes with the *fifth* report of the Inspector of Mines.

MAPS—Two maps accompany the Report and bear more particularly on the geological resources of the Rainy River district, showing all mining locations filed up to date in the Department of Crown Lands, June, 1895.—H.M.A.

Fifth Report of the Bureau of Mines, Toronto, 1895. Published by the Legislative Assembly of Ontario, Toronto, 1896.

In this report, just received, the Director of the Bureau of Mines for Ontario discusses the important and growing industry of gold mining. Besides this, the economic value and relations of nickel, copper, gypsum, salt, petroleum, natural gas, and graphite for Ontario are given.

Section II contains Dr. A. P. Coleman's "Second Report on the Gold Fields of Western Ontario" from p. 47 to p. 106. Prof. Coleman quotes extensively from Dr. Lawson's report on the "Geology of the Lake of the Woods Region," in part CC. of the Geol. Survey of Canada, Rep. for 1885 and other geological survey reports. Bag Bay, Shoal Lake, the Manitou region, Lake Wabigoon and Lonely Lake region, Sandy Lake, Lake Minnietakie, Abraham's L., and Pelican Lake, the Seine River region, Vermilion and Shoal Lake, Little Turtle River, Sheep Rock Lake with other gold locations and regions are reported upon in detail accompanied at times by diagrams and cuts showing the mode of occurrence of the various rock formations. Iron and silver locations are also described.

The report closes with chapters on the "Glacial and post-glacial deposits," pp. 87-93, quoting extensively from Dr. Dawson, Dr. Lawson, Mr. Tyrrell, Mr. Upham and other writers, adding several "stratigraphical and petrographical notes," pp. 94-105. Maps of parts of the Rainy River district, exhibiting the Seine River and Rainy Lake regions, also the Manitou, Wabigoon and

Eagle Lake District, accompany the report and are coloured geologically from information obtained from the Geological Survey at Ottawa.

Mr. Archibald Blue's contributions deal more especially with the economic and commercial interests of the province which go hand in hand with the mode of occurrence, value and best methods of working the natural resources we possess.

H. M. A.

GEOLOGICAL SOCIETY OF AMERICA.—The ninth annual winter meeting of the Society will be held in the city of Washington, D.C., on December 29th, 30th, 31st, 1896. Details of the meeting will be announced in a circular to be issued to the Fellows. H. L. FAIRCHILD, Secretary.

THE IROQUOIS HIGH SCHOOL NATURAL SCIENCE ASSOCIATION of which there was a notice in last year's NATURALIST has begun another season's work. The membership of the association is increasing and the interest taken by its members very keen. The officers form the ensuing year are, Hon. President, W. A. Whitney, M. A.; President, Principal J. A. Jackson, B. A.; Vice-President, Miss Maggie Gibbons; Sec'y-Tres., J. M. Warren, B. A.; Council, U. McAllister, J. H. Donnelly, A. E. Lidstone; Science Master, R. H. Knox, B. A.; Curator of the Museum, Geo. Clarke; Patrons, J. W. Conklin, Esq., Rev. T. J. Stiles; and Dr. C. W. Bouck. At a recent meeting of the Association the Editor of the OTTAWA NATURALIST was elected an honorary member of the Association.

EARTHQUAKE.—On the *seventeenth* day of September, 1896, at *seven* o'clock in the morning, and at Bay St. Paul, below Cape Tourmente, Que. a rather severe shock of earthquake is reported to have been very generally felt. It lasted one minute.—H.M.A.

LECTURE COURSE.

The Councils of the Ottawa Field-Naturalists' Club and Literary and Scientific Society each appointed a sub-committee to prepare a joint course of lectures to be given under the auspices of the two societies during the present winter season. The Ottawa Field Naturalists' Club was represented by Messrs. Shutt, Fletcher, Prince, Sinclair and Ami, whilst the following represented the Ottawa Literary and Scientific Society: Messrs Klotz, LeSueur, Ells, Saunders and Jolliffe.

At a joint meeting of these committees Mr. W. D. LeSueur and Dr. Ami were respectively elected to the position of Chairman and Secretary.

The subjciued programme of lectures was finally agreed upon by both committees.

As can be seen from a mere glance at the programme now in the hands of the members of both societies, the lectures are of an attractive nature, and it is hoped that the attendance will continue as good as it has been both at the conversazione and at Prof. Cox's lecture. There is a decided increase over the attendance of last yeai, which was deemed an exceedingly high and satisfactory one.

LECTURE COURSE, 1896-1897, UNDER THE JOINN AUSPICES OF THE OTTAWA FIELD NATURALISTS' CLUB AND THE LITERARY AND SCIENTIFIC SOCIETY, TO BE HELD IN THE ASSEMBLY HALL OF THE PROVINCIAL NORMAL SCHOOL, OTTAWA (LISGAR STREET ENTRANCE). ALL LECTURES FREE, AND TO BEGIN AT 8 P.M. SHARP.

Nov. 19.—Conversazione. Exhibition of Microscopical Objects, Nataral History Specimens and Lantern Slides.

Short Addresses by

Dr. J. A. MacCabe, F.R.S.C, Principal, Normal School, Ottawa.
Mr. F. T. Shutt, M.A., F.C.S., President, Ottawa Field-Naturalists' Club.

Mr. Otto J. Klotz, President, Ottawa Literary and Scientific Society.
Mr. A. H. MacDougall, B.A., President, Ottawa Teachers' Association.

Five-Minute talks on Natural History. Objects and Specimens Exhibited.

Nov. 27.—Prof. John Cox, M.A., F.R.S.C., (of the Physics Laboratories, McGill University, Montreal) "Electrical Discharges in High Vacua." (Illustrated).

Dec. 17.—Prof. Leigh R. Gregor, M.A., Ph. D. (Heidelberg), of McGill University, Montreal, "Goethe."

Jan. 7.—Pref. Jas. Mavor, University of Toronto, "Under the Midnight Sun—A trip to Iceland" (with original sciopticon views).
Report of the Geological Section, O.F.N.C.

Jan. 21.—Dr. G. M. Dawson, C.M.G., F.R.S., &c., "Recent Explorations in Canada," with remarks by Dr. Bell, J. B. Tyrrell and A. P. Low.
Report of the Botanical Section, O.F.N.C.

Feb. 4.—Mr. W. D. LeSueur, B.A., "The Meaning and Value of Culture."

Feb. 18.—Andrew Macphail, B.A., M.D., M.R.C.S., Prof. of Pathology, University of Bishop's College, Montreal; and A. Arthman Bruere, M.D., (Edin.) Prof. of Physiology, University of Bishop's College, Montreal, "The American Lobster," (with illustrations).
Report of Entomological Section, O.F.N.C.

Mar. 4.—Mr. Otto J. Klotz, "Weather."

Mar. 11.—Mr. John Craig, Horticulturist, Central Experimental Farm, "Fruit and Fruit Districts of Canada," (illustrated).

Report of Ornithological Section, O.F.N.C.

THE OTTAWA NATURALIST.

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THE GEOLOGY OF THE OTTAWA AND PARRY SOUND RAILWAY.

By R. W. Ells, LL.D., F.R.S.C.

The opening of the Ottawa, Arnprior and Parry Sound railway, while marking an epoch in the affairs of the Capital from the commercial standpoint, furnishes, to the student of Natural History, fresh fields for study along the several lines in which the members of the Field-Naturalists' Club are interested. It has rendered readily accessible many places which have hitherto been reached with great difficulty and at very considerable expense. To the student of Geology and Palæontology it is especially advantageous, since many interesting points can now be easily reached and large areas of fossiliferous strata can be examined, many of which will furnish a rich harvest to the collector. With the object of calling attention to some of these, and thus arousing interest in the subject on the part of our younger members, as well as renewed interest among those who have already done good work in collecting and determining the fossil contents of our Palæozoic formations, a brief sketch of some of the leading geological features observable along the line is here presented.

Starting from the Capital, a short run of about fifteen miles over a generally level country brings us to the first stopping place near the line between Nepean and March. The formations traversed in this distance are nearly all horizontal, and comprise the Trenton, Black River, Chazy, Calciferous and Potsdam. The last three can be well seen between the crossing of the Canadian Pacific railway, south of Britannia, and the station

at South March. The Black River and the Trenton formations, between this crossing and the city are well exposed, and contain well defined characteristic fossils which are obtainable from the ledges on the Experimental Farm and on the knolls to the west. An interesting feature to be noticed as we approach the March line is a cutting in which Potsdam sandstone is penetrated by dykes of quartzose granite which have altered the rocks in contact very considerably. The sandstone in the vicinity contains numerous markings of *Scolithus*, and the quarry, from which the stone was obtained of which much of the Parliament buildings is composed, is situated on the hill near by. This locality is therefore of very considerable interest in several ways and affords excellent opportunities for the study of our lowest Palæozoic formation in the Ottawa basin. As we approach South March station, however, knolls of hard dioritic and granitic rock appear on either hand, and form the eastern terminus of a somewhat extensive ridge of the old Laurentian rocks. These embrace granite, gneiss, crystalline limestone, etc. and in close proximity to the station are deposits of mica and graphite which form interesting subjects of study to the mineralogist. A number of minerals can be collected at this place and the locality is well worthy of a visit by the club at some not far distant day.

From March to Carp the road traverses a depression in these Laurentian rocks, coming out on the Palæozoic basin about two miles east of the latter station. The old rocks, however, continue along the north side of the railway below this place and present excellent opportunities for the study of the various eruptives which are associated with the Laurentian everywhere throughout this area. At Carp station, several cuttings in the gravels contain shells of marine origin, and the study of the sands and gravels allied to the glacial period can be readily made. The Black River limestone can be well seen two or three miles to the south of the station and these hold an abundance of the characteristic fossils of the formation which are easily obtainable.

From Carp to Kinburn, which is the next station, going west, the country is clay covered and rock ledges do not appear, but the Black River limestones continue to the south, and about two miles east of Kinburn, on the road north of the railway, a large quarry in this rock affords excellent opportunities for collecting the characteristic fossils of the formation. South of Kinburn station a drive of six miles over a good road brings one to Pakenham, where the Black River formation is also well exposed on the Mississippi River and where fossils can be obtained in the bed of the stream at low water in great abundance. This is an excellent locality for their study and very convenient of access. Thence towards Galetta, the road, after following the valley of the Carp River for a mile or so, enters the low ridge of the Laurentian again and furnishes a good opportunity for observing the relations of the granites, gneisses and associated limestones till Galetta is reached. These rocks can also be well seen at this latter place and the intrusive dykes are easily recognized. About a mile and a half from the station on the road to Fitzroy Harbor, and a short distance north of the channel of the Mississippi, an old opening in limestone for a lead mine is an interesting point for mineralogical study, the association of the eruptive dykes being well seen at this place.

At Fitzroy Harbor, four miles from Galetta, are the celebrated Chats Falls, probably the most beautiful in the whole course of the Ottawa River. The water falls in a series of cascades over a huge dyke of granite extending across the entire channel of the river which here has a breadth of two miles or more, thus furnishing a magnificent water power, destined at no distant day to be utilized, and equal in economic importance to that of the Chaudiere in this city. This locality is a very interesting one to the geologist since the crystalline limestones are here largely developed and there is also a great variety of intrusives associated with them.

The crystalline limestones extend to Arnprior, which is situated at the junction of the Madawaska and the Ottawa

Rivers, but at this place they are overlaid by horizontal beds of the Calciferous limestone which show at several points in the town and along the river up to Braeside to the south of which, however, the fossiliferous ledges of the Black River formation are seen and are well worthy of study, several quarries being located in its strata. A little farther west, to the south of Sand Point, excellent opportunities are also presented for collecting the characteristic fossils of the formation, the beds holding *Tetradium fibratum* being well developed about a mile south of the last named place.

The bluish-striped limestones of Arnprior, and of the section thence to Renfrew, belong to what has been called the Hastings Series; and by crossing the Ottawa River by the ferry from Braeside, their continuation into the province of Quebec can be readily seen, the association of striped crystalline limestone, hornblende rocks and dolomitic and other schists being well exhibited, so that this locality is a very interesting one from the geological standpoint. The celebrated Iron mines of Bristol are situated in the rocks of this series on the Quebec side of the Ottawa.

Between Arnprior and Glasgow, the next station, the road traverses an area, largely clay covered, but ridges of the peculiar bluish-striped crystalline limestone, which is extensively quarried at Arnprior, occur at intervals. At Glasgow, however, these are cut off by a well pronounced area of reddish granite which crosses the track and extends northward for several miles. In its westward extension this granitic belt has a breadth of several miles on the Renfrew and Burnstown road and is an important geological feature in this area. From Glasgow to Renfrew, the rocks, where exposed, are alternately granites and crystalline limestone, the latter predominating as Renfrew is approached. At this latter place extensive quarries are in operation in the limestone and large quantities are extracted, both for building and for burning to lime, for both of which purposes it is well suited.

West of Renfrew an extensive clay flat extends up the

valley of the Bonnechère River to the vicinity of Douglas. To the north of this valley the rocks are crystalline of the old series, comprising both limestones and gneisses as well as frequent masses of granite. Similar rocks occur to the south of the railway, but approaching Douglas it skirts the south side of a large outlier of the Black River formation and several quarries are here located in these rocks. In these the characteristic fossils are quite abundant and a careful study of the several strata will amply repay the collector. To the north of Douglas village also these rocks are well exposed, and will yield good results.

From Douglas to Caldwell the rocks are of the old series, being well exposed near the latter station. Occasionally pyroxenic rocks are seen with these, and traces of various minerals were observed at several points, but not in quantity to be of economic importance. But little exploration has yet been done in this area for minerals as yet, and it is possible that subsequent search may be more successful. The road passes about a mile to the south of Eganville which is on the Bonnechère River; but before reaching Eganville station it crosses another very considerable outlier of the Black River formation, which extends northward to the river and also presents a good field to the fossil collector. At Eganville itself the Chazy also appears, and the presence of several small faults along the valley of the stream tends to complicate the structure and make the study more interesting. To the south of Eganville, at Clear Lake, a very interesting mineralogical field is presented, and several islands in this lake have afforded a rich collecting ground for mineralogists both from the United States and Canada for some years, and some very rare and valuable minerals have been obtained. A very interesting outlier of Utica Shale was found several years ago by the officers of the Geological Survey on the north slope of the mountain which rises from the south shore of the lake, at an elevation of about 800 feet above the sea.

The valley of the Bonnechère west of Renfrew, and nearly to Douglas, is occupied by heavy deposits of clay. These must

in places have a depth of nearly a hundred feet; but though undoubtedly of marine origin, they have as yet, in this particular locality yielded no marine organisms. This is however a feature observed in most of the clays of the upper Ottawa basin, the marine shells being almost entirely confined to the overlying sands and gravels. The same mode of occurrence is observed near the St. Lawrence at River Beaudette, where a ridge of gravel, in places very coarse in character, has yielded the valves of a large *Balanus* as well as other marine forms. Characteristic Chazy rocks, however appear in the stream at Douglas Village, underlying the Black River formation and extend up the valley of the Bonnechère for some distance. They are also well exposed at the Fourth Chute about midway between Douglas and Eganville, and at this place there is "remarkable subterranean channel, where a part of the water turns off at right angles to the general course, running northerly, for about ten chains, through a great cavern. This cavern is usually nearly dry, excepting during freshets, but has been turned to advantage by throwing a dam across the main body of the river near the middle of the fall. This turns through a sufficient quantity of water to convert the channel into a mill-race, and the fall at the lower end is applied to drive the wheel of the mill.*" The Black River limestones are also well exposed on the north side of the river to the west of Douglas and contain characteristic fossils of the formation.

Going west from Eganville we traverse considerable areas of drift, the underlying rocks being the gneisses and limestones of the Laurentian, till we reach Golden Lake station. This is situated near the lower end of Golden Lake, a beautiful sheet of water about eight miles in length, around the shores of which the crystalline rocks are well exposed, and these occupy the country to Killaloe near the upper end of the lake. Here the gneisses are in great force and well stratified. The cuttings along the road between Golden Lake station and this point are

*Geology of Canada, p. 176, 1863.

largely in drift gravel and sand, which has replaced the clays which form so prominent a feature to the eastward. These sands have a wide distribution in all directions and the distribution of the drift in this vicinity forms an interesting subject of study. Great blocks of the Black River limestone occur here and there, and a very interesting development in this connection is the number of them observed on the high ridge to the south of Clear Lake at an elevation of nearly 1400 feet above the sea, along the Brudenell road.

The country west of Golden Lake now becomes much more rugged, the surface being hilly and the valleys occupied largely with drift sand and gravel. Thence on to Barry's Bay the rocks are mostly granitic and gneissoid, the limestones having but a small development; but a small outlier of Palæozoic rocks was noted in a shallow cutting on the road about four miles west of Killaloe station, which appeared to belong to the Chazy limestone formation, but from which no fossils were obtained, and its exact horizon is therefore as yet undetermined. The granitic character extends westward from Barry's Bay for a long distance but the geology of the western portion of this road has not yet been examined.

Many interesting observations on the striæ have been made and the general course of the ice movements have been approximately outlined. These will however form the materials for another paper by Mr. Wilson on the surface geology of the area which will be of much interest and value.

In addition to the locality at Carp where marine shells can be obtained it may be of interest to note that these fossils were also observed on the summit of the Laurentian ridge north of Kinburn, and easily accessible by the road leading directly north-east from that station, at about three miles distant. Another interesting locality, for these shells, readily reached from Glasgow station by the road leading north from that point, is the summit of the ridge to the south of Sand Point, which also is a station on the Canadian Pacific railway. The shells at this place are strewn over the surface of the Black River or lower Trenton

limestone which forms a ridge rising to the height of about a hundred feet above the Ottawa River at this place. The sand or gravel in which the shells were originally embedded has nearly all been removed and the bare rock is exposed at the surface. This is also an excellent spot for collecting fossils from the underlying rocks.

For those members of our Club who are interested in fossil collecting an excellent opportunity is afforded for the study of the fauna of the Black River formation in the many scattered outliers which are found to the south of the Ottawa River, in the townships of Bromley, Stafford and Wilberforce. Those between Douglas and Cobden can be easily reached, either by the Ottawa and Parry Sound railway, from Douglas station, or from Cobden on the Canadian Pacific. Large outliers occur in Stafford near the lower end of Muskrat Lake in which the fossils are abundant and easily obtained. The celebrated locality at the Paquette's Rapids on the Ottawa, near the foot of Allumette Island, is now easily reached by the Pontiac and Pacific Junction railway, which now runs to that point, but a week's trip or even less will enable one to visit all the principal areas to the south of the river and furnish plenty of material for future study. The Black River formation at one time must have had a very extensive development, since its scattered outliers are now found over a very considerable extent of country, lying between the Ottawa and the Madawaska Rivers. Among the most extensive, and at the same time most readily accessible of these, is a series of outcrops to the south of Arnprior, lying to the north of the mountain ridge which extends from the vicinity of White Lake to Pakenham. These have as yet been but little studied, but the rocks contain an abundance of fossils at many points and some of the principal exposures can be reached in a distance of four to five miles south from either Arnprior or Galetta.

For convenience of reference a synopsis of the various geological formations to be seen at the several stations is appended. The elevations of the different points along the line

have been kindly furnished by Mr. James White, Geographer to the Geological Survey.

STATIONS.	ELEVATION ABOVE SEA LEVEL.	REMARKS.
Ottawa, Central Station.	218 ft.	Trenton and Utica, well exposed.
Elgin St. Sta.	226	
South March	292	Potsdam sandstone and Laurentian gneiss and limestone with diorite and granite. Mica and graphite in the vicinity.
Carp.	315	Clays and gravels; the latter with marine shells, underlaid by Black River limestone. Laurentian gneiss and granite in ridge to the north.
Kinburn.	319	Clay flat, underlaid by the Black River formation. Laurentian granite and gneiss with crystalline limestone in ridge to the north. Marine shells on summit of ridge three miles to the north.
Galetta.	402	Mostly crystalline limestone of the old series with some gneiss, cut by dykes of granite. Marine shells near Mohr's Corner about a mile to the south-east.
Arnprior.	309	Bluish striped crystalline limestone of the Hastings series, overlaid by Calciferous limestone. Black River outcrops to the south.
Glasgow.	350	Ridge of black hornblende-rocks and reddish granite which cuts the striped limestone of the vicinity. Hastings series. Marine shells on Sand Point ridge, three miles to the north east.
Goshen.	392	Striped crystalline limestone.
Renfrew.	410	Striped crystalline limestone of the Hastings series, with ridges of hornblende schist and masses of reddish granite. Important quarries in the limestone.
Admaston.	423	Clay flat of the Bonnechère.
Douglas.	455	Large outliers of the Black River limestone with crystalline limestone and gneiss underlying.
Caldwell.	505	Mostly reddish granitic gneiss; some pyroxenic rocks in the vicinity. The 4th chute of the Bonnechère to the north.
Eganville.	528	Drift with large outliers of the Black River formation in the vicinity. Chazy and Black River rocks on the Bonnechère at the village.
Golden Lake.	543	Crystalline limestones and gneisses with granite.
Killaloe.	663	Reddish and hornblende gneiss, well stratified.
Barry's Bay.	937	Gneiss and granite. Much of the country occupied by drift sand and gravel

Geological Survey Department,
Ottawa, Canada.

FAUNA OTTAWAENSIS.

HYMENOPTERA PARASITICA—PROCTOTRYPIDÆ.

By W. HAGUE HARRINGTON, F.R.S.C., Ottawa.

The species of parasitic hymenoptera are exceedingly numerous and require much time both to collect and study. The insects very often so closely resemble others that their satisfactory determination is difficult and for these reasons, while material has been steadily accumulated, it has not hitherto been possible to publish any lists of the hundreds of species contained in our cabinets. Last winter I devoted considerable time to the study of the numerous small forms belonging to the family Proctotrypidæ, and while the examination is not yet completed, it has enabled me to present the following list. It would perhaps be more satisfactory to longer withhold it, were it not that collections run so many risks of destroyal or damage, and consequent loss of the labour bestowed upon them if records have not been published. Mr. Ashmead's exhaustive monograph of the North American species of this family, published in 1893 contained descriptions of some fifty new species from Ottawa; and the present list indicates several new species showing that our present knowledge is still limited. Many additions will undoubtedly be made, and the life-histories of many are yet unknown to us. The list indicates, usually, the localities in which specimens were captured, and the dates of appearance. The majority of the species have been captured with the sweeping net, but a considerable number have occurred in moss, collected late in the year, and a few have been bred. Where no remarks follow a species, the only examples taken were those sent to Mr. Ashmead, to whose assistance I am much indebted.

PROCTOTRYPIDÆ.

SUBFAMILY I. BETHYLINÆ.

Isobrachium myrmecophilum *Ashm.*	Male; Race-course, 22 Aug.
Mesitius bifoveolatus *Ashm.*	Female; 11 May.
Anoxus Chittendenii *Ashm.*	Male; Hull, 22 July.

Perisemus formicoides *Prov.*	Female; Type of species.
Perisemus prolongus *Prov.*	Female; several in May, June, and July.
Goniozus foveolatus *Ashm.*	Two males and female; Powell's Grove and Hull, June, July and August.

SUBFAMILY III. DRYININÆ.

Gonatopus contortulus *Patton.*	One female; Hull, 29 July.
Gonatopus flavifrons, *Ashm.*	One female; Hull, 15 July.
Phorbas laticeps *Ashm.*	One female; Hull, 15 July.
Chelogynus canadensis *Ashm*	One female; 4 June.
Aphelopus melaleucus *Dalm.*	

SUBFAMILY IV. CERAPHRONINÆ.

Habropelte fuscipennis *Ashm.*	One male.
Habropelte armatus *Say.*	One male and one female.
Lygocerus picipes *Ashm.*	One female; Kettle Island, 23 July. Two males; Hull, 16 and 26 Aug.
Lygocerus stigmatus *Say.*	Male and female; several bred by Mr. Fletcher from Aphides on Rubus strigosus, July.
Megaspilus striatipes *Ashm.*	
Megaspilus Harringtoni *Ashm.*	Several; in July and Aug. One bred from Willow Diplosis puparium emerged in April.
Megaspilus canadensis *Ashm.*	
Megaspilus Ottawaensis *Ashm.*	Apparently a common species in August. Taken at Hull, Kingsmere and Racecourse. Several specimens also from moss from Dow's Swamp in Nov.
Ceraphron minutus *Ashm*	Also found in moss from same locality.
Ceraphron auripes *Ashm.*	With the above.
Ceraphron melanocephalus *Ashm.*	One female; Hull, 19 Aug.
Ceraphron pallidiventris *Ashm?*	One at Beechwood on 13 Aug.
Ceraphron salicicola *Ashm.*	From Willowgalls and also from moss. Taken at Hull, 19 Aug.
Ceraphron melanocerus *Ashm.*	One specimen.
Ceraphron pedalis *Ashm.*	Both sexes; Hull, all in Aug. except a female 13 May.
Ceraphron flaviscapus *Ashm.*	Female; Dow's Swamp moss, Hull 13 May.
Ceraphron unicolor *Ashm.*	Female; Hull 19 Aug.
Ceraphron sp. nov.	Female; Hull 19 Aug. A large black species.
Ceraphron sp. nov.?	Female; a large pale species.
Aphanogmus bicolor *Ashm.*	Female; from Dow's Swamp moss.
Aphanogmus marylandicus *Ashm.?*	Male; Beechwood, 13 Aug.

SUBFAMILY V. SCELIONINÆ.

Telenomus orgyiæ *Fitch.*	Numerous specimens bred from eggs of Orgyia sp.
Telenomus gracilicornis *Ashm.*	

Telenomus podisi *Ashm.*	One female; Racecourse, 1 Aug.
Telenomus arzamæ *Riley.*	Three males; Racecourse, 1 Aug.
Telenomus sp. nov.	Thirty-one specimens from two eggs of *T. polyphemus?*
Telenomus sp.	Several from eggs of undetermined moth, on Hickory leaf, July.
Trissolcus euchisti *Ashm.*	One female.
Acoloides saitidis *Howard.*	Many specimens bred from spiders eggs.
Acoloides bicolor *Ashm.*	
Acoloides subapterus *Ashm.*	Female; from Dow's Swamp moss.
Acoloides seminiger *Ashm.*	Female; with above.
Ceratobæus binotatus *Ashm.*	Several females.
Bæus minutus *Ashm.*	Abundant in Dow's Swamp moss.
Bæus piceus *Ashm.*	Taken with above, but rare.
Bæus clavatus *Prov.*	Type specimen.
Bæus americanus *Howard.*	Female; under stone, Hull, 15 April.
Pentacantha canadensis *Ashm.*	Two in June.
Prosacantha melanopus *Ashm.*	From Dow's Swamp moss.
Prosacantha Linellii *Ashm.*	Female; Kettle Island, 18 Aug.
Prosacantha sp.	Female; Racecourse, 3 Aug.
Hoplogryon longipennis *Ashm.*	Female; Hull, 16 Aug.
Hoplogryon minutissimus *Ashm.*	Several; Hull and Racecourse, August.
Hoplogryon brachypterus *Ashm.*	Abundant in swamp moss in Nov. also taken in Aug.
Hoplogryon obscuripes *Ashm.*	Three females.
Hoplogryon solitarius *Ashm.*	Four males: Powell's Grove and Hull, August.
Gryon borealis *Ashm.*	Abundant; Racecourse and Hull, Aug., also in moss.
Gryon canadensis *Ashm.*	Abundant: Hull, Beechwood, Kettle Island, etc., Aug., and in moss in Nov.
Gryon flavipes *Ashm.*	Four females
Calotelia Marlattii *Ashm.*	Three males, twelve females: Hull, June and August.
Calotelia sp. nov.	Three males, nine females: Race-course, 29 August.
Calotelia sp. nov.	Three females: Hull and Race-course, August.
Macrotelia floridana *Ashm.*	Three males, one female; Hull and Kettle Island, July and Aug.
Macrotelia virginiensis *Ashm.*	One female; Hull, 5 Aug.
Opisthacantha mellipes *Ashm.*	One female.
Hoplotelia floridana *Ashm.*	One female; Hull, 26 Aug.
Scelio opacus *Prov.*	Three males: Hull and Kettle Island, August.

SUBFAMILY VI. PLATYGASTERINÆ.

Metaclisis erythropus *Ashm.*	
Leptacis flavicornis *Ashm.*	Three males; Race-course, Aug.
Leptacis striatifrons *Ashm?*	One male; Hull, Aug.
Polymecus canadensis *Ashm.*	One male, one female; Powell's Grove, June.
Polymecus pallipes *Ashm.*	Three males, two females; Hull, June.
Polymecus picipes *Ashm.*	Two females; May 13.
Synopeas rufiscapus *Ashm.*	Eight males, eleven females; Race-course and Hull, July and Aug.
Synopeas sp.	Five females; Hull, Aug. = preceding?
Eritrissomerus sp. nov.	Thirteen males and females; Hull, Aug.
Polygnotus alnicola *Ashm?*	Twenty-seven specimens; bred by Mr. Fletcher from dipterous galls on Muhlenbergia.
Polygnotus sp.	One male; Race-course, 1 Aug.
Polygnotus sp.	Four specimens; from willow-galls.
Platygaster Herrickii *Pack.*	
Platygaster obscuripennis *Ashm.*	Two females; from willow-galls.
Platygaster sp.	Several; from willow-galls.
Platygaster sp.	Several; from willow-galls.
Isocybus pallipes *Say.*	One female.
Isocybus canadensis *Prov.*	Both sexes abundant; May. Several specimens seem to indicate a variety, if not a distinct species.

SUBFAMILY VII. HELORINÆ.

Helorus paradoxus *Prov.*	Two females; Kettle Island, Aug.

SUBFAMILY VIII. PROCTOTRYPINÆ.

Disogmus sp. nov.	One female.
Proctotrypes rufigaster *Prov.*	Four males, one female: Hull, etc. Aug.
Proctotrypes californicus *Holmg.*	
Proctotrypes flavipes *Prov.*	Three females; Hull, Aug.
Proctotrypes abruptus *Say.*	Abundant; Race-course, Kettle Island, Hull, Aug.
Proctotrypes obsoletus *Say.*	One male.
Proctotrypes longiceps *Ashm.*	
Proctotrypes canadensis *Ashm.*	Five males, one female; Race-course, 22 Aug.
Proctotrypes medius *Ashm.*	
Proctotrypes quadriceps *Ashm.*	Three females; Race-course and Kettle Island, Aug.
Proctotrypes sp. nov.?	One male; Hull, 16 Aug., a large black species.
Proctotrypes clypeatus *Ashm.*	

(To be Continued.)

Ottawa, Canada, Dec., 1896.

THE EVOLUTION AND DEVELOPMENT OF ANIMAL INTELLIGENCE.

By WESLEY MILLS, M.A., M.D.,

Professor of Physiology in McGill University, Montreal.

As the term evolution means literally an unfolding, it is convenient and comprehensive for the purpose in view, whether it be employed in its more literal signification or in the sense that has become attached to it by the modern doctrine of evolution as set forth by Darwin and other writers of recent times.

Darwin himself believed as thoroughly in mental evolution as in organic evolution; that is to say, he held that the non-corporeal or psychic this term being employed to cover all qualities not physical whether purely intellectual or relating to will, feeling, etc., qualities of animals were as much related by genetic descent as their corporeal features. The characteristics of the human mind for example, are to be explained, according to this great investigator, by man's descent from forms of life lower in the scale, in the same way as his corporeal nature. To illustrate, Darwin believed that we are in a position to understand the dog much better if we recognize his origin from wild forms such as the jackal, wolf, etc.

As regards man's psychic nature, however all evolutionists do not hold to Darwin's view.

Alf. R. Wallace, who enunciated the doctrine of organic evolution at the same time as Darwin, held that all the qualities of man's mind could not be accounted for in this way, though he thought such an explanation adequate for the corporeal structure of man.

The majority of evolutionists are of opinion, however, that the doctrine of descent of higher from lower forms does explain both the physical and psychic nature of animals, with all their

similarities and differences, better than any other; and no one has worked out this view better than Darwin himself in his various works; and so far as the psychic is concerned, especially in his "Descent of Man"; though in this connection Romanes' "Mental Evolution in Animals" and "Mental Evolution in Man" also deserve mention as very admirable and highly scientific works.

There is, however, another sense in which the term evolution may be properly employed, viz: The unfolding or development of the individual animal from the beginning of its existence to full maturity; we may speak of the evolution of the chick from the egg; and in like manner we may follow the evolution of the mind from its first, dim manifestations to its complete development.

While the mind of the adult human being had been studied for ages it is only very recently that investigators thought of commencing at the beginning, or in other words, making researches into the nature of the infant mind; though when one reflects it seems strange that such should have been the case.

The anatomy of man and the higher animals has been rendered easier of acquirement and its true significance made vastly clearer by comparative anatomy, or the study of one form of animal life as compared with another. The structure of the cat and tiger, related animals, is each better understood if compared. But it is embryology or the study of the development of animals from their germs that has shed such a flood of light on the structure and relations of the whole animal kingdom.

The writer being convinced that the same principles apply to the study of the mental life of animals has for some years been engaged on investigation of the psychic development of animals by a method corresponding to the embryological as applied to physical developement.

Some writers, Professor Preyer especially, have published fairly complete studies on the psychic manifestations of infants. The latter's "Mind of the Child" is a monument of patience, industry and ability, and is simply invaluable to those desirous of understanding the human mind. A record has been kept by this author of his own child's mental development from the very first day of its existence to the fortieth month.

The writer of the present article is attempting to do similar work for several groups of our domestic animals or pets, and a considerable number of these investigations are now completed. It is hoped that by such researches a truer light will be thrown on the psychic nature, not alone of the animals investigated, but on that of man also; for whether we admit evolution in the Darwinian sense in psychology or not, there can be no doubt, after compariug these studies one with another, that there is much that is common in mental development as there is in physical development.

The dog and the rabbit, much as they differ in anatomy, have also much in common; and in like manner they greatly resemble each other in certain features psychically, as such studies prove beyond all doubt.

To many minds this will be evidence for the truth of evolution, and to be explained only on some such theory.

It is well known that in a very early stage of embryonic development, animals that afterwards differ widely in form and structure, can scarcely be distinguished, if at all, even by the the most expert.

In like manner the psychic behaviour of whole groups of animals has much in common during the first days of life, a remark that especially applies to those that are born blind. They all manifest certain reflexes and instincts. By a "reflex," physiologists mean a physical result, usually a movement, independent of the will. It follows because of some sort of stimulus;

and many of them would take place if the brain of the animal were removed.

The movements of the snake, after its head has been pounded into a mass beyond recognition by the school boy, are reflex, movements which when first seen cause such feelings of the "uncanny" to arise. The mechanism of these movements resides in the spinal cord, the nerves and their endings etc., and is wholly involuntary in such a case. The touch that causes it is the stimulus and the result is a reflex.

The movements of those newly born animals that are blind for some days are largely if not entirely of this reflex character, and, as has been already observed, they are of the same nature in all mammals thus born blind. This is not because they are blind, or rather because their eyes are closed, but because their blindness is an expression of the fact that their organization, both physical and psychic, is in a comparatively undeveloped condition. It will be observed, however, that these animals have developed at this period such reflexes and instincts as enable them to adapt to their new surroundings after birth. They can get nourishment by sucking—a reflex or an instinct, probably both. They can move sufficiently to huddle together and crawl close to their mother—their source of heat; for of all the enemies of young animals cold is the greatest. Warmth is a need even more urgent than food itself.

When they have learned to adapt themselves to their new environment somewhat, and so to be prepared for advances, some new developments take place rather rapidly; their eyes and ears open; they learn to see and to hear, though it must not be inferred that seeing and the opening of the eyes are contemporaneous; for as a matter of fact I have demonstrated in the clearest way that young animals born blind, as dogs, cats, rabbits, etc., do not really see objects for some days after their

*Part of a paper read before the Natural History Society of Montreal.

eyes open, though it is likely they do distinguish between light and darkness.

It appears that all animals born blind are also born deaf; at all events, I have as yet found no exception to this rule.

The greatest difference sometimes exists as to the psychic condition at birth of different groups of animals belonging to the same larger group. This is well illustrated by the cavy (Guinea pig and the rabbit. The latter is born blind, deaf and comparatively helpless, while the newly born cavy can in a few hours run about, see, hear and even eat, yet both belong to the great group of rodents or gnawers. This is to be explained by the relatively short period of gestation of the rabbit, as compared with the cavy, so that the young of the rabbit are born in a comparatively immature condition. Even in the dog tribe there are differences in rate of development for the different breeds; thus, small dogs, as terriers, are precocious as compared with St. Bernards and other large breeds and they attain physical and psychical maturity earlier. A terrier is generally quite mature at one year, while a St. Bernard may grow and develop for at least two years.

The writer is not aware that a record of physical changes as complete as the psychic has been kept in studies made on infants.

This omission he has in some measure endeavored to to supply in his researches on the lower animals, because it is in this way alone, probably, that the relations of the physical and the psychic can be established. So far as investigations have been made they seem to show that psychic growth and development run parallel with the development of the nervous centres, especially the brain.

The writer has completed a research bearing directly directly on this subject, and the evidence is clear that the degree of psychic development at birth and for some days after, in

animals born blind, corresponds with a similar (undeveloped) condition of those parts of the brain that have unquestionably to do with voluntary movements and the higher functions generally.

The limits assigned to this paper will prevent my going further into detail—but I hope sufficient has been brought forward to show that in animals lower in the scale as well as in man there is a development to the mind as to the body; that this development follows, as does that of the physical organism, certain laws; that there is a close relationship between mind and body, and that we must, if man is to be understood, study him in connection with animals lower in the scale. Man is not apart from but a part of nature, and the sooner the world ceases to isolate man and proceeds to investigate him as a part of a grand whole, the better it will be for man and all other animals.

NOTES, REVIEWS AND COMMENTS.

COLEMAN, A. P. PROF.—"The Anorthosites of the Rainy Lake Region."—Journal of Geology, Vol. IV., No. 8, pp. 907—911 Chicago, Nov.—Dec., 1896.

The quartzose granites of the Rainy Lake district, which hold the important gold-bearing veins, have been carefully studied by Lawson and Coleman in various reports to the Dominion and Ontario geological surveys. The barren anorthosites associated with these had hitherto been neglected. Prof. Coleman describes the anorthosite rock of Bad Vermilion Lake and Seine Bay region. It is of post-Keewatin age and differs from the typical anorthosites of Quebec described by Adams. "More than nine-tenths of the rock is seen to consist of plagioclase, usually sprinkled with zoisite particles, or more or less completely changed to a saussuritic mass." "An analysis of the freshest rock studied [from Seine River mouth] shows" a low percentage of silica and soda and high percentage of lime compared with Quebec anorthosites."

Prof. Coleman disagrees with Dr. Lawson regarding these anorthosite rocks in not "representing the truncated base of a Keewatin volcano" but as "having solidified under a considerable thickness of superincumbent rock" and been exposed by denudation so as to be eroded and fragments rolled into bowlders which appear as part of a conglomerate before the eruption of the granite.—H. M. A.

TYRRELL, J. BURR "*The Genesis of Lake Agassiz.*" Journal of Geology, Vol. V., No. 7, pp. 811—815, Chicago, Dec 1896.

In this paper, Mr. Tyrrell first describes the two centres of glaciation or gathering grounds for the snow and ice on each side of Hudson Bay during the "Great Ice Age." He then more closely defines the terms, "Keewatin glacier" and "Laurentide glacier" which have been applied to these centres by himself* and Dr. Dawson Regarding the origin of Lake Agassiz itself, Mr. Tyrrell states:—"The Keewatin glacier seems to have retired northward well into Manitoba, and possibly even beyond the northern limit of that province, before it was joined by the eastern glacier. When they united the water was ponded between the fronts of the two glaciers to the north and east, and the highland to the south and west. Thus Lake Agassiz had its beginning." The later history of the lake is to some extent still undetermined, but is given in the light of the evidence obtained during several explorations in those regions. A passing note is also made of the "Cordilleran glacier" ‡ in the mountains of British Columbia and of a fourth great glacier—the Greenland glacier?, that which "covers Gr eenland at the present time."—H. M. A.

*Geographical Journal, London, pp. 439, November, 1895.
‡ G. M. Dawson in Bull. Geol. Soc. Am., Vol. 7, pp. 31-66, 1895.

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THE LIVING CHIMÆRA AND ITS EGG.

By PROF. E. E. PRINCE, B.A., F.L.S.,

Dominion Commissioner of Fisheries, Ottawa.

Few naturalists have ever had the advantage of seeing alive that somewhat rare and profoundly interesting fish, the oceanic Chimæra or Rabbit Fish. Its grotesque outline and staring eyes so impressed Frank Buckland that he pronounced it "worthy the imagination of the most barbarous Chinaman that ever designed a figure-head for a piratical war-junk." In 1891 two or three specimens were obtained off Achill Head, Co. Mayo, at a depth of 127 fathoms, but as I had just left the vessel, the "Fingal," on which I was acting as naturalist to the Fisheries Survey, I missed seeing these remarkable examples alive. In 1895, during my cruise along the Pacific Coast, I had the privilege on many occasion of examining living specimens, the species occurring there (viz *Chimæra collaei*, Bennett) being netted fairly numerously in the inshore waters. In British and Norse seas the Chimæra is taken at considerable depths, say 70 to 200 fathoms; but in British Columbia this fish is frequently found in the drag seines used for taking salmon this kind of net being necessarily hauled in very shallow bay and estuaries.

The length of the fish varies from 12 inches to 30 or 36 inches and the head is disproportionately large, bluntly tapering in front, flattened on the top, and below sloping back to the mouth, which is quite underneath the head, some distance from the tip of the snout as in the sharks The long body narrows

very much and ends in a long whip-like tail, bearing a fin-lobe above and below, near the tip. A long fin passes down the back, nearly the whole length, and in front of it, immediately behind the head, there rises a high first dorsal fin, triangular in shape, and provided with a powerful anterior spine, curiously serrated upon its front edge. The wing-like pectoral fins are a most striking feature as they possess a fleshy peduncle or arm portion, and the pointed fins protrude most prominently on each side of the head. When lying flat against the body they extend over one-fifth of its length. A similar but much smaller pair, the ventral fins, protrude some distance behind the pectoral fins. Both pairs are like very flexible grey wings, resembling Indian rubber in texture, semi-transparent, and supported by horny fin-rays. I was enabled to examine specimens of both sexes, a fortunate circumstance as they differ considerably in their external characters. On the forehead of the male, between the eyes, there exists a finger-like protruberance partly bent upon itself, with a flattened tip, fimbriated, and studded underneath with sharp denticles. This spine-covered surface fits into a soft mucous depression in front. Oil and mucus occur in the cavity which is no doubt glandular in nature. One writer has suggested that it is phosphorescent, and that the Chimæra carries a lamp upon its forehead ; while Buckland fancifully compared it to a crown, whence he says, the Norwegians have called the Chimæra the "king fish" and also the "King of the Herrings."

The hind part of each ventral fin forms a separate bifurcate appendage, covered with a soft glandular membrane complexly folded and perforated by a longitudinal channel.

The male shark and skate have similar curious structures but in the Chimæra they are even more complex and curious, and impossible to be clearly described without the aid of figures.

The eyes are large and brilliant, unprovided with lids, and show a glowing green opalescent in the living fish. The iris is of a pale steel-blue colour. Buckland presaged that "the eye in life must have a monstrous and fierce appearance" and

certainly these organs stand in great contrast with the dull unintelligent eyes of the shark or the sturgeon.

On account of its peculiar projecting teeth, four protruding from the upper jaw and two from the lower jaw, the fish bears in British Columbia the name of Rat-fish or Rabbit fish, and the terms are appropriate as the mouth recalls most strikingly that of a rodent. They are white or semi-transparent, and unlike the teeth of sharks and rays are never replaced if lost. No doubt mollusks and crustaceans from a large part of its food.

The gill arrangements are most remarkable, for instead of the five to eight exposed gill-openings in front of each breast fin, such as we find in sharks, the Chimæra has a large operculum or gill cover consisting of several broad plates marked by distinct lines of division, and most effectively shielding the four-paired gills within. The gill chamber opens by a narrow slit near the base of the peduncle or stalk of the pectoral fin, on each side of the head. No doubt the lines marking the separate opercular plates are the tracks of mucus canals. Similar large smooth plates encase the whole head. They resemble a coat of mail resplendent with a brilliant metallic appearance. The head is especially striking from its bright silvery lustre, over which, in life, all the colours of the spectrum spread, golden yellow, rosy pink, emerald green, pearly blue, indeed every prismatic tint. If Chimæra is one of the sea's most grotesque creatures, it is, in its rainbow glory, one of its most resplendent. The shrunken, faded brownish or yellow examples of Chimræa, exhibited in our museums, convey no idea of the real splendour of this strange marine vertebrate. The crude semblance as if made of wrinkled leather, is utterly unlike the smooth glittering, living fish. In allusion to its beautiful colours the Norsemen call it the gold or silver fish ; but its external appearance is not less remarkable, to the naturalist, than its anatomical structure.

In my dissection of a number of specimens in 1895 I noted some of its structural features. Thus the short and capacious intestine exhibited the spiral partition or valve, which we also find in sharks and ganoids.

The liver was smooth, solid and compact, not expanded and lobed, as in many fishes, and it was extremely rich in oil. In form and character it reminded me of the same organ in the electric ray *(Torpedo)* which I dissected in Ireland six years ago. The cheeks and face of the fish are traversed by a complex series of mucus canals with numerous rows of pores. These canals are connected with the well-marked lateral line, along the side of the body. The ovaries in the female fish were large leaf-like organs, not unlike those of the Skate, and in the semi-transparent tissue pale white eggs were scattered in great numbers, about the size of peas. The ova were not apparently near complete maturity, though the specimens were examined in July, which is usually regarded as the spawning time. I should opine that the specimens examined by me would not have spawned until the fall, say September or October. The eggs deposited are probably few in number as in the sharks.

In the male specimens I found white, compact ovate organs with complicated tortuous ducts, and other structures found always in the shark tribe. By the kindness of the curator of the Victoria Museum (Mr. Fannin) I became possessed of an egg case of Chimæra. It is an extremely rare object though H. M. Inspector of Irish Fisheries (Mr. Spotswood Green) lately secured many examples in deep water on the west coast of Ireland. Yarrell curiously enough states that the eggs are large and "covered with a horny shell flattened on the edges and velvety," but on what authority is not explained. The egg case is in fact like a dark horny pod, long and narrower at one end than at the other. It is $3\frac{1}{2}$ or 4 inches long, and down each side there extends a flattened projecting edge which may, in some cases, bear hairs. Each case contains one egg, and the young fish is compelled to assume a somewhat peculiar position, lying flat on its side with its head directed towards the larger end of the case. How it escapes no one knows. Probably an imperceptible slit exists through which the fish emerges, but the Chimæra's egg is usually held to be imbedded in the sand with

one end projecting. This, it is considered, accounts for its extreme rarity in the marine zoologist's hauls.

In the Fisheries Museum in Ottawa, a specimen of the egg of Chimæra is exhibited but the young fish had hatched out before it was obtained.

The scientific interest of a fish like Chimæra is very great. There are not more than three or four species now existing and they are widely scattered in the most diverse seas. No doubt it is an ancient type of fish and may be the last of a dying race. Its protocercal or equal-lobed tapering tail is more primitive than that of any other fish. In some points *e. g.* the spiral valve, the ventrally placed mouth, and the cartilaginous skeleton, it is allied to the sharks. Its naked skin is in contrast to both sharks and ganoids, while the operculum, almost enclosing the branchial apparatus, connects it with Ganoids and Teleosts. The teeth, ears and jaw cartilages are very peculiar. the palato-quadrate bar being unsegmented. Whether to class it with the sharks, or establish as Professor Huxley urged, a separate sub-class Holocephali, for these few fish, the Chimæras, scientific authorities are not yet agreed.

Linnæus called it Chimæra on account of its peculiar external aspect, but its anatomical and other features fully justify the name. It is at once a primitive, aberrant, and grotesque creature, with characteristics which are common to all the various sub-classes of the great class of fishes. It is in many respects one of the most generalised of existing fishes, and on that account it is of the highest scientific interest.

Marine Dept., Ottawa,
January, 1897.

OTTAWA SPIDERS AND MITES.

By W. HAGUE HARRINGTON, F.R.S.C.

In the first number of the present volume, page 11, was published a list of 61 species of spiders collected at Ottawa, and kindly determined for me by Mr Nathan Banks. During the past season my collections were, unfortunately not very extensive but I was able to send recently to the same gentleman a small lot which he has again been good enough to examine. His list, which I append, shows that 35 species were represented, of which 15, or nearly half, were not in the former sending. These additions I have indicated by an asterisk, and it will be noticed that the family Lycosidæ especially has furnished several. One species is considered to be new and has received the manuscript name given in list.

Last winter I also sent to Mr. Banks a small collection of mites, which had been obtained in sifting moss gathered in November in Dow's Swamp. The list of the species is annexed, and Mr. Banks wrote to me as follows in regard to them:— "The first is a large, globose, shiny species found in moss, readily known by its emarginate wing; it is widely distributed. The second is not common. The third is not rare in moss, it has dark spots from which arise bristles. The Oppia is new, it is close to my *Scutovertex pilosus*, but differs in tectal plate and less bristly body. The Nothrus is probably *N. rugulosus*, but it is not quite adult. The Hoplophora is very distinct, being strongly granulate. The Uropoda is probably new. You will find others (Oribatids) in fungi, decaying vegetable matter, and sphagnum moss. There should be some interesting Nothrids from your locality, as they are rather common in Northern Europe."

ARANEINA—SPIDERS.

DRASSIDÆ.

Drassodes humilis *Bks.**

Gnaphosa brumalis *Thor.**

Gnaphosa conspersa *Thor.*

CLUBIONIDÆ.

Clubiona obesa *Htz.*

Thargalia canadensis n. sp.*

AGALENIDÆ.

Agalena nævia *Htz.*

DICTYNIDÆ.

Dictyna volupis *Keys.*

THERIDIIDÆ.

Theridium differens *Em.*
Linyphia communis *Htz.**
Crustulina sticta *Cb.**
Stemonyphantes bucculentus *Clk.**
Lophocarenum florens *Cb.*

EPEIRIDÆ.

Epeira patagiata *Clk.*
Epeira strix *Htz.*
Singa variabilis *Em.*

TETRAGNATHIDÆ.

Tetragnatha extensa *Linn.*

THOMISIDÆ.

Xysticus limbatus *Keys.*
Coriarachne versicolor *Keys.*
Misumena vatia *Clk.*
Philodromus ornatus *Bks.**

LYCOSIDÆ.

Lycosa babingtonii *Blk.**
" frondicola *Em.**
" pratensis *Em.**
" communis *Em.**
Pardosa lapidicina *Em.**
Pirata sp?
Pisaura undata *Htz.*

ATTIDÆ.

Phidippus mystaceus *Htz.*
Phidippus rufus *Htz.*
Phikeus militaris *Htz.*
Dendryphantes octavus *Htz.*
Dendryphantes flavipedes *Peck.**
Attus palustris *Peck.*
Epiblemnm scenicum *Clk.**
Ergane borealis *Blk.*

CHERNATIDÆ.

Chelanops sanborni *Hag.**

ACARINA—MITES.

ORIBATIDÆ.

Oribata emarginata *Bks.* Several.
Oribatella signata *Bks.* Two specimens.
Oribatella bidentata *Bks.* Several.
Oppia canadensis n. sp. Two specimens.
Nothrus rugulosus *Bks?* Young.
Hoplophora granulata n. sp. Three specimens.

GAMASIDÆ.

Uropoda sp? Several.

CLOUDS.

By PRINCIPAL J. A. DRESSER B.A., of Richmond, Que.

Read before the St. Francis College Literary and Scientific Society, Feb. 3rd, 1897.

(An Abstract).

In the opening words of Prof. Davis's admirable work on the subject of Meteorology he says: "We dwell on the surface of the land; we sail across the surface of the sea; but we live at the bottom of the atmosphere.

Its changes pass over our heads; its continual fluctuations control our labors. Whether our occupation is indoor or out, on land or at sea, we are all more or less influenced by changes from the clear sunshine of blue skies, to the dark shadows under clouds; from the dusty weather of droughts to the rains of passing storms; from the enervating southerly winds to the bracing currents from the north.

Few persons fail to raise some questions now and then concerning the causes and processes of these changes; some inquire more earnestly, desiring to inform themselves carefully on the subject.

No school study suggests more frequent questions from schoolars, or allows more educative replies from teachers than meteorology, the science of the atmosphere."

To this it may well be added that the atmospheric phenomena of sky and clouds furnish some of the grandest panoramas of beauty that nature ever presents to our eyes. And yet, how strange it is that while we recognize the different forms of earth and sea, we so seldom distinguish the various features of the atmosphere.

We have an abundance of names for the different appearances of land and water, as island, peninsula, isthmus, cape, and mountain; or, sea, gulf, bay, lake and river. But for the many and beautiful aspects of the sky, only indefinite or figurative language is commonly at hand. It is only fine or dull, bright or cloudy.

With the advancement of meteorological knowledge much has been done, however, to bring about a desirable change. Convenient names which have a definite application, more commonly used to designate the different kinds of clouds and it thus becomes possible to describe an appearance of the sky in such a manner as to correctly represent it to a person who has not seen it. In order to distinguish the different classes of clouds it is necessary to consider how they are formed.

The atmosphere, like a sponge, can absorb a certain amount of water. Thus the water evaporated from the streams and pools, which dry up in summer, passes into the air, generally in the form of invisible vapour.

The atmosphere also can hold more water when warm than at a colder temperature, and it becomes colder the farther it is removed from the earth.

Accordingly as the warm air rises from the earth, it becomes cooler and the moisture that was before invisible is seen in the form of minute floating droplets, and a fog or cloud appears according to the height at which it is developed. The degree of temperature at which those appear is called the dew-point, and the height at which this is reached is marked by the lower margin of those clouds which have even base lines.

If the clouds rise so high that the temperature falls below the freezing point, the vapour is changed to snow or icy particles which probably constitute the majority of clouds.

The upward movement of the air, which it is necessary to consider here, is, like the winds, caused primarily by differences in the temperature of the air. This ascent of the warmer air, which is known as *convection*, assumes a vorticular or whirling motion and is often very rapid. It may be observed on the eve of a thunder storm when the cloud known as cumuless can be seen rolling upwards with astonishing celerity.

Having thus briefly treated of the causes of clouds, their different classes may be taken up. These are distinguished chiefly by their form but the altitude is also considered.

CUMULUS.—That form which is the most easily distinguished and is at the same time also the most beautiful, is known as the Cumulus. These are the dome-like clouds that appear on a showery afternoon of summer, which are commonly called "Thunder heads." They usually rise from a flat base, perhaps a mile above the earth to a height of several thousand feet higher, with bold rounded tops often resembling huge mountains. Where the sun shines upon them they present a fleecy appearance, where it does not, they are dark and frowning. When the opposite side from the observer is exposed to the sun they show most beautifnl white margins being in poetic imagery the clouds with silver lining.

STRATUS.—*Stratus* includes all low-lying cloud sheets which have no definite form, from the fogs at the surface of the earth, to clouds of considerable height. It is not a cloud of beauty, but is a usual accompaniment of dull weather and cyclonic storms. It is sometimes the only cloud seen at a single point for several days.

CIRRUS.—*Cirrus* is the name applied to clouds composed of long slender fibres, which are sometimes delicately ; at others, finely banded. They are the highest clouds we see, probably ranging from five to eight or even ten miles in height. In our latitude they generally more eastward, often with a velocity of more than one hundred miles per hour, but owing to their great altitude, they appear to move much more slowly. They undoubtedly consist of icy particles similar to those which float in the lower atmosphere in our coldest weather.

CIRRO-STRATUS.—*Cirro-Stratus* clouds consist of wavy cirrus fibres mingled with bands of a more horizontal appearance. They often extend across the entire sky, when they converge at opposite points of the horizon and form the peculiar feature known as "Noah's Ark." This is probably due to the perspective effect of the parallel bands seen directly overhead being produced in opposite directions in parallel lines. They range next in height to the cirrus and like clouds of that class are in general an indication of a storm.

CIRRO-CUMULUS.—*Cirro-Cumulus* is another modification of the cirrus and is somewhat closely related to the last. It consists of separate masses or balls of clouds. When these are close together they form the mackerel clouds which overspread the sky with the appearance of a mosaic. They are also seen in isolated forms when they represent small storms in the upper air.

There is the authority of both science and verse for the adage that "a mackerel sky seldom leaves the meadows dry," and also for the sailor's saying that "Mare's tails and mackerel scales make lofty ships carry low sails."

CUMULO STRATUS.—The flattened or extended cumulus clouds are called *cumulo-stratus*. They are somewhat extensive clouds and are chiefly seen in fair windy weather. In the latest terminology this class is divided into two sub-classes, (*a*) Strato-cumulus embracing the extended bumulus; (*b*) Cumulus which is bordered by cirro-stratus tops, and called cumulo-nimbus.

NIMBUS.—*Nimbus* is the name given to any cloud from which rain or snow is falling. It therefore represents a state of the weather rather than a form or elevation of cloud and hence it is not a truly scientific term. Accordingly, the term "overcast" is often employed in its stead to denote a sky evenly obscured by a cloud having no definite form. . . .

Did time permit, we could here study the phenomena of storms. The nature of the *cyclone* and the *tornado*, the laws by which they are governed and how these laws were discovered, as well as the great value of scientific weather predictions, all of which are most interesting topics of study.

The beauty of the clouds, however, is more than sufficient for our present consideration.

Whether we look at the towering cumulus or the graceful and wavy cirrus, we must acknowledge their beauty. Nor is there less to admire in the mottled cirro-cumulus or the delicate streaks of the cirro-stratus.

How often a few fleecy floating patches of cirro-cumulus in a clear blue sky form a scene that can only be compared to the view from some high cliff out upon an island-dotted sea; or a lofty cumulus raising his head high above his fellows, frowns down in a awful darkness, or shines resplendent in the setting sun!

The successive variations of the clouds, the grand and imposing as well as their beautiful and graceful aspects, present a field for contemplation and admiration too varied, too grand, and too sublime to fail to arouse the enthusiasm of the most prosaic observer and to implant in him a true love of nature.

In the words of Shelley, the cloud seems to say:

"I bring fresh showers for the thirsty flowers,
From the seas and the streams;
I bear light shade for the leaves when laid
In their noon-day dreams,
From my wings are shaken the dews that waken
The sweet buds every one,
When rocked to rest on their mother's breast,
As she dances about the sun,
I wield the flail of the lashing hail,
And whiten the green plains under;
And then again I dissolve it in rain
And laugh as I pass in thunder.

Richmond, Que.,
Feb. 3rd, 1897.

NOTES, REVIEWS AND COMMENTS.

WHITEAVES, J. F.—"*Canadian Stromatoporoids.*" Can. Rec. Science, Vol. VII, pp. 129-146, July, 1896.

The following species are herein recorded:

ORDOVICIAN SPECIES.

1. Clathrodictyon variolare, Rosen sp.
2. Labechia Canadensis, Nicholson and Murie.
3. Labechia Huronensis, Billings, sp.
4. Beatricea nodulosa, Billings.
5. " undulata, Billings.

SILURIAN SPECIES.

6. Actinostroma matutinum, Nicholson.
7. Clathrodictyon vesiculosum, Nich. and Murie.
11. Stromatopora Galtensis, Dawson sp.
12. " " constellata, Spencer sp.
13. " " Hudsonica, Dawson sp.

8. Clathrodictyon fastigiatum, Nich.
9. " " ostiolatum, Nich.
10. Stromatopora antiqua, Nich. and Murie.
14. " " Carteri, Nicholson.
15. Syringostroma Ristigouchense, Spencer.

DEVONIAN SPECIES.

16. Actinostroma expansum, Hall and Whitfield.
17. Actinostroma Tyrrellii Nicholson.
18. " " Whiteavesii, Nich.
19. " " fenestratum, Nich.
20. Clathrodictyon cellulosum, Nich. and Murie.
21. Clathrodictyon laxum, Nicholson.
22. " " retiforme, Nich. and Murie.
23. Stromatopora sp. cf. S. bucheliensis, Bazatzky.
24. Stromatopora sp. cf. S. bucheliensis, Bargatzky.
25. Stromatoporella, cf. S. Hüpschii, Barg.
26. Stromatoporella granulata, Nicholson.
27. " " Selwynii, Nicholson.
28. " " incrustans, Hall and Whitfield.
29. Stromatoporella tuberculata, Nich.

SPECIES OF DOUBTFUL AFFINITIES.

30. Stromatocerium erugosum, Hall.
31. Stromatopora Hindei, Nicholson.
32. " " striatella, Nicholson.
33. Caunopora Walkeri, Spencer.
34. Caunopora mirabilis, Spencer.
35. Coenostroma botryoideum, Spencer.
36. Dictyostroma reticulatum, Spencer.
37. Stromatopora perforata, Nich. sp.
38. " " mamillata, Nich.

MATTHEW, G. F.—"*Faunas of the Paradoxides beds in Eastern North America.*" No. 1. Trans. N. Y. Acad. Sc., Vol. 15, pp., 192-247, plates 14-17, Aug. 1896.

LUQUER, L. M. AND HEINRICH RIES—"*The 'Augen' gneiss area, pegmatite veins and diorite dikes at Bedford, N. Y.*" Amer. Geol., Vol. XVII, No. 4, pp. 239-261, Oct., 1896.

BULLETIN OF THE NATURAL HISTORY SOCIETY OF NEW BRUNSWICK, No. XIV, 66 pp., St. John, N.B., 1896.

This number contains: (1) *A Biographical Sketch of Dr. Abraham Gesner*, accompanied by a portrait of that eminent worker in the field of geological survey in Eastern Canada early in the century (1839-1843). The sketch is written by G. W. Gesner and gives useful information regarding this pioneer in the gelogical work of a portion of Acadia. The writings of Dr. Gesner are also indicated. (2) *The Restigouche—with notes especially on its flora*, by G. U. Hay. This sketch of a trip down the Restigouche in company with Dr. Ganong contains

eleven species of plants new to the flora of New Brunswick. (3) *An outline of Phytobiology (Phytoecology)*, by W. F. Ganong. This is practically a plea for the establishment of a biological Survey of Acadian Plants. (4) "*Notes on the Natural History and Physiography of New Brunswick*, by W. F. Ganong. In this article "Temperature measurements in Clear Lake," the outlet-delta of L. Utopia and other topics are discussed. (5) "*Notes on the occurrence of two shrews new to New Brunswick*," by Philip Cox. *Sorex Richardsoni*, Bachman and *S. fumeus*, Miller, are the two specimens recorded—the latter for the first time in British North America. An interesting Appendix, with Biographical Notes, follow the articles just mentioned.—H. M. A.

GEOLOGICAL SURVEY OF CANADA, By G. M. Dawson, C.M.G., LL.D., &c., Director, "Annual Report," (New Series) Vol. VII, Reports A. B. C. F. J. M. R S. for 1894, published 1896, being publication No. 581 of Geol. Survey Reports, &c.

REPORT A.—This deals with the Summary Report of the operations of the Survey for 1894, and includes a preliminary account of explorations and geological surveys as well as of museum and office work for that year.

REPORT B.—This is the "Report on the Area of the Kamloops map-sheet, British Columbia," by George M. Dawson, with an appendix contains 427 pages in which are described the physical geography of the region, the general geology, indicating the palæozoic and mesezoic formations represented, together with descriptions of the conditions of metamorphism appertaining the volcanic rocks. Four appendices accompany this report; one on the petrographical characters of the rocks, by W.F. Ferrier; one on Shuswap names in the Kamloops map-sheet; one on limits of growth of spruce trees, &c. and one on observations of temperatures at different altitudes.

REPORT C.—"*Exploration of the Finlay and Omenica Rivers*," by R. G. McConnell. The routes travelled, the geological observations made, together with a geological summary and economic notes obtained are given in this report.

REPORT F.—"*On the Country in the vicinity of Red Lake and part of Berens R., Keewatin*," by D. B. Dowling. In this report the physiographic and geologic features of the district are indicated, together with interesting notes of observations made.

REPORT J.—"Report on that portion of the Province of Quebec comprised in the S.W. quarter sheet-map of the Eastern Townships of Canada," by R. W. Ells, F. D. Adams and H. M. Ami.

REPORT M.—"On the Surface Geology of East New Brunswick, N.W. Nova Scotia and a portion of P.E.I.," by R. Chalmers. In this report the topographical and physical features of the district are delineated, the Tertiary or Preglacial and early and later Pleistocene deposits are described. The agricultural capabilities of the district, its forests and minerals, as well as materials of economic importance are pointed out.

REPORT R.—This is the report of the Chemical and Mineralogical Branch of the Department, by G. C. Hoffmann. Analyses of coal, gold and silver assays, analyses of iron, nickel and cobalt ores, natural waters, and miscellaneous examinations of material from the various Provinces of the Dominion are given.

REPORT S.—"Mineral Statistics," Reports for 1893 and 1894, by E. D. Ingall.

This very important and instructive contribution to our knowledge of the mineral, forest and other natural resources of our vast Dominion is accompanied by maps, sections and illustrations which greatly enhance the value of the volume. Eleven geological and topographical maps are included in the above, besides fourteen plates illustrating different sections of country and exhibiting remarkable features of more that usual interest.—H.M.A.

JOURNAL OF GEOGRAPHY.

The Journal of Geography, 41 North Queen Street, Lancaster, Pa.

For many years past there has been felt a growing need of some journal or periodical which would assist in geographical studies and research in America. To satisfy this long-felt want, a number of enthusiastic professors, students of *geography* in the strict sense of the word have just issued. *The Journal of School Geography*. The January and February Nos. 1 and 2, 1897, have just reached us. The editorial staff consists of well-known workers in the field of geography. Besides original articles of strict accuracy and scientific value, the *Journal*

will contain monthly reviews of the leading works which mark the progress of geographical research from an educational standpoint. To the teachers of Ontario and of Canada in general we have no hesitation to recommend this work, and hope that many of our members, who are teachers, will subscribe to this very instructive and live journal.

To give a better idea of the character of the subjects treated, we give herewith the following tables of contents for the two numbers already issued :—

JAN., 1897.—*Introduction* ; *Home Geography*, by W. M. Davis ; *Africa*, Cyrus C. Adams ; *Geographic Instruction in Germany*, Will S. Munroe ; *Suggestions regarding Geography in Grade Schools*, R. E. Dodge ; *Notes*, R. E. Dodge ; *Reviews*.

FEB., 1897.—*The Influences of the Appalachian Barrier upon Colonial History*, Ellen C. Semple : *Meteorological Observations in Schools*, R. DeC. Ward ; *The Causal Notion in Geography*, F. M McMurry ; *Geographic Aids* (1), R. E. Dodge ; *Notes and Reviews*.

The editorial staff comprises men most eminent in geographical research, work and studies, including Messrs R. E. Dodge, W. M. Davis, C. W. Hayes, H. B. Kummel, F. M. McMurry, R. DeC. Ward.

CLUB NOTES.

ANNUAL MEETING.—The eighteenth annual meeting of the Ottawa Field-Naturalists' Club is called for Tuesday evening the 16th day of March at 8 o'clock, when the reports of the Council, Treasurer's statement, and Librarian's report will be presented. The election of officers will also take place and discussion on methods of work in order to advance the interests of the Club. Place of meeting: Normal School, Elgin St. entrance.

PRIZES.—At the beginning of the year 1896 the Council of the O. F. N. C. offered a number of prizes for the best collections of plants, insects, minerals and fossils from the Ottawa district. The Council is now prepared to receive the collections for competition. For particulars *see* May number of NATURALIST.

O. F. N. C.—NEW MEMBERS.

B. E. Walker, Esq., F.G.S., Toronto, Ont. ; Miss Helena Coleman, Toronto, Ont. ; Mr. J. L. Coté, Ottawa ; Rev. R. McNab, Mattawa, Ont.

THE OTTAWA NATURALIST.

VOL. X. OTTAWA, FEBRUARY, 1897. No. 11.

RECENT EXPLORATIONS IN CANADA.

INTRODUCTORY SKETCH—By GEORGE M. DAWSON, C. M. G., F. R. S., F. G. S.

In March 1890, now nearly seven years ago, I had the pleasure of addressing the Ottawa Field-Naturalists' Club on the *Larger Unexplored Regions of Canada.* The subject is one in which those who have actually taken part in exploratory work naturally feel much interest, but I was surprised by the amount of general interest evidenced in it, and by the wide currency given by the press to the remarks then made. It was in fact a surprise to many people to learn that, although they had been accustomed to see the northern part of the continent shown in apparent detail on maps of very small scale, much of the detail was really based upon no actual geographical knowledge, and that there were vast areas which had never even been traversed by reconnaissance surveys, about which practically nothing had been ascertained, and in which the courses of rivers, the position and even the existence of great lakes and other features was practically unknown.

An appeal for the further exploration of such tracts, was made, based primarily on their possible economic value, but it was also pointed out, that whether valuable or not, a certain sentimental and territorial responsibility rested upon Canada, to at least inspect and examine all parts of her vast landed property. The back of Canada's farm lies somewhere near the North Pole, and between our cultivated fields and that point, lie immense reserves of timber, lakes, and seas well stocked with fish, and above all where other resources fail, great possibilities in the way of mineral wealth. We may reasonably look forward to a time, when even in the Arctic lands important mining communities will be planted.

It was necessary to assume some method in defining the regions characterized as unexplored, for in such a matter there is no hard and fast line. After leaving the districts which may

be counted as more or less completely *surveyed*, it was in consequence assumed that along each reasonably accurate line of exploration, a belt of country about fifty miles in width was removed from the unexplored category. This was a very liberal assumption, for no explorer, however competent, could know much about the country twenty-five miles away from his route on either side. Still he would have obtained a general idea of the character of the land—there could scarcely be any prominent mountains which he would not see, nor very large lakes or rivers of which he would not hear from the natives. Drawing broad belts of this kind across the map, some very large and very many small areas remained, but of such areas none under 7,500 square miles were considered. Neither were the Arctic islands, to the north of the continental land, taken into account.

Proceeding on the plan above mentioned, sixteen unexplored areas of large dimensions were outlined,* of which the aggregate area was computed to be about 954,000 square miles, an area between one-third and one-fourth that of the entire Dominion.

Since the date of the address to which I have been alluding —partly perhaps in consequence of the facts made known—a great deal of good exploratory work has been done, and the map then drawn to represent these facts, now requires to be largely modified Most of the work has been done by officers of the Geological Survey, and it has thus been possible to combine geographical exploration with geological work and the scientific inspection of the resources of the regions traversed. Detailed reports and maps have been made or are in course of preparation. You are all, no doubt, already familiar with some of these, but it has been urged by the gentlemen engaged in arranging the programme of evening meetings for this season, that some short account at first hand of the results achieved would be acceptable and interesting.

I will not now occupy more of your time, except to say that in the near future it devolves upon us to remove what remains of the unexplored dark tracts upon our map, and further

* See map Vol. 4, No. 2, May, 1890.

than that, having arrived at a knowledge of the more promising regions in each case, to institute more comprehensive and exact surveys of these, of such a kind as to enable their resources, whatever they may be, to be utilized. If some of them are at present too remote to be profitably employed, it is still well to know that they exist and lie in reserve until it may be practicable or necessary to draw upon them.

THE BARREN LANDS.

By J. B. TYRRELL, M.A., F.G.S.

Dr. Dawson has asked me to give you a brief account of the explorations carried through the unexplored regions west of the northern part of Hudson Bay. The more southern of the two districts explored has an area of rather more than 60,000 square miles, which is somewhat larger than the Province of New Brunswick and the State of Maine put together, or than England and Wales.

In 1892 Dr. Selwyn, then director of the Geological Survey, instructed me to explore this country as far as could possibly be done in one season, and Mr. Dowling was detailed to act as my assistant. As the district is large and there were no trading posts in its interior from which supplies could be obtained, it was necessary to divide the party in order to carry sufficient provisions for the journey.

Mr. Dowling proceeded to Edmonton and thence to Athabasca Landing, and from there, with a canoe and small sail-boat carrying supplies for the greater part of the season, he decended Athabasca river, which had previously been surveyed by Mr. Ogilvie, and thence made a compass and boat-log survey of the south shore of Lake Athabasca as far east as Fond du Lac, a little outpost of the Hudson Bay Company.

I proceeded by rail to Prince Albert, thence north-westward to Green Lake, and in two canoes descended Beaver River to Ile a là Crosse Lake, carrying the supplies that would be needed until a union with Mr. Dowling was affected.

From the north side of the Churchill river, a short distance below Ile a là Crosse Lake, we struck northward into the unexplored country, ascending a small rapid stream that had been called by the Indians Mudjatick (bad deer) river. A sandy plain, forming the height of land, was crossed at the head of this river, and Cree Lake, a beautiful sheet of clear water, 45 miles long, was entered, lying, like so many of the great Canadian lakes, along the line of contact of the Archæan and overlying Palæozoic rocks. The surrounding country was now almost sterile sandy plains, thinly wooded with Jack-pine. Between the scattered tree-trunks one could see long distances in any direction. Saying nothing of innumerable swarms of black flies and mosquitoes, porcupines were about the only living things to be seen on these sandy plains, and where these animals are plentiful you may be sure that human beings rarely come, for they are very easily killed, and the Indians are very fond of a nice roasted porcupine.

Cree river, a wild torrential stream, flowing in a shallow channel, was descended to Stone river, and this river was descended to Fond du Lac on Lake Athabasca, where Mr. Dowling and I arrived within a few hours of each other, more than six weeks after we had separated at Regina on the C.P.R. 650 miles further south.

The united party then turned eastward, and carried an instrumental survey to the west end of Athabasca Lake, up Stone river to its source in Wollaston Lake, from which lake Mr. Dowling continued the survey to Reindeer Lake, down Reindeer river and up Churchill river to the Frog Portage where it was connected with the instrumental survey made by Mr. Fawcett down Churchill river. An instrumental survey had thus been carried entirely round this extensive area, forming an excellent basis for further explorations either in the interior or further north.

At Wollaston Lake I left Mr. Dowling, and, accompanied by three Indians who, however, knew nothing of the country, ascended Geikie river to the height of land, and descended Foster river to Churchill river, thus carrying a second line of exploration, almost parallel to Mudjatick and Cree rivers,

through the middle of the unexplored country, arriving at Ile a là Crosse as the September equinoxials set in,having been absent in the north three months, and having carried all the provisions that we needed for the journey.

During this season I learned, in talking with Chippewyans, of three canoe-routes into the far northern country, followed by the Indians in their search for deer, as these animals come from the north down to the edge of the woods. These routes led across the height of land to unkown rivers flowing towards the north, but to what ocean the rivers flowed the Indians had no idea.

These routes seemed to furnish a means of entrance into the great unknown country, of 178,000 square miles, lying west of Hudson Bay, an area as large as Vermont, New York, Pennsylvania, Ohio and Kentucky put together; or three times as large as England and Wales. This area includes the south-eastern and eastern part of the barren lands of Canada, an area of 350,000 square miles, of which almost the only reliable information that we possessed was derived from the explorations of Franklin, Back and Richardson, made in the early part of the present century. Throughout this whole region there is not a single white inhabitant, and the explorer must depend for provisions solely on what he is able to carry with him, or on his net and gun.

This country lies entirely north of the possible limit of successful agriculture, and if it possesses any considerable wealth that wealth must be in its minerals. Consequently any exploration that stands a chance of being of economic value must be carried out by the geologist and the prospector.

In the spring of 1893 I was instructed to explore this unknown country, and the route northward from Black Lake on Stone river was chosen as the one most likely to lead through the very centre of the great unexplored area on the west side of Hudson Bay.

Descending Athabasca river, loaded with supplies for the whole summer, we reached Fort Chippewyan about the 18th of June, and on the 21st we left it with our three canoes loaded down to the gunwales, for there was no prospect of again

seeing white men or obtaining supplies from others until the close of the season of open water.

Early in July we began the ascent of Chipman river, without anything to guide us but the determination to keep constantly forcing our way up the stream until we had reached its source. To give you some idea of the difficulties of travelling in this way, I may mention that we spent the whole of one valuable day searching the shores of a small lake, and at last we found the river that we wished to ascend only four miles, or one hour's travel, from where we had entered it. On the shores of Selwyn Lake, at the head of the river, we met a small band of Indians, but they declared that they knew nothing about the country further north, except that it was swarming with cannibal Eskimos who would certainly eat us. This may seem very ridiculous to us, but it was very dispiriting to our Indian canoe-men, some of whom immediately endeavoured to leave us.

From the north end of Selwyn Lake we crossed the height of land, here an almost level plain, to the shore of Daly Lake, and our search for its outlet began. When the river was found we determined to follow it, if possible, wherever the current would take us, whether to the Arctic Ocean or to Hudson Bay. The Chippewyans had told us that a river called Telzoa (or wide shallow) river flowed northward from this lake to To' bon Lake, that their fathers used to travel down it as far as that lake, but that its character was unknown to them.

We descended this river for 700 miles, often with many misgivings, and with many precious days lost in search of our course, until, on the second of September,we reached the head of Chesterfield Inlet where some of the old explorers of last century, in search of a north-west passage, had been before us. We had accomplished what we had started out to do, and had surveyed a line through the very middle of the unknown region. Thence we travelled down and surveyed Chesterfield Inlet and the west shore of Hudson Bay as far as Fort Churchill, where we arrived, very much exhausted, on the 16th of October.

On the following spring I was again sent northward to further explore the same region, and this time I was accom-

panied by Mr. Munroe-Ferguson, A.D.C. to His Excellency, the Governor General. After a paddle of 650 miles to the north end of Reindeer Lake, we struck northward into the unknown country, made 53 portages, averaging a third of a mile each, across rough stony country, and then descended Kazan River to Yath-kyed Lake, from which we portaged twelve miles across flat marshy land to Ferguson Lake, and then descended Ferguson River to the west coast of Hudson Bay. From there we surveyed the shore southward to Churchill, where we arrived on the first of October.

The total distance surveyed in these three years amounts to 4,200 miles, 2,150 of which was on lines, marked in red on the map exhibited on the wall, through country previously untrodden. To accomplish these surveys it was necessary to travel, in all, either in canoes or on foot, 7,800 miles.

Both tracts of country here spoken of have a generally even contour, and as a rule they slope gently northward or north-eastward towards the Arctic Ocean, or Hudson Bay. They are the homes of a couple of thousand of the people of Canada, and though these people may be Indians and Eskimos, they contribute to the revenue and to the support of the Government of Canada the same as we do. Without some knowledge of the people and the country they live in, it is impossible to govern them wisely and justly.

But what are the possibilities of settlement for civilized men? Large districts have been shown by these explorations to be underlain by Huronian and Keweenawan rocks, which are almost everywhere found to be rich in precious minerals, and if extensive deposits of these were discovered the country would soon be opened up. The surface is moderately level, so that railways could easily and cheaply be built, and ocean-going steamers could readily run into Churchill Harbour, or into any of the other numerous and good harbors along the north-western shore of Hudson Bay.

THE LABRADOR AREA.

By A. P. Low, B.A.Sc., F.G.S.A. &c.

INTRODUCTION.—Dr. Dawson in his paper, read before the Ottawa Field Naturalists Club in 1890, estimated the unexplored area of the Labrador Peninsula at 389,000 square miles out of a total area of 511,000 square miles, making it the greatest unexplored area in the Dominion. Since that date we have run exploratory lines from east to west and from north to south through this great area, so that it is now divided into six smaller areas ; and allowing, as in the previous paper, that a line through any region gives a knowledge of the country for twenty-five miles on both sides of it, the total area is now reduced to less than 200,000 square miles. At the least, we can now claim to have a fair idea of the climate, distribution of the forest and some of the natural resources of this vast region, and have found that although poor enough, it is not the desolate wilderness of rock and snow which it was popularly supposed to be up to a recent date.

During the past five seasons it has been my duty to undertake explorations in the Labrador Peninsula, and the total length of the surveys through the unexplored area is approximately 3,500 miles, made up as follows:—In 1892, 500 miles; in 1893, 700 miles ; in 1894, 1,300 miles ; in 1895, 400 miles, and in 1896, 500 miles. Much of this work was commenced far from railways and civilization, so that the total amount of travel in canoes and boats, or on foot, not counting railway or ship transport, amounts to upwards of 8,000 miles.

In 1892 I was assisted by Mr. A. H. D. Ross, and we started from Lake St. John, which is situated about one hundred miles north of Quebec city, at the end of the Quebec and Lake St. John Railway. From there the Ashouapmouchouan River was ascended in a north-west course, some two hundred miles to its head, at the watershed dividing the rivers flowing south into the St. Lawrence from those flowing westward into Hudson Bay.

Having crossed the height-of-land, a north-west course was followed sixty miles through three large lakes to Lake Mistassini. This great lake was navigated for sixty miles to the Rupert River, its outlet on the north-west side. This portion of the route had been previously explored from Lake St. John to Mistassini by J. Richardson in 1870* and Lake Mistassini by myself in 1885.*

The Rupert River, a short distance below where it leaves Lake Mistassini, is divided into two nearly equal channels by a large island ; these channels do not again unite for nearly one hundred miles. Our way followed the east channel in a northerly direction for fifty miles,when the stream makes a sharp bend to the westward, and continues in that direction until it joins the other channel. The Rupert River was left at this bend and passing still northward for fifty miles, over a portage route of small lakes and streams connected by long portages, either of a swampy character or formed of packed boulders, the East Main River was reached about three hundred miles above its mouth. This stream was ascended about thirty miles to where it was joined by the Tichagami branch, and then turning westward its course was followed to its mouth on the east side of James Bay. The return trip was made by skirting James Bay to the mouth of the Moose River, which flows into its south-west corner. The Moose River was ascended to Missinaibie Station on the C. P. Ry., and so Ottawa was reached in October.

The results of this exploration, besides the survey of the route from Lake Mistassini to James Bay, include the discovery of large areas of Huronian rocks along the East Main River, and as these rocks have a close resemblance to the gold-bearing rocks of the Lake of the Woods area, the precious metal will probably be found in them. Other important observations on the climate, forests, plants, animals and fisheries were made, which go to show that this northern region is not nearly so barren

*Geol. Surv. Canada, Report 1870-71. †Geol. Surv. Canada, Report 1885.

as had been believed, and that the climatic and other conditions about James Bay and for a hundred miles inland are such as to allow of settlement, and the growth of the more hardy cereals.

In 1893, accompanied by Mr. D. I. V. Eaton, we again started from Lake St. John, but instead of following the Ashouapmouchouan River in a northwest direction to its head, we passed directly northward up the Chef branch of that river, and thus lessened the distance to Lake Mistassini by about fifty miles. The route explored in 1892 was followed to the East Main River, and the work of the season started from the end of the last season's survey, this time ascending the river. The main stream was ascended, with numerous portages past falls and rapids, about one hundred miles, when the river was left and the route passed up a small northern tributary, called Long Portage Creek, which is on the route followed by the Hudson's Bay Company to their post at Nichicun. This stream was ascended thirty-five miles and then the route led eastward through a number of lakes for thirty miles to the watershed between the East Main and the Big river which is the next large stream to the north flowing into James' Bay. From there six miles of lakes were passed through to the Big River, which flows from the southward, and is a large stream where we joined it. Eight miles below, the river enters Nichicun Lake, which is a large irregular body of water about thirty miles long, and 1760 feet above sea level.

From Nichicun the route explored continued eastward through a bewildering system of irregular lakes drained by tributaries of the Big River, for forty miles to the height of-land dividing the Big River from the waters flowing north into Ungava Bay: and from there twenty miles farther to Lake Kaniapiskau, another of the large lakes found throughout the Labrador Peninsula. The Kaniapiskau River flows out of its north end, and was followed downward to its mouth on the southwest side of Ungava Bay. For sixty miles below the lake, the river, like all the streams of the central area, flows nearly on

a level with the general surface, or rather fills all the depressions along its course, and in consequence is made up of a succession of lake expansions connected by short stretches of rapids, where the river is often broken into several channels by large islands. Below this distance the channel contracts and in five miles the river descends more than 200 feet into a distinct valley well below the level of the surrounding country; and from there to its mouth always follows a distinct ancient valley cut down into the solid rock from 300 to 1,000 feet below the surrounding country. Between the first and the second gorge, which is about eighty miles lower down stream, the river is almost a continuous succession of heavy shallow rapids so bad that the stream is not used by the Indians. At the second gorge, or Eaton Canon, the river passes through a narrow cleft in the rocks and falls more than 300 feet in less than a mile. Below Eaton Canon the river continues with a very rapid current for 175 miles to where it joins the Larch River, a very large branch from the westward, which was subsequently explored in 1896. From the confluence to these two large streams to its mouth ninety miles below the Koksoak River varies from half a mile to two miles in width, and has everywhere a swift current, so that the discharge is probably greater than any other stream in Labrador.

It had been intended that the party should winter at Fort Chimo, a Hudson's Bay post situated about thirty miles above the mouth of the river, but on our arrival there, we learned that during the previous winter the Indians and Eskimo belonging to this post had suffered grievously from famine, so that, of the former, upwards of 150 persons had perished of starvation, while among the latter several families had been nearly wiped out. This calamity was due to the failure of the herds of barren-ground caribou to make their usual mirgation from the barren grounds southward to the wooded regions in the late autumn and winter. As the Indians of the region depend almost wholly on the deer for both food and clothing, the failure of the supply reduced them to abject poverty, and was the direct cause of the

death of about one half of the entire Indian population from starvation and exposure. For this and other reasons, it was thought advisable to leave Fort Chimo, and to pass the winter at North-west River post at the head of Hamilton Inlet ; and to do so we took passage on the H. B. Co's steamship "Erik" to Rigolet on Hamilton Inlet. From Rigolet the supplies were sent in a small schooner to North-west River ; and from there the men were dispatched with the canoes up the Hamilton River, with instructions to go on as far as possible before the river set fast ; they ascended about 130 miles before being stopped by ice. In January an attempt was made to send provisions inland up the Hamilton River, but after ascending it 70 miles, the work was abandoned owing to the impassable nature of the ice in the rapids above. In the beginning of March the party, reinforced by a number of natives, again started inland, and this time succeeded in passing the rough ice, which in the interval had been filled in and levelled with snow. From the beginning of March to the end of May, we were engaged daily hauling on sleds loads of provisions and outfit for the coming summer's work. Finding that the work of the extra men did not assist materially they were soon discharged, and the work of moving five months' outfit devolved upon our party of six. To do this it was necessary to make at least three loads and often four, so that the same ground was passed over from five to seven times, adding great monotony to the heavy work. In this manner we proceeded inland, and when stopped by the break-up of winter, on the 20th May, we had reached a place near the Grand Falls, or 250 miles inland from the mouth of the river. During the entire time while thus engaged, we lived on a diet compound exclusively of rusty pork and flour, there being no chance to secure game or fish in the river valley at that season of the year ; and the advent of spring, bringing with it ducks and geese, and the opening of the rivers and the lakes, so that we could obtain an unlimited supply of fish, was heartily welcomed. The Hamilton River, like the Koksoak and all the

other large rivers of Labrador, flows in a distinct valley cut down far below the general level of the surrounding country. If Hamilton Inlet, which is only a portion of the ancient valley now sunk below sea level is included, the main valley extends inland nearly four hundred miles, and its present bottom is from 600 to 1,200 feet below the surface of the surrounding tableland. The upper portions of the river flows nearly on a level with the lower portions of the central tableland, and like the Kanapiskan spreads out into lakes, or in other places is broken into several channels by large islands, so that it is often difficult to define or follow the principal channel. Near the Grand Falls, the river changes from a meandering stream, that follows the lower levels of the general surface, and contracting into one channel. is percipitated into the ancient, deeply cut valley. In twelve miles this great river, with a volume nearly equal to that of the Ottawa where it flows past the Capital, falls 760 feet from where it issues from a narrow canon into the wider valley. The first part of the descent is seven miles of rapids with a total fall of 200 feet. The river then contracts into a narrow inclined, rocky trough down which it rushes with a tremendous velocity and is spurted out in a solid mass over a steep precipice into a circular basin 300 feet below. The mighty roar of this falling, seething mass of water, which can be heard ten miles away as a vibrating rumble, the mighty display of power and the whole grandeur of the scene fills the beholder with awe so great that the poor Indians of the region cannot be induced to look at it. The basin into which the river falls is about two hundred yards wide, and is nearly surrounded with vertical rocky cliffs, that rise 500 feet above the water. The bottom of the cliffs are lashed continuously by the mighty waves generated in the basin by the fall ; while rising high above the walls of the basin is a column of spray that forms a conspicuous mark visible from any hill within 30 miles of the falls. From the basin the river rushes out through a narrow canon cut vertically into the rock at right angles to the falls. This canon, on

the level with the surrounding table-land, is from 100 to 300 feet wide, but at its bottom is often less than 50 feet across. Down this narrow zig zag gorge the river rushes in a continuous rapid with a fall of 260 feet from the basin to where it issues into the wider ancient valley some eight miles away.

Fram June 1st to July 15th we were engaged exploring the western or Ashuanipi branch of the river ; and an idea of the almost level nature of the central area may be obtained, when it is stated, that duriug this time we did not make a single portage of the river. The last two weeks in July were spent exploring Lake Michikamau which, next to Mistassini is the largest lake in Labrador being upwards of seventy miles long and twenty five miles across in the widest part. This lake, like all the other large lakes of the region, is abundantly stocked with fine large fish, including lake trout, brook trout, land-locked salmon, whitefish and pike, and I may here mention that the finest trout fishing in Labrador, which means the finest in the world, is to be found on the Hamilton River above the Grand Falls.

On August 1st we started southward up the Attikonak Branch of the Hamilton, and followed it to Attikonak Lake at its head ; from there a short portage route lead to the Romaine River, which was descended to within 100 miles of the coast, when it becomes unnavigable, and a portage route sixty miles long was followed south-westward to the St. John River and that stream descended to its mouth near Mingan on the Gulf of St. Lawrence. From Mingan the party crossed to Gaspe and so returned home.

The principal geological discovery of these two years was the finding of a large area of stratified Cambrian rocks, which extend from the upper part of the Hamilton River in a north-northwest direction across the Koksoak River. These rocks contain a quantity of valuable iron ore so great that, in the exposures seen, it was estimated by millions of tons. From the notes taken much information was added to the knowledge

possessed regarding the climate and natural resources of the country passed through.

During the month of July and August, 1895, again accompanied by Mr. Eaton, I was engaged in an exploration of the country about the head-waters of the Manicougan River, which flows southward into the St. Lawrence about 220 miles below Quebec. The river was ascended 200 miles to the upper end of the Lake Mouchalagan, to where the Quebec Crown Lands survey ended. From there the course of the river was traced 125 miles to its source in Summit Lake, which, as has already been stated, is also the source of the longest branch of the Koksoak River. In order to reach the head of the river we were obliged to leave the stream thirty miles above Mouchalagan, and to pass by many long portages, that lead either over ridges of boulders or through deep swamps to and from small lakes situated on the highlands along the west side of the river. The country passed through is the highest and roughest in Labrador and its elevation varies from 2000 and 2500 feet above the sea level.

Before reaching Summit Lake a trip was made westward to the head-waters of the Big River above Lake Nichicun, in order to connect with the survey of 1894. Having with great difficulty gained the head of the river, we carried the survey down it, and in doing so had to pass for 50 miles through a narrow gorge, where it was impossible to make portages out of the valley and where the river, by its heavy grade, forms a continuous rapid. This work was exceedingly dangerous and in running a heavy pitch a canoe upset and one of our Indian canoemen was unfortunately drowned.

The results of this season's work was a number of surveys in this almost inaccessible region which give a good idea of the location of the central watershed. Along the portage route and the river above Lake Mouchalagan great thickness of crystalline limestone were discovered, and associated with them extensive beds of valuable iron ore.

In 1896 I was assisted by Mr. G. A. Young and started with canoes from Missinaibie Station on the C. P. Ry., from there we descended the Moose River to James Bay where a Collingwood fishing boat, the property of the Department, was fitted up, and in it we sailed 450 miles along the east coast of Hudson Bay to Richmond Gulf. Leaving the boat here we passed inland with canoes and ascended streams flowing from the eastward some 75 miles to Clearwater Lake. This lake was thoroughly explored, and was found to be about 35 miles long by 18 miles across in its widest part; it is abundantly stocked with large trout and whitefish. Continuing eastward by a short portage route Seal Lake was reached, and was followed 35 miles to its east end, which is only a few miles from the water-shed dividing the waters flowing into Hudson Bay from those emptying into Ungava Bay. Having crossed the heights-of-land we reached the head of the Stillwater or western branch of the Koksoak River, and descended it 350 miles to its mouth. From Fort Chimo passage was taken in the "Erik" to Rigolet where a change was made to a schooner bound for Quebec, and so Ottawa was reached on October 10th. Among the practical results of this exploration was the discovery of an extension of the Cambrian rocks with their immense beds of valuable iron ore which were found for upwards of 30 miles along the Stillwater River; the elevation of the watershed was found to be about 900 feet above sea level, or much lower than at any other place where it has been crossed.

The results of the explorations of the past five seasons embrace the survey of the East Main, Hamilton and Koksoak rivers and portions of the Rupert, Big, Romaine, St. John and Manicuagan rivers in all some 3,500 miles; the limits of the forest areas and of the different trees composing it have been approximately mapped, and sufficient data has been collected to give a good general idea of the climate and natural resources of the interior of the peninsula. The interior, formerly supposed to be chiefly occupied by barren Laurentian granite and gneiss has been found to contain a large area of iron bearing Cambrian rocks and in other places rocks of the metal-bearing Huronian system have been discovered, while the Laurentian areas which occupy the greater part of the interior, represent all the different rocks found in that series elsewhere.

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FAUNA OTTAWAENSIS.

HYMENOPTERA PARASITICA—PROCTOTRYPIDÆ.

By W. HAGUE HARRINGTON, F.R.S.C., Ottawa.

The species in the remaining two sub-families have proved more numerous than I anticipated. Fortunately I was able to send about a score of the more difficult specimens to Mr. Ashmead, who found among them seven new species, including representatives of two new genera. He very kindly prepared for me descriptions of these new genera and species, which will be found in the Canadian Entomologist, Vol. XXIX, pp 53, 56. The first list contained 99 species and in the subjoined one are 60, so that, after allowing for possible synonyms, we have, in round numbers, 150 species captured in this locality. All the sub-families are represented except the second—Emboliné—of which, however, only one American species has been recognized, viz. *Ampulicomorpha confusa*, Ashm., from California and Nevada. Undoubtedly many other species will yet be found around us, perhaps enough to swell this preliminary list to 200 eventually.

New localities will have to be visited, as those which were nearest are rapidly disappearing. Since the first portion of this paper was printed, Powell's Grove and the Race-course have met the fate of the luxuriant woods which, a few years ago, were known as Stewart's bush—the happy hunting grounds of the botanist, and yielding some game even for the gunner. The fall of the giant twin-pine that stood on Bank Street, signalled the near clearance of the adjacent woodland patches to make way for the extension of the city southward. Both Powell's Grove and the swamp enclosed by the old race track were capital collecting grounds, and their disappearance, albeit

inevitable, must give Ottawa naturalists a sense of personal loss sustained. One compensation there is in the extension of electric car systems, by which other more distant localities may be reached almost as quickly as were those which lay so near at hand.

PROCTOTRYPIDÆ. *(Continued.)*

SUB-FAMILY IX. BELYTINÆ.

Leptorhaptus rufus *Ashm.*	Three females; Hull and Race-course, July and Aug.
Leptorhaptus conicus *Ashm.*	Female; Kettle Island, Aug. 25. Male; Race-course, Aug. 22.
Miota canadensis *Ashm.*	Female; King's Mt., Aug. 12. Two males; Hull, Aug. 26.
Miota americana *Ashm.*	Several females; Kettle Island, Hull and Race-course, Aug.
Miota coloradensis *Ashm.*	Female; Hull, July 23.
Miota rufopleuralis *Ashm.*	Female; Hull, Aug. 14.
Scorpioteleia mirabilis *Ashm.*	Female; Kettle Island, Aug. 18.
Stylidolon politum *Ashm.*	Female; May 13.
Acropiesta flavicauda *Ashm.*	Female.
Belyta erythropus *Ashm.*	Two males; Hull, July and Aug.
Oxylabis spinosus *Prov.*	Female and five males; Hull, Kettle Island and Race-course, May and Aug.
Cinetus mellipes *Say.*	Female; King's Mt., Aug. 12. Male; Hull, Aug. 19.
Cinetus similis *Ashm.*	Female; Hull, Aug. 16.
Xenotoma xanthopus *Ashm.*	Female; Hull, July 29.
Zelotypa flavipes *Ashm.*	Female and two males; Race-course, Aug.
Zelotypa longicornis *Ashm.*	Four females and one male; King's Mt., Kettle Island and Hull, Aug.
Zelotypa fuscicornis *Ashm.*	Male; Hull, July 22.
Zelotypa ruficornis *Ashm.*	Female; Race-course, Aug. 14.
Zelotypa sp. nov.	Female; King's Mt., Aug. 12.
Pantoclis canadensis *Ashm.*	Two females and male; King's Mt., and Race-course, Aug.
Pantoclis coloradensis *Ashm.*	Three males; Hull and Kettle Island, Aug.
Pantoclis analis *Ashm.*	Female and two males; Hull and Race-course, June and Aug.
Pantoclis similis *Ashm.*	Two males; Hull, Aug. 5 and 14.
Pantoclis crassicornis *Ashm.*	Male; Kettle Island, Aug. 25.
Zygota americana *Ashm.*	Abundant in Aug.
Aclista rufescens *Ashm.*	Female; Hull, Aug. 5.

Aclista borealis *Ashm.*	Female and male.
Anectata hirtifrons *Ashm.*	Female and two males; July and Aug.

SUB-FAMILY X. DIAPRIINÆ.

Polypeza Pergandei *Ashm.*	Female; May 20.
Paramesius clavipes *Ashm.*	Four females, one male; Hull, Aug. and Dow's Swamp moss, Nov.
Paramesius spinosus *Ashm.*	Male.
Paramesius sp. nov.	Female and two males; Aug.
Spilomicrus armatus *Ashm.*	Two females and male: Race-course and Casselman, Aug. and May.
Spilomicrus atriclavus *Ashm.*	Female.
Spilomicrus sp. nov ?	Two females; Hull, Aug.
Spilomicrus sp. nov. ?	Female; Hull, July 29.
Hemilexodes sp. nov.	Female.
Aneurhynchus mellipes *Ashm.*	Six females, one male; Hull, Kettle Island and Race-course, June, July and Aug.
Aneurhynchus sp. nov. ?	Male; Casselman, May 24.
Galesus quebecensis *Prov.*	Five males; Hull, July and Aug.
Galesus atricornis *Ashm.*	Female.
Galesus polita *Say.*	Female; so determined by Provancher.
Loxotropa nana *Ashm.*	Two females; Aug.
Loxotropa abrupta *Ashm.*	Several females; Aug.
Loxotropa pezomachoides *Ashm.*	Eight females.
Tropidopria conica *Fabr.*	Female; June 12.
Tropidopria carinata *Thoms.*	Female.
Tropidopria torquata *Prov.*	Female.
Tropidopria simulans *Ashm*	Females abundant, Aug.
Diapria armata *Ashm.*	Female.
Diapria virginica *Ashm.*	Three females and male; King's Mt. and Race-course, Aug.
Diapria sp. nov. ?	Male; Aug. 13.
Ceratropria megaplasta *Ashm.*	Female.
Ceratropria infuscatipes *Ashm.*	Three females; Aug.
Trichopria Harringtonii *Ashm.*	Female.
Trichopria carolinensis *Ashm.*	Female; Dow's Swamp moss, Nov. Male; Race-course, Aug. 1.
Trichopria flavipes *Ashm.*	Female.
Phænopria hæmatobiæ *Ashm.*	Four females; Dow's swamp moss, Nov.
Phænopria aptera *Ashm.*	Females abundant. Several from Dow's Swamp moss.
Monelata hirticellis *Ashm.*	Two females.

STEPHANOCEROS—A BEAUTIFUL ROTIFER RECORDED AT OTTAWA.

By WALTER S. ODELL, Esquire.

I am not aware that the species of Rotifer *Stephanoceros Eichornii* has been found in this locality, if so it has not been described in the "Naturalist." Dr. A. C. Stokes, who is perhaps the best authority on Infusoria in America, says it "does not seem to be common." It has never been my good fortune to find it till it appeared in my aquarium this winter, on a leaf of Ceratophyllum. Three specimens have since appeared in the same. This is one of the most beautiful living microscopic objects found in fresh water, and is barely visible to the eye, being 1.82 mm. long, 212 mm. wide. This rotifer unlike the common forms, lacks the wheel-like cilia surrounding the rim of the head, but instead, five long elliptical arms arranged equidistantly on the head, are held aloft like graceful plumes. These, thicker at the base, are beautifully curved and extended, while the rotifer is feeding, and the tips all point inwards to a common centre. Each arm is bordered by a row of long hairs or cilia springing from the sides and curved outwards and upwards, with inner rows of shorter cilia, forming a firm cage for holding any unlucky infusorian that wanders in. I have seen a Paramecium passing through this cage several times without being secured. When touching the mouth at the base of the arms, it was suddenly drawn, in and in few seconds the creature was transformed into a shapeless mass. The rotifer then straightened the arms till they appeared as a round bundle of erect plumes, and gradually retracted into its case, first withdrawing the head and then the bundle of plumes till it was entirely enclosed. This hyaline case is hollow, tubular, faintly ringed and about four times as long as broad, rounded at the top, and constricted so as to enclose the animal tightly as if in the mouth of a sac The body is pyriform, the lower part gradually tapering to an attenuated foot. The mouth at the base of the arms is ciliated and leads through a short passage to the mastax or jaws. No eyes were present, and I would therefore conclude

that the individuals examined were adults, as Prof. Slack writes: "two red eyes are found in young specimens, but in adults they either disappear or not conspicuous."

Stephanoceros is voracious and feed upon a variety of organisms, such as unicellular plants, amniulcules and rotifers.

Reproduction takes place by means of ova. No ova were detected in the Ottawa examples but in Flossularia, an allied form. I have frequently met the brownish, ganular and oval ovism adhering to the body case. The ova of the latter are generally found attached to the slender stems of myriophyllum or other aquatic plants growing in quiet ponds or shallow bays. They are also found adhering to the fine rootlets of submerged willows. For the period covering two whole weeks I was able to study the characters and structure and mode of life of this rare and most beautiful rotifer—by being carerul and placing the individuals back into my aquarium immediately after examination.

OTTAWA HYDRACHNIDA.

KŒNIKE, VON F.—*Zur systematik der Gattung Eylais, Latr.* Sonder-Abdr. d. Abh. d. Naturw. Ver. z. Bremen, 1897, Band XIV, H. 2.

In this paper, *Eylais falcata*, *Eylais desecta* and *Eylais triangulifera* are three Canadian species of Hydrachnida described for the first time by Dr. Kœnike, on pp. 288-290. Previous to this most recent study of the genus Eylais, our Ottawa species of Eylais were all referred to *E. extendens** by Mr. Tyrrell, in the Report of the Entomological Branch of the Club, and by Dr. Kœnike himself in his "Nordamerikanische Hydrachniden." Dr Kœnike's present paper evidently subdivides the genus *Eylais* and the forms described under the designation *E. extendens* O. P. Muller).

(1) *E. falcata*—This species was found in a pond at Deschenes, and in the Rideau, by Mr. Tyrrell.

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*Trans. Ottawa Field-Naturalists' Club, Vol II, No. 1, p. 140, 1884; and Nordamerikanische Hydrachniden, Abh. d. Naturwiss. Ver. z. Bremen, Bd. XIII, Heft. 2, p. 171, 1895.

(2) *E. desecta*—Also discovered by Mr. Tyrrell in a pond at Deschene, Que. This form is related to *E. undulosa*, Kœnike.

(3) *E. triangulifera*—Pond at Deschenes, collected by Mr. J. B. Tyrrell. A form showing some characters allied to *E. desecta*, Kœnike, and to *E. Mulleri*, Kœnike.

The Rideau Canal and the ponds about Ottawa have only been partially examined as yet by the members of our Club, and we hope that future researches will disclose the rich fauna waiting to be discovered.—H. M. A.

THE LECTURE COURSE.

The joint course of Lectures under the auspices of the Ottawa Literary and Scientific Society and of the Ottawa Field Naturalists' Club is now over and a brief synopsis is given of the events as they took place.

By kind permission of the Hon. G. W. Ross, Minister of Education for Ontario, and of Dr. J. A. MacCabe, Principal of the Provincial Normal School, Ottawa, the hall was again placed at our disposal for the said course of free public lectures. The following comprise the series of evening soirees :

NOVEMBER 9TH, 1896.—On this evening between 8 and 10.30 p.m. was held a *Conversazione* and *Microscopical Soiree* at which Principal MacCabe, Mr. Shutt, Mr. Klotz, ond Mr. A. H. Macdougall gave brief addresses. These were followed by five-minute talks on Natural History, illustrated with microscopic slides thrown upon a white screen by means of an electric projection microscope furnished for the occasion by Mr. H. M. Ami. This method of presenting microscopical objects before so vast an audience as was present on that occasion proved most interesting and satisfactory. Dr. Fletcher spoke on insects and plants ; Mr. Odell on living organisms in water ; Prof. Prince on various Zoological and Anatomical preparations whilst Dr. Ami introduced thin sections of corals and rocks and spoke briefly upon their structure and characters.

At the conclusion of the evening a hearty vote of thanks was unanimously accorded to the Ottawa Electric Company for supplying *gratis* electric current, wires, etc., during the evening. To Mr. Wm. Scott and Mr. A. Dion especially, are the thanks of the members of the two societies due for their great kindness and interest in the matter.

NOVEMBER 27TH, 1896. Ottawa Teachers' Association.—*Electrical Discharges in High Vacua*," by Prof. John Cox, M.A., F.R.S.C., of the Physics Laboratories, McGill University, Montreal.

Professor Cox began by showing the insulating power of dry air and the disruptive discharges which occurs when the terminals are approached to a minimum distance. He then caused the same discharge to take place in sealed tubes from which the air had been exhausted in varying degrees, and demonstrated Quet's observations upon the stratification of the medium. He referred to the fact that De la Rue has proved by the uniformity of potential that even in highly attenuated air the discharge is a disruptive one, and that at no degree of exhaustion is air a conductor. The striæ were shown in a large number of Geissler tubes containing various gases highly rarified. All the strata appear to start from the positive pole, and as they successively detach themselves from it they occupy very constant positions relatively. The potential necessary to cause a current to pass (disruptively) diminishes until a certain attenuation is reached, when it increases and the strata thicken and diminish in number until no discharge passes, however high be be the potential. The colours are reversed in order by reversing the direction of the current. All these experiments were made in tubes which, are highly rarified, still were far from perfectly vacuous. Dr. Crookes was the first to carry the exhaustion of tubes to a degree approaching perfect vacuum. In this case the stratification ceases, and a bluish light fills the entire tube. When the vacuum approaches perfection the light proceeds from

the electrode in straight lines, and is capable of throwing a shadow (of a piece of mica, &c.,) surrounded by a brilliant fluorescence. Tubes containing gems, as diamond, ruby, emerald, topaz, etc., were illustrated in this way with most beautiful effect. The rectilinear light is also capable of producing mechanical effects, and these were demonstrated. One of the most beautiful experiments was that in which a tube of potash was fused into a perfectly vacuous globe provided with electrodes. The vacuum acted as a complete non-conductor, but as the potash tube was treated and a little moisture generated, the striæ began to appear. As the potash tube cooled, and the moisture was reabsorbed, the phenomena proceeded in reverse order.

Professor Cox went on to state the theories which have been promulgated to explain the appearances referred to; but our space will not permit us to attempt any exposition of these. But it would be inexcusable to omit stating that the whole field opened up by Crooke's and more recently investigated by Lenard, Roentgen and others, is really very imperfectly explored as yet, and may expected to yield rich treasure as research progresses.

DECEMBER 17TH, Ottawa Literary and Scientific Society.—"*Goethe.*" By Prof. Leigh R. Gregor, M.A, Ph.D., (Heidelberg), of McGill University, Montreal.

Before introducing the lecturer (Dr. Gregor) to the audience. Mr. O. J. Klotz, who was chairman on this occasion, seized the opportunity and on behalf of the members of the two societies under whose auspices the lecture course was organized, disclaimed publicly their having had anything whatever to do with a certain item which had appeared in the daily press of the Capital reflecting upon the suitability of the hall for public lectures. The hall is most eminently fitted and particularly well adapted for courses of free public lectures like these.

Dr. Gregor's valuable lecture was greatly appreciated by the large audience present.

JANUARY 7TH, 1897, Ottawa Field-Naturalists' Club.—"*Under the Midnight Sun—a Trip to Iceland*," with lime-light illustrations. By Prof. James Mavor, University of Toronto.

At this lecture the Report of the Geological Branch of the of the Club was read by one of the leaders, Dr. H. M. Ami. This report will appear in the April number of the OTTAWA NATURALIST.

As Prof. Mavor's lecture has already been published *in extenso* in two leading Scottish magazines the above references are given for the benefit of those who desire to peruse this interesting study of the descendants of that early race which inhabits one of the most remote and northerly centres of civilization.

JANUARY 21ST, 1897, Ottawa Field-Naturalists' Club.—"*Recent Explorations in Canada*" was the subject of this evening's entertainment.

The Director of the Geological Survey of Canada, Dr. G. M. Dawson, was present and introduced the subject with a few preliminary remarks on the progress made in geographical research since '91—in which year he had read a paper before the Ottawa Field-Naturalists' Club—when he pointed out that there was then not less than 950,000 square miles of unexplored territory in British North America—in round numbers 1,000,000 square miles. Since that time, various exploratory surveys were carried on by the Geological Survey Department and by the other Geographical branches of the Canadian Government, chiefly under the direction of Capt. E. Deville, Surveyor General, and not less than 350,000 square miles of British territory had been made known within these six years of research.

Dr. Robert Bell was the next speaker. He described more particularly the region which may be called northermost Ontario in that part of the province and in the adjacent parts of Quebec which border on James's Bay. He spoke at length upon the non-validity and non-permanence of Indian names and con-

cluded his remarks with notes upon the agricultural, forest, mineral and other natural capabilities of that region.

Mr. J. B. Tyrrell then followed and described the "Barren Lands" through which he had traversed in several directions.

Mr. A. P Low then described the "Labrador Area," the special district which had fallen to his lot to explore. The evening proved a most interesting and instructive one.

The February issue of the OTTAWA NATURALIST, Vol. X, No. 11, pp. 201-216, 1897, contains a full account of the exploratory surveys and remarks made by Dr. Dawson, Mr. Tyrrell and Mr. Low. We hope to publish Dr. Bell's remarks in a forthcoming report of these transactions.

FEBRUARY 4TH, 1897, Ottawa Literary and Scientific Society.—

This evening was occupied with "*The Lyric Poets of the Sixteenth Century*," by Duncan Campbell Scott, who kindly undertook to fill the gap caused by Mr. W. D. Lesueur's illness. The latter had intended to present to the audience a lecture entitled ; "*The Meaning and Value of Culture.*"

FEBRUARY 25TH, 1897, Ottawa Field-Naturalists' Club.—"*The American Lobster*," by Andrew Macphail, B.A., M.D., C.M.

This lecture proved a most instructive one and was illustrated by means of lime-light views, microscopic slides, and also by specimens. The lecture will probably appear in a forthcoming number of this journal, and need not be referred to at any greater length at present.

MARCH 4TH—"*Weather*" by Otto J. Klotz. Esq.

This lecture is now in the press and will be published in the May number of the OTTAWA NATURALIST. It was illustrated with a number of excellent lantern slides and much eneyjod by all who were present.

MARCH 11TH, 1897. Ottawa Field-Naturalists' Club.—"*Fruit and Fruit Districts of Canada*," by Mr. John Craig, Horticulturist, Dominion Experimental Farms.

The valuable remarks made by His Excellency the Governor General, who, as patron of the Club, has always taken much interest in the work of the Club by attending on several occasions, together with remarks by members of the O. F. N. C. and the excellent lecture delivered by Mr. Craig, will shortly appear in the OTTAWA NATURALIST.

This lecture closed the series of winter soirees which were exceedingly well attended throughout.

NOTICES AND REVIEWS OF RECENT GEOLOGICAL LITERATURE.

BEECHER, CHARLES E.—*Outline of a Natural Classification of the Trilobites.* Articles VIII and XVIII, Amer. Journ Sc., 4th Series, Vol. III, pp. 89-106 and 181-207, Plate III, New Haven, March, 1897.

Following up his own good work on the ontogeny, structure, appendages and systematic position of the trilobites, Dr. Beecher presents to us his arrangement of the families of trilobites. We have much pleasure in reproducing his scheme as follows :—

SUB-CLASS TRILOBITA.

ORDER A.—HYPOPARIA.

Family 1. Agnostidæ.
" 2. Harpepidæ.
Family 3. Trinucleidæ.

ORDER B.—OPISTHOPARIA.

Family 4. Conocoryphidæ.
" 5. Olenidæ.
" 6. Asaphidæ.
" 7. Proetidæ.
Family 8. Bronteidæ.
" 9. Lichadidæ.
" 10. Acidaspidæ.

ORDER C.—PROPARIA.

Family 11. Encrinuridæ.
" 12. Calymenidæ.
Family 13. Cheiruridæ.
" 14. Phacopidæ.

The definitions of the orders and the families of the Trilobita given by Dr. Beecher in article XVIII, point to the recent rapid advances made in palæobiologic studies ; and whilst retaining the families adopted by Barrande, Salter and Zittel, the order of arrangement, consequent upon his own researches, is very different. There are certain families and genera of trilobites which Dr. Beecher has not yet included in his classifications. These it were well to keep in mind and obtain information thereon so as to enable them to be placed in their proper position in the classification. To Dr. Beecher and Mr. H. M. Bernard we owe much regarding the affinities and structure of a trilobite.—H. M. A.

BEECHER, CHAS. E.—*On the occurrence of Silurian strata in the Big Horn Mts., Wyoming, and in the Black Hills, South Dakota*, (not previously noted). Amer. Geol., Vol. XVIII, pp. 31-33, Minneapolis, July, 1896.

Dr. Beecher notes the occurrence near Buffalo, Wyoming, of *Halysites catenulatus*, L., *Heliolites interstinctus*, L., species of *Zaphrentis*, *Favosites* and *Amplexus*, besides a *Rhynchotrema* allied to R. *increbescens* and a small *Scenidium* or *Orthis* which may be from a horizon as yet indeterminate between the limits limits of the Trenton and Niagara. He further records the occurrence of *Endoceras annulatum* of *Maclurea Logani*, and of *Halysites* from a locality a few miles south-east of Deadwood, S. Dakota. "Recent investigations have shown," says the writer, "the unreliability of several species generally considered as characteristic of the American Niagara, notwithstanding that in Europe the same forms are well-known to have a wide vertical range."—H. M. A.

CROSBY, W. O.—*Englacial Drift.* Technology Quarterly, Vol. IX, Nos. 2 and 3, pp. 116-144, June and September, Boston, 1896.

CROSBY, W. O.—*Contribution to the Geology of Newport neck and Conancut, Island.* Amer. Jour. Sc., Vol. III, pp. 230-236, March, New Haven, 1897.

CROSBY, W. O. AND M. L. FULLER—*Origin of pegmatite.* Technology Quarterly, Vol. IX, No. 4, pp. 326-356, Boston December, 1896.

The aqueo-igneous theory of the origin of pegmatite, the characters of the *acid pegmatites*, their composition, the relations of the composition to enclosing rocks, texture and crystallization are presented. Then the igneous, aqueous, and aqueo-igneous theories that have been advanced are discussed. We think that writers are presenting the situation in a very fair light when they conclude from their studies of *pegmatite* that :

(1) "No sharp line of demarcation can be drawn between dikes and veins."

(2) "In a broad view of the early history of the earth, all the sedimentary and vein rocks are, of course, secondary with reference to the primitive igneous crust, but so are the igneous rocks with which we are now acquainted."

(3) "Probably none of the igneous rocks which have been studied are truly primitive and their derivation in some cases from sediments is claimed by many observers. We commend this paper to all earnest students of Archæan geology.—H. M. A.

BOLETIN DEL INSTITUTO GEOLOGICO DE MEXICO. Nums 4, 5, 6. *Bosquejo geologico de Mexico*, Director, José G. Aguilera, Mexico, 1897.

We have just received the above work, which contains 270 pages of 4to letter press with a number of wood cuts and a coloured geological map of Mexico. This work opens with an appropriate "biographical sketch of Don Antonio del Castillo, late Director of the Geol. Inst. of Mexico," by J. G. Aguilera, followed by an introduction to the present volume and report by the same author. Three chapters follow, bearing upon the geological work carried on by R. J. Bullna, E. Ordonez and J. G. Aguilera. This completes part 1 of the present volume. The second part consists of a geological summary of the Republic of Mexico, in which extensive lists of the fossil

organic remains determined by James Hall, Newberry, Felix, Castillo and Aguilera and others are given. The volume closes with a chapter on volcanic rocks and a well-executed coloured geological map of Mexico mentioned above.—H. M. A.

CALVIN, S.—*Administrative Report of the State Geologist of Iowa for 1896.*

The Pleistocene geology of Iowa is given by stages and include the following periods :—

I. The ALBERTAN.—Invasion by glaciers.
II. The AFTONIAN.—Melting interglacial retreat.
III. The KANSAN.—More intense cold than Albertan.
IV. The BUCHANAN.—Long stage, interglactal.
V. The ILLINOIS.—Only small part of Iowa invaded.
VI. (Unnamed)—Interglacial modifications of previously deposited drift.
VII. The IOWAN.—N. half of Iowa over-ran by glaciers.
VIII. The TORONTO (?) *sic.*—Fourth interglacial, of short duration.
IX. The WISCONSIN.—Last invasion of Iowa by ice.
X. RECENT STAGE.—Wisconsin ice disappeared.

The above sketch is taken from Prof. S. Calvin's comment in the April number of the *American Geologist*, and may be of interest to our readers.—H. M. A.

WATSON, THOS. L.—*Lakes with more than one outlet.* Amer. Geol. Vol. XIX, pp. 267-290, April, 1897.

The result of observations over the surface of an island located in Hudson Strait, directly off the south-east coast o Baffin Land, named Big Island are here noted. The author quotes R. Bell, A. P. Low and J. B. Tyrrell of the Canadian Geological Survey. He also combats the theoretical assumption that "it is contrary to all known physiographic principles for a lake to exist with more than one natural outlet, for any length of time," a subject upon which we trust to hear further.

KIMBALL, JAMES B.—*Physiographic Geology of the Puget Sound Basin.* Amer. Geol. Vol. XIX, No. 4, pp. 225-237, Minneapolis, April, 1897.

Bears directly upon the geological history of the geolopical history of the Coastal Region of British Columbia and Vancouver Islands. This paper will be of special interests to Canadian

geologists, and others who have taken an active part in unravelling the intricate problems involved. The author states that he has not yet observed the marked "physical break between the Cretaceous and Eocene on the Pacific border."

STANTON, T. W.—*The faunal relations of the Eocene and Upper Cretaceous on the Pacific Coast.* U. S. Geological Survey, Extr. from 17th Ann. Rep. of Survey, 1895-96 1065-1048, Washington, D. C., 1886.

In this paper the author, who has made a most careful study of and carried extensive researches in the Pacific Coast Region of the U. S. of America, gives us a valuable contribution to the geological history of that region, not only in differentiating the various horizons and faunas presented, but also in describing several new species which he has discovered during his travels in the West. Dr. Stanton has been able to bridge that hiatus between the Eocene and Cretaceous systems by careful statigraphic methods accompanied by accurate palaeontologica determination. H. M. A.

JAHN, JAROSLAU J.—*Ueber die Geolog Ver des Cambrium von Tejrovic und Skrei in Bohmen.* Jahrbuch der K. K. geolog. Reichenstalt, 1895, Bd. 45, Hft. 4, Wien., 1896.

An indispensible work to the student of Cambrian geology.

HERSHEY, OSCAR H.—*Eskers indicating Stages of Glacial recession in the Kansan epoch in Northern Illinois.* Amer. Geol. Vol. XIX, pp. 237-253, April, 1897.

DILLER, J. S.—*Hornblende Basalt in Northern California.* Amer. Geol. Vol. XIX, No. 4, pp. 253-255, April, 1897.

TARR, RALF S.—*Valley Glaciers of the upper Nugsuak peninsula.* Amer. Geol. Vol. XIX, pp. 262-267, April, 1897.

MARSH. O. C.—*Stylinodontia, a sub-order of Eocene Edentates.* Amer. Jour. Sc., (4) III, pp. 137-146, 1897.

FRECH, FRITZ, AND W. DAMES—*Ueber unter-devonischen. Korallen aus den Karnischen Alpen.* Zeit. d. Deutsch, geol. Gesell, 119-201, 1896.

MARGERIE, EMMANUEL DE—*Catalogue des bibliographies géologiques, r digé avec le concours des membres de la commission bibliographique du Congres.* Congrès Géol. International, (5e session, Washington. 1891), 733 pages, Paris, 1896.

SMITH, GEORGE OTIS—*Geology of the Fox Islands*, Maine. Pamphlet, 76 pages, plate and map, Skowhegan, 1896.

Seven bulletins of the Geol. Society of America were issued February 1897, as follows :

EMERSON, B. K.—*Diabase pitchstone and mud enclosures of the Triassic trap of New England.* Vol. 8. pp. 59-86, pls. 3-9, Rochester, 1897.

MCGEE, W J.—*Sheetflood Erosion*, Vol. 8, pp. 87-112, pls. 10-13, Rochester, 1897.

LECONTE, JOSEPH—*Earth crust movements and their causes.* Vol. 8, pp. 113-126, Rochester, 1897.

STANTON, T. W. and KNOWLTON, F. N.—*Stratigraphy and Palæontology of the Laramie and related formations in Wyoming.*

MERRILL, GEO. P.—*Weathering of Micaceous gneiss in Albermarle County, Va.* Vol. 8, pp. 157-168, Rochester, 1897.

KEMP, J. F.—*The leucite hills of Wyoming.* Vol. 8, pp. 169-182 pl. 14, Rochester, 1897.

UPHAM, WARREN—*Modified drift in St. Paul, Minnesota.* Vol. 8, pp. 183-196, pl. 15, Rochester, 1897.

Earthquake.—On Tuesday the 23rd day of March, 1897, at 6 hrs. 8 min. 3 sec. p.m., there was felt at Ottawa a rather severe shock of earthquake which lasted about twenty seconds. The shock was accompanied by a rumbling noise, the period of greatest intensity of the shock being about eight seconds. At 6 hrs. 8 min. 23 sec. the vibrations and shock were no longer felt. The direction of the oscillations seemed to be from east to west.

The same shock was also felt and recorded at Montreal, Pointe Claire, Ste. Anne de Bellevue, Como, Point Fortune, Hawkesbury, Clarence, in a direction west of Montreal and along the Ottawa Valley ; at Cornwall, Morrisburg and Lancaster along the St. Lawrence ; at St. Hilaire ane St. John's south of Montreal, also at Jessup's Rapids, Berthierville, Three Rivers, east of Montreal besides Valleyfield, Coaticooke, Vankleek Hill ; and at Malone in northern part of the State of New York.

ERRATA.

P. 128, for No. 3, Sept., 1896, read : p. 123 No. 2, Aug., 1896.

P. 149, line 9 from top, for Fullberg, read : Tullberg.

GENERAL INDEX

TO THE

OTTAWA NATURALIST, VOL. X., 1896-'97.

AND

Transactions of the Ottawa Field-Naturalists' Club, Vol. XII.

The Canadian field-naturalist