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APRIL, 1896.

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# THE OTTAWA NATURALIST.

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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-faceted 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 mulhausenii*). 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. Verrill, 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 saltiness 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 desiccation, 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 desiccation 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 desiccation. 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 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 clapse 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 occurred. 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.

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## 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 occurring 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 alcohol, 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-mosses 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 fuliginosus* of Blackwall. There are several other interesting spider 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 *Nysticus limbotus* which you send is also rare; as are *Icius formicarius* and *Synageles picata*. One would hardly have expected that *Theridium unimaculatum* and *Theridula sphæxerula* 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.

*Gaaphosa conspersa* Th.

## CLUBIONIDÆ.

*Clubiona obesa* Htz.  
" *riparia* Koch.

*Clubiona abbotti* Koch.  
*Thargalia agilis* Bks.

## AGALENIDÆ.

*Agalena navia* Htz.

## DICTYNIDÆ.

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

## ULOBORIDÆ.

- Uloborus plumipes *Koch.*

## THERIDIIDÆ.

- Theridium murarium *Em.*                      Lophocarenum florens *Cb.*  
 "                      unimaculatum *Em.*                      Tmeticus bostoniensis *Em.*  
 "                      frondeum *Htz.*                      Microneta quinque-dentata *Koch.*  
 "                      differens *Em.*                      Linyphia marginata *Koch.*  
 Theridula sphaerula *Htz.*                      "                      phrygiana *Koch.*  
 Ceratinella laeta *Cb.*                      "                      mandibulata *Em.*  
 Cornicularia communis *Em.*

## EPEIRIDÆ.

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

## TETRAGNATHIDÆ.

- Tetragnatha extensa *Linm.*                      Tetragnatha laboriosa *Htz.*

## THOMISIDÆ.

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

## LYCOSIDÆ.

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

## ATTIDÆ.

- Phidippus mystaceus *Htz.*                      Attus palustris *Preck.*  
 "                      rufus *Htz.*                      Icius elegans *Htz.*  
 Philæus militaris *Htz.*                      "                      fuligineus *Blk.* (hartii *Em.*)  
 Dendryphantus octavus *Htz.*                      "                      formicarius *Em.*  
 Astia vittata *Htz.*                      "                      n. sp. (canadensis *Bks. Ms.*)  
 Ergane borealis *Blk.*                      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.  
*Limnaea jugularis* Say.  
 " *appressa* Say.  
 " *ampla* Mighels.  
 " *palustris* L.  
*Physa heterostropa* Say.  
 " *hypnorum* L.  
*Planorbis trivolvis* Say.

FROM FORT SIMPSON TO MAC-  
KENZIE RIVER.

*Succinea avara* Say.  
 " *lineata* W. G. B.  
*Limnaea 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.

*Limnaea* 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.  
*Limnaea palustris* L.  
 " *appressa* Say.  
*Physa heterostrophia* Say.

FROM FORT RESOLUTION,  
SLAVE LAKE.

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

## FROM HUDSON'S BAY.

*Limnaea 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:

<i>Bithynella obtusa</i> Lea.	<i>Planorbis bicarinatus</i> Say.
<i>Valvata tricarinata</i> Say.	“ <i>albus</i> Mull.
<i>Succinea ovalis</i> Gld.	“ <i>parvus</i> Say.
“ <i>avara</i> Say.	<i>Segmentina armigera</i> Say.
<i>Limnaea stagnalis</i> L.	<i>Sphaerium sulcatum</i> Lamk.
“ <i>palustris</i> Mull.	“ <i>striatum</i> Lamk.
“ <i>desidiosa</i> Say.	“ <i>occidentale</i> Prime.
“ <i>caperata</i> Say.	<i>Pisidium</i> sp. indet.
<i>Physa gyrina</i> Say.	<i>Unio luteolus</i> Lamk.
<i>Planorbis trivolvis</i> var.	<i>Margaritana complanata</i> Bar.
<i>macrostomus</i> Whiteaves.	<i>Anodonta ferussaciana</i> 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.

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### 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 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.

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## 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 Pagan 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 Pagan 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. A. . .

## 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 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 those 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 Pagan 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. Beddoe, 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	
	<hr/>	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	
	<hr/>	423 75

## EXPENDITURE.

On OTTAWA NATURALIST, 11 numbers of Vol. IX—		
Printing.....	\$295 63	
Mailing, typewriting and en-		
graving .....	18 60	
Postage .....	21 31	
	<hr/>	\$335 54
Printing " Authors' extras" .....	19 25	
General printing and stationery.....	8 98	
"    postage .....	5 50	
On soires and meetings—		
For Circulars, programmes and		
notices.....	\$ 14 39	
Doorkeeper, travelling expenses		
of lecturer.....	12 90	
	<hr/>	27 29
Labels for library.....	2 00	
	<hr/>	398 56
Balance on hand .....	25 19	
	<hr/>	\$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 K ewatin, 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 Marmorata 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  $1\frac{1}{2}$  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.

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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 type-written 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.

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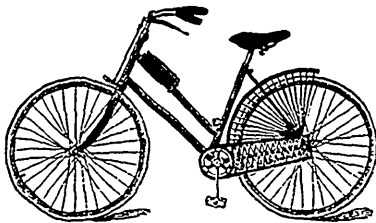
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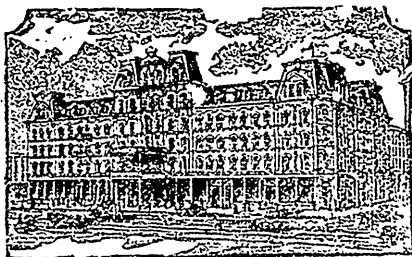
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