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FEBRUARY, 1901.

VOL. XIV, No. 11

THE

OTTAWA

NATURALIST.

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Published by the Ottawa Field-Naturalists' Club.

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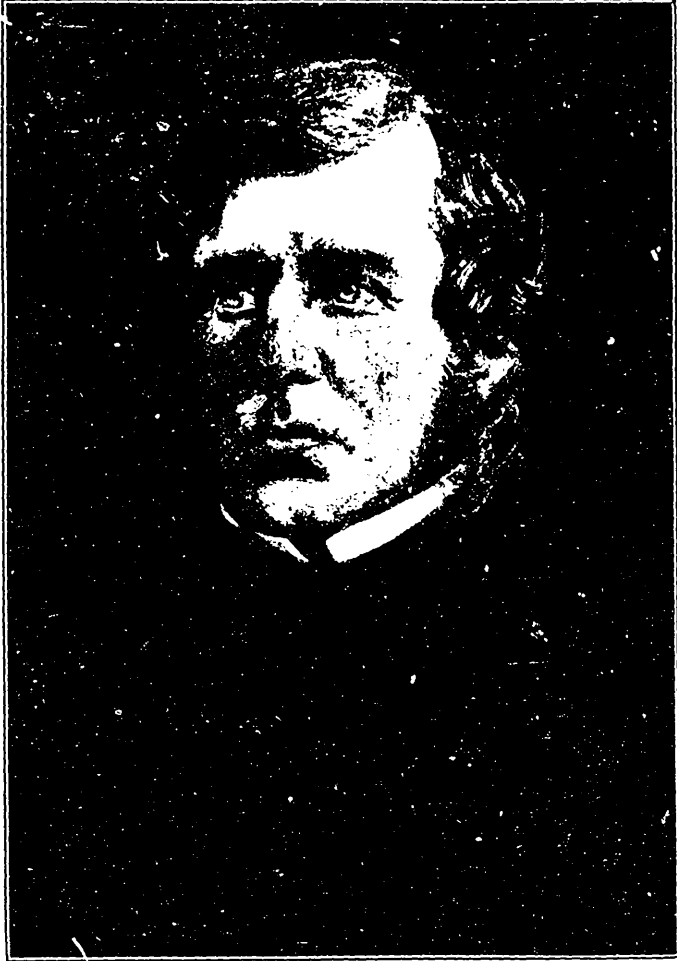
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In common with all the sorrowing subjects of  
**HIS IMPERIAL MAJESTY KING EDWARD VII.**

the members of

**THE OTTAWA FIELD-NATURALISTS' CLUB**

desire to express their deep sense of sorrow and loss at the demise of their beloved Sovereign Lady, **QUEEN VICTORIA**, during whose glorious reign of sixty-four years, scientific work and research, such as our Club aims to accomplish, have received unprecedented impetus.



*E. Billings*

# THE OTTAWA NATURALIST.

VOL. XIV.

OTTAWA, FEBRUARY, 1901.

No. 11.

## ANNUAL ADDRESS OF THE PRESIDENT OF THE OTTAWA FIELD-NATURALISTS' CLUB.

(Delivered December 11, 1900.)

### *Ladies and Gentlemen :*

Another year has passed since we met to inaugurate our last course of winter soirées. As a general statement of the condition of the Ottawa Field-Naturalists' Club to-day, I have no hesitation in stating that we are in a healthy and vigorous condition. The *membership* has possibly never been higher; the finances are, I am informed by our worthy Treasurer, very encouraging; the excursions or sub-excursions or outings, held by the Club last season, have been unusually well attended; and, as far as we can see by the programme of winter soirées which the soirée committee has prepared for us, there is in store many a treat in various branches of the Club's work during the coming season. I take this as an earnest of the good work done and results obtained by the members of the Club at the outings.

### EXCURSIONS AND SUB-EXCURSIONS.

These were held at regular intervals last spring and during the summer months. Beechwood, Britannia, Hemlock Lake, Beaver Meadow, Kirk's Ferry, Montebello, Cumberland, are some of the localities visited. Notices of these outings have appeared from time to time in THE OTTAWA NATURALIST.

### THE OTTAWA NATURALIST.

The official organ of the Club, THE OTTAWA NATURALIST, is fast

becoming the most rapid medium of publication in Canada for notes on the Natural History of our various Provinces.

There is much to be done yet in the way of publication, and it is to be noted that considerable time and labour would be spared the editor, if the associate editors appointed by the Council and responsible for several most important departments of research in Canadian science would co-operate with him and form a committee of supply which would not only prove most interesting but make THE NATURALIST less one-sided perhaps—a phase which at different times it may appear to assume owing to circumstances over which none but the Associated Editors can have control.

#### THE ROSS PRIZE.

Nearly a year ago, during his visit to Ottawa, the Hon. G. W. Ross, then Minister of Education for Ontario, now the Premier of that Province, met a number of the officers of our Club and, noticing the educational work which we were trying to do in our midst, proposed of his own accord to grant a prize or medal for the student of the Normal School doing the best work in connection with our Club.

Competition was keen, and as a result the following communication was prepared by the committee of judges.

Mr. J. H. Putman, Ottawa, June 12th, 1900.  
Science Master, etc.,  
Ottawa Normal School.

On behalf of the Judges appointed by the Council of the Ottawa Field-Naturalists' Club to examine the collections of plants sent in for competition, I have the honour and pleasure to report that after a very careful and critical examination of said collections we have come to the conclusion that owing to the excellence of the collections and large number of specimens sent in and correct identifications of species, the first prize, presented by the Hon. Dr. Ross (Premier of Ontario) falls to Miss Elma Cannon, and the second prize, presented by the President of the Club (proxime accessit) to Miss Mary E. Robson.

The collections of Messrs. J. A. Graham, H. F. Breckenridge and Elmer Bolton, comprising the exact number of twenty-five

species each, are worthy of special mention, as also the collections of Miss L. Mabel Graham, Miss Van Alstyne, and Miss M. M. Mackenzie.

The Judges report that it was no ordinary task of awarding the prizes, as the all-round excellence of the collections demanded critical comparison of specimens with specimens throughout, before decision could be arrived at.

P.S.—The Judges appointed by the Club were :—Dr. James Fletcher, Prof John Macoun, and the President of the Club, Dr. H. M. Ami.

#### THE NATIONAL MUSEUM.

I am not one of those whose motto is "despair." In fact it is with considerable satisfaction and reasonable hope that we look forward to the early meeting of the Canadian Parliament when the realization of the promises made by our worthy representatives are to be fulfilled. We expect a National Museum—a building commensurate with the needs of the times, adapted for the specific purposes for which it is designated—as a repository of authentic and representative specimens illustrating the immense wealth and natural resources of our great Dominion. We hear from all sides the cry that the present building on Sussex street, the building on O'Connor street and other repositories of Canadian collections are "too small," "very inadequate," "totally unfit," "dangerously situated" and running the daily risk of being destroyed by fire, although they contain probably more "types" and typical series of collections illustrating the mineral wealth, forest products, products of earth, sea and sky of Canada than would take a half century to acquire and replace. The fact is, ladies and gentlemen, if the types now displayed, say, in the Geological Museum on Sussex street, were ever destroyed, they could never be replaced and an irreparable loss to Canada as well as to science (or exact knowledge) would be the result. The people of Canada, all the Natural History Societies of the Dominion, the Council of the Ottawa Field-Naturalists' Club, and its members will hail with special delight the first tangible proof of the erection of a National Museum at the capital.

#### ROYAL SOCIETY MEETING.

In May of this year, the Royal Society of Canada again met



in Ottawa, and, as delegate of the Club, I had the honour to lay before that body, with which we have been affiliated since 1882, the results of the previous year's work. This report has been published and a number of extra copies have been issued. These give a fairly comprehensive view of the aims and methods of work carried on by our Club.

#### SUMMER SCHOOL OF SCIENCE.

The Club has heard of the possibility of a Summer School of Science being organized in this portion of Ontario. From the results achieved by a similar organization in the Maritime Provinces, a vast amount of most useful information has been gathered not only by the teaching fraternity for whom these schools of science are generally organized, but also by all who may come into contact with their workings and any of their published results.

The Club heartily welcomes such an organisation in the Ottawa Valley, and trusts that not only the teachers of the Ontario side of the Ottawa River will constitute its membership, but also teachers from the Québec side. Schools of science for the purpose of becoming better acquainted with the natural resources of our country might well be established in every part of the Dominion, so that, instead of scattering our forces during the holiday season, we might acquire much useful knowledge, in a pleasant and profitable way—never as a task, but as a delightful pastime in the broad field of Nature.

I feel confident that I echo the sentiments of every member of the Ottawa Field-Naturalists' Club when I say that the Club is willing to do all in its power to assist such a Summer School of Science whenever established in our midst.

#### MEMBERSHIP.

It had been my purpose, when selected by you to fill the responsible position to which you have once more re-elected me, to organise a *membership committee* of the Club. I am convinced that the Club does not count within its membership one-half, nor one-third of the citizens of this City who are anxious to join us. On all sides I meet with such questions and statements as these :

“ Oh ! may I join your club ? ” “ I'm not scientific enough to join your Club ! ” “ Can I really join your Club ? ”

Certainly you can join the Club ; any lover of Nature or student of the Natural Sciences ought to join our Club, and the sooner we see our membership roll increased, and the readers of THE OTTAWA NATURALIST also increase in their interest in its pages, the sooner will our city awaken to the fact that we are in the midst of a most charming locality, full of attractions and useful studies in all branches of natural history and geology. There is plenty of work for the Club on all sides, whether we concentrate on our special locality, Ottawa, or whether we deal with notes and observations on other parts of Canada. The work carried on by the *Royal Society of Canada* in our midst, by the *Ottawa Literary and Scientific Society*, by the *French Canadian Institute*, by the *St. Patrick's Literary and Scientific Society*, by the *Scientific Society of Ottawa University*, possibly the youngest of our sister societies, has its place, and Ottawa is all the better for these organizations. We are all trying to plant thoughts. May they grow and multiply.

It is not my purpose to detain you very long this evening. I have not prepared any elaborate address such as I would have wished for, on an occasion of this kind. In its stead I have brought together a few words regarding two persons, one, a great Canadian scientist, twenty-four years gone to his rest ; the other a member of our Club, but a few months, gone, whose loss we oft-times feel, for we miss him at our excursions and his familiar face is no longer with us.

#### ARCHIBALD LAMPMAN.

The issue of that simple, chaste but excellent volume of poems from the pen of Archibald Lampman, recalls a duty unaccomplished by us at our last annual inaugural meeting. I refer to the too early demise of our friend and fellow member, the sweet poet of Ottawa, Archibald Lampman.

It was on the 10th day of February, 1899, that he was taken from us, the result of too severe a strain upon his delicate constitution some three years previous, followed by a severe attack of pneumonia two days prior to his death. His ardent love of Nature

and all she teaches in lake, in forest, in autumn, in winter, in sorrow, in comfort, led him into those numberless nooks and sequestered spots which enchant the eye, please the mind and entrance the soul.

In him the Club has lost one of its best friends and sympathizers. His was an observant as well as a contemplative soul. We have caught him many a time fairly revelling in the beauties of Nature-scenes surrounding our city, especially in those least frequented spots in the wilds of Nature where the ruthless hands of man hath not yet laid everything low. How he loved to pore over the harmonies of Nature as his pure true spirit saw them in their virgin beauty and grandeur with which his soul communed ! His poems ought to be in the hands of every field-naturalist. The seasons, the flowers, the birds, the forest, the storm, were so many voices to him which the tender and responsive chords of his delicate nature and temperament understood and with which he was intensely enamoured. In the volume edited by our fellow townsman, Mr. Duncan Campbell Scott, his descriptions reveal a heart that has tasted and seen the lovelinesses and beauties of the favourite haunts of our Club about Ottawa, where Lampman used to drink in those lovely sights that our eyes have witnessed and which his pen has so happily traced. We mourn his loss, but cherish and revere his memory.

#### BILLINGS MEMORIAL.

The late Elkanah Billings, who for twenty years was palæontologist to the Geological Survey of Canada and was the founder of the "Canadian Naturalist and Geologist," was born in the township of Gloucester, along the right bank of the Rideau River in the old, and now demolished Billings homestead situated a few yards below the present bridge which spans that river at the little village of Billings Bridge. He was the second son of Mr. Bradish Billings whose ancestors came from England while those on his mother's side came from Wales. His grandfather was a Brockville physician, Dr. Elkanah Billings, after whom the subject of this sketch was named. Both his parents, however, were born in the United States, his father in Massachussets and his mother in New York State.

From Dr. Whiteaves's obituary notice of Elkanah Billings the following extracts are made :

"Elkanah Billings, our esteemed associate for so many years, was born at the family homestead on the 8th of May, 1820. His first teacher was a governess, Miss Burritt, his next a family tutor named Maitland, and he afterwards went to three small schools in the neighborhood kept respectively by Messrs. Colquhoun, Collins and Fairfield. In 1832 the youth was placed at Rev. D. Turner's school in Bytown as a day pupil, and after four years' interval during which he remained at home on the farm, his parents sent him in 1837 to the St. Lawrence Academy at Potsdam, in the State of New York, of which the Rev. Asa Brainerd was Principal.

"On leaving this institution, Mr. Billings entered the Law Society of Upper Canada as a student in 1839 and was articled to Mr. James McIntosh, a Barrister in Bytown. Mr. McIntosh died in the same year and was succeeded by Mr. Augustus Keefer, with whom Mr. Billings remained for nearly four years; and it appears that he was for a short time also in the office of the late Mr. George Byron Lyon Fellowes in the same town. In 1843 he went to Toronto and studied for a twelvemonth longer with the legal firm of Baldwin & Wilson, and was admitted to practice as an attorney in the fall of 1844. Soon after this he returned to Bytown and entered into partnership with Mr. Christopher Armstrong, who was then one of the judges of the County Court, but, a law having been passed prohibiting judges from pleading, the partnership was dissolved after having lasted only six months."

In 1845 Mr. Billings married a Toronto lady, a sister of the Hon. Judge Adam Wilson. Between 1845 and 1848 he practised law in Bytown, having been called to the Bar in 1845. In 1849, however, he removed to Renfrew, where he practised his profession until June, 1852, when he returned to Bytown where most of his time was engaged in journalistic and scientific pursuits. He occupied the editorial chair of "The Citizen" from the fall of 1852 until late in 1855. Many of Mr. Billings's leading articles in "The Citizen" of those days comprised popular disquisitions on geological topics and natural history subjects, which served to indicate

the trend of thought of the man whose subsequent life led him into enquiries of the highest scientific type, whose writings are now held in the highest esteem and well known the whole scientific world over. It was during these years of residence in Bytown that he began the systematic study of the fossiliferous rocks which are so extensively developed along the banks of the Ottawa River in the vicinity of our city. Probably at first entered upon more as a pastime and relaxation from his journalistic duties, these researches culminated in his final adoption of geological studies, especially in the department of fossil organic remains, for the remainder of his life. The magnificent collections of crinoids, cystideans and star-fishes from the Trenton limestone of Ottawa that are now exhibited in the Museum of the Geological Survey of Canada, testify to his remarkable success and energies in these researches, for it must be remarked that these organisms are extremely rare and great diligence as well as patience must be exercised if satisfactory results are to be expected.

Early in 1856 Mr. Billings issued the first number of the "Canadian Naturalist," of which and the succeeding numbers of the first volume he was practically the sole contributor. The production of this number marks an epoch in the history of the progress of scientific research and discussion in Canada. The articles contained in the first volume of the "Canadian Naturalist, and Geologist" at once stamp Mr. Billings as a master in the description of fossil organic remains as well as of recent natural history objects.

Previous to the issue of this magazine, Mr. Billings had been brought into direct communication with Sir William Logan, then Director of the Geological Survey of Canada, and it was not long, yea, but few months elapsed, before the latter with his usual clear-sightedness engaged the services of Mr. Billings, his friend, as Palæontologist to the Geological Survey of Canada. It was in August, 1856, that Mr. Billings entered upon his duties as Government Palæontologist, and until his death which took place June 14, 1876, a period of nearly twenty years elapsed in which he worked ceaselessly in the domain of palæontology and in assisting his chief and director in assigning geological horizons to the

various geological formations of eastern Canada, involving numerous and difficult problems which made it a task of no mean importance, but fraught with results that the world of to-day can, not only appreciate, but esteem, as amongst the best performed work it has to consult.

His first geological paper was published in April, 1854, and was entitled "On Some New Genera and Species of Cystidea from the Trenton Limestone." It was published in the "Canadian Journal," Toronto, page 215. On removing to Montreal in 1856, Mr. Billings removed also the headquarters of his Magazine—"The Canadian Naturalist and Geologist"; from that date on the same was published in Montreal under the same designation and under the name of "Canadian Naturalist and Quarterly Journal of Science." until 1883, when it was superseded by the "Canadian Record of Science," and became the recognized official organ of the Natural History Society of Montreal. Of this Society he was regularly elected a Vice-president for 14 years, having declined the office of President proffered to him on many occasions.

In 1858 Mr. Billings paid a visit to Europe, where he came in contact with leading geologists of the time and examined the various collections in geology throughout Great Britain. These he studied most zealously and made a comparative study of the Silurian (including both the lower and the upper Silurian of Murchison) and Devonian fossils of Western Europe with those of Canada and arrived at the conclusion that there were but few species identical with those of Canada. In April 1858, when in London he was elected a F. G. S. (Fellow of the Geological Society of London); Sir Roderick Murchison, Professor A. Ramsay, and Prof. T. H. Huxley, having nominated him. He visited Paris where he met a number of distinguished men, amongst others the great Bohemian palæontologist, the Abbé Joachim Barrande, with whom, and in conjunction with Sir William Logan a most interesting discussion arose regarding the age of several rock formations occurring in the Province of Quebec, to which Sir William Logan gave the name "Quebec Group"—a controversy which included many difficult problems and in which the "Taconic Question" was a conspicuous factor.

The term "Quebec Group" will invariably be associated with

the excellent work performed by Sir William Logan and Mr. E. Billings.

Notwithstanding all the attacks that had been made upon the validity of that term and the discussions on its significance, it is as truly a natural group or division in the succession of palæozoic sediments in Eastern Canada to-day as it was in the 50's and 60's, and the chapters devoted to this most important study in the "Geology of Canada" for 1863, are replete with wisdom and forethought.

On several occasions Mr. Billings made extensive collections in the Silurian as well as in the Devonian formations of Ontario and in the vicinity of Montreal, as can be seen from the collections now in the Geological Department, but the bulk of his time was devoted to the determination of geological horizons for mapping purposes and the description of new genera and species brought into the Department by the various field-geologists. Of genera new to science, Mr. Billings described no less than sixty-one and in all described 1065 new species of fossil organic remains from various horizons in the Palæozoic of Canada. He also contributed many papers on natural history and zoology.

He did much in assisting Sir William Logan to establish and build up the Geological Museum ; for, besides the large number of type species which he described, he identified as many more again, species from Canada with forms previously described by Conrad, Hall, Emmons, Vanuxem, Sowerby, and other palæontologists of America and Europe.

His writings indicate a clear and precise mind, coupled with a rare judgment, couched in a phraseology simple and to the point. He published upwards of 170 distinct papers, memoirs, or reports, many of which are now very difficult to obtain or entirely out of print. The bulk of his writings are embodied in the reports of the Geological Survey of Canada, comprising the figures and descriptions of Canadian fossil organic remains. or "Decades I, III, and IV, the Palæozoic Fossils, vol. i., parts 1 to 5 ; Pal. Fos. vol. iii, part 1" ; part 3 of which is still unpublished. While residing in Montreal he was a constant contributor to the "Canadian Naturalist" ; he also wrote important papers in the

“American Journal of Science and Arts,” New Haven, the “Geological Magazine,” London, and the “Journal of the Canadian Institute,” Toronto.

He was an indefatigable worker. From early morning till late at night he was at his desk, and later on at home into the hours of night he carried on his studies, and thus accomplished much in those twenty years of official connection with the Geological Survey of Canada.

Billings left behind him a large amount of unfinished work, numerous and important lists of organic remains bearing upon the geology of the older Provinces of our Dominion. Many of these lists would form most important contributions to Canadian Geological Science, should they ever be published. As noted by Dr. Whiteaves in his obituary notice and in Memoriam paper *Can., Nat. and Q.J.S.*, vol. iii., No. 5, p. 261, “Mr. Billings died before he could describe the whole of the material he had studied and carefully examined, including collections by Sir Wm. E. Logan and Prof. (now Dr.) Robert Bell, at Gaspé; Mr. T. C. Weston, at Arisaig; T. Curry, at Port Daniel and Bay of Chaleurs. The whole of the material from these localities had been carefully examined, and it only remained to write the “descriptions of the different species, but this, alas, he was not destined to accomplish.”

Those who had the pleasure and privilege to know Mr. Billings state that he was characterized “by great firmness and decision and an unswerving love of truth and justice, by an unaffected and winning modesty of demeanor.”

To do him honour and tell the world of science what Billings did for Canadian Geological Science many a palæontologist in America and Europe has named genera and species after him. The genera *Billingsia*, *Billingsites*, *Billingsella*, *Elkania*, have been erected by Walcott, Hall, Ford and Hyatt, whilst upwards of thirty species of corals, crinoids, brachiopods, lamellibranchiata, gasteropods, cephalopods, ostracods, trilobites and other fossii organic remains have his name affixed as their specific names.

The Bibliography of Mr. E. Billings, prepared from my card catalogue of contributions to Canadian palæontology of some years' standing, which last year was withdrawn for a season, will it is hoped, form an appendix to this already too long address.



Such Bibliographies are a necessity nowadays.

During his lifetime Mr. Billings received many tokens of appreciation. In 1867 the Natural History Society of Montreal voted him its silver medal for "his life-long efforts for the promotion of science in Canada." He was awarded a bronze medal (in Class I) by the Jurors of the International Exhibition of London in 1862 and a similar one at the Paris Exposition of 1867.

In connection with this evening's programme comes the presentation of the portrait of the late Mr. E. Billings to the Geological Survey of Canada, and after these few remarks by your President on the career and work of that eminent Canadian, it may not be out of place for me to read three or four extracts of notes and communications received from a number of well-known palæontologists and others whose words appear to me to show the eminently high esteem in which Billings is held to-day after a lapse of twenty-four years since he died. These communications include letters from the Hon. C. D. Walcott, Director of the United States Geological Survey; Prof. R. P. Whitfield, Curator of the Geological Department of the American Museum of Natural History, Central Park, New York City; Prof. Charles Schuchert of the U. S. National Museum and Smithsonian Institution; Prof. J. M. Clarke, N. Y. State Palæontologist at Albany, and the successor of the late Prof. James Hall.

Prof. J. M. Clarke writes: "I sincerely regret that circumstances do not permit me to testify *propria persona*, on the occasion of the presentation of the Billings memorial portrait, to my profound appreciation of the great work accomplished by Mr. Billings for his elect science of palæontology. My admiration for his keenness of observation and correctness of orientation grows with the continued study of his results. At one time and another I have had occasion to study some part of his work with critical care, and no instance occurs to me in which any of his determinations appeared open to question. In this day we often seem to be building for others to pull down, and one works with the ever present consciousness of a multitude of critical witnesses, but Billings's tenacious adherence to facts and his ability to recognize the truth, have rendered his work stable and enduring. Mr. Billings was in

these respects an ideal palæontologist, and his contributions to the palæozoic faunas of America are of tremendous value. There was a large element in his results which his contemporaries in American palæontology did not infringe upon nor compete with, the faunas of the early Siluric; and had he not lived and laboured, or were our knowledge of these faunas *debillingsed*, the science would be thrown backward a generation. There is little danger of future palæontologists forgetting their obligations to Elkanah Billings, father of a thousand palæozoic children. His name will always remain familiar to, and honoured by the workers in the science to which he devoted his life."

Prof. R. P. Whitfield thus writes: "I never met Mr. E. Billings but twice, once at Albany, N.Y., and again at Montreal while looking through the Survey Museum with a class of students from the Troy Polytechnic Institute. Mr. Billings was sick at the time but came into the Collection and spent some time with us and interested us all much with the collections then under his charge. I have been familiar with his work in Palæontology and also with some of his more popular articles in the magazines and have admired his keen appreciation of the nature of the objects with which he was dealing. He must have been a close student of Nature and have fully appreciated and understood the bearings of the objects with which he was dealing.

"His Palæontological work is very well known and thoroughly appreciated among all workers in that line of investigation and will stand as a lasting Monument to his credit."

The Hon. C. D. Walcott, Director of the U. S. Geological Survey, Washington, D.C., has sent the following communication:—

"I am very much pleased to learn that it is intended to present a memorial portrait of the late Mr. E. Billings to the Geological Survey Museum. It will be a fitting tribute to the man who did so much to assist Sir William Logan in unravelling the stratigraphic geology of the Palæozoic rocks in Canada. I have always regretted that I was not personally acquainted with Mr. Billings, as I was impressed, when study-

ing his descriptions and correlations, with the fact that he was a man of unusual ability, and possessed of a keen appreciation of the value of thorough palæontological work."

Dr. Charles Schuchert, Assistant Curator of the U.S. National Museum at Washington also writes:—

"When in Ottawa last summer I was much pleased to see the splendid portrait of Elkanah Billings and delighted to know that it was to be shown amongst the many Canadian fossils which he immortalized. His short but brilliant descriptions hit off the salient characteristics of the species, proof positive of a distinguished palæontologist. In short, Elkanah Billings's name stands high amongst North American Invertebrate palæontologists and is one of that great triumvirate of pioneers in our sciences: Hall, Billings and Meek."

Besides these brief but genuine appreciations of the man whom we seek to honour this evening, I feel constrained to add another tribute paid to the memory of Mr. Billings by one who formed the main theme and subject of our address last year, viz., Sir William Dawson. In his volume entitled "Salient points in the History of the Earth," Sir William dedicates Chapter XII "to the Memory of Elkanah Billings, first Palæontologist of the Geological Survey of Canada, who laid the foundations of our knowledge of the invertebrate fossils of Canada."

I shall not attempt to give you any further details of his life works or writings, suffice it to say that "though dead he still lives" and his name stands unusually high in the estimation of all who have had anything to do with the unravelling of the Geological problems of Canada, especially as they present themselves to us in the older Provinces of our Dominion.

In 1876 Billings died, and to fill his position the department engaged the services of the present distinguished occupant of the position of Palæontologist and Zoologist, Dr. J. F. Whiteaves, a member of our Club since 1883.

I regret exceedingly that Dr. Whiteaves is not present on this occasion. He has requested me to present his sincere regrets to this audience. We expected some words from him, but he is unfortunately prevented from being here by an indisposition, and

we can only say that in Dr. Whiteaves, the Government has had an earnest and painstaking officer as successor to the eminent name of Billings.

#### THE PORTRAIT.

The portrait before us is the result of the work of our fellow townsman, Mr. Charles E. Moss, R.C.A., whom we are pleased to see with us this evening.\* It is a faithful reproduction of that excellent likeness of Mr. Billings, now hanging in the Lecture Hall of the Natural History Society of Montreal by W. Raphael, Esq., painted in 1876, from a photograph by Notman in 1861.

It is the intention of the Committee to have a tablet prepared for the portrait with the following inscription :—

ELKANAH BILLINGS, Esq., F.G.S.,  
Palæontologist from 1856 to 1876.

Presented to the Geol. Survey of Canada by a Committee of the  
Ottawa Field-Naturalists' Club, Dec. 11th, 1900,  
on behalf of his friends and admirers.

I will now formally present this memento of Mr. Billings to the Dominion Government as represented here this evening by Dr. Geo. M. Dawson, the Director and Deputy Minister of the Geological Survey Department.

The following is a synopsis of Dr. Dawson's apt remarks when accepting the portrait :

My duty this evening is an easy and a very pleasing one, consisting as it does in receiving, on the part of the Geological Survey Department, this excellent portrait of Elkanah Billings, who for many years was Palæontologist to the Survey. I can promise it a place of honour near the collections to which his labours were devoted, and I trust a still more conspicuous position may be found for it in the new and spacious Museum in which we hope, before long, to see these collections adequately housed.

In thus honouring Billings's memory the Ottawa Field-Naturalists' Club, have, I feel, equally done themselves honour. It is particularly appropriate that a Committee of members of this organization has been instrumental in arranging for the production

\* The excellent frontispiece to this number is reproduced from the portrait by the Grip Printing & Publishing Co., Toronto. J. F., A'g Ed.

of this portrait, for all Mr. Billings's early associations were connected with Ottawa, the fossils contained in its rocks were the first objects of his scientific study, and, although much of his work was afterwards done in Montreal, the collections to which his time was devoted have come back to be preserved here.

Billings was one of a remarkable triumvirate connected with its initiation and early work of the Canadian Geological Survey, all well in the van of scientific progress at the time, but each working along his own lines. Logan and Hunt were his associates, but his scientific eminence was less recognised in Canada because his work was less obviously connected with the economic problems that the Survey had set itself to solve. His audience was not so much in the little Canada of that day as in the studies and laboratories of Europe and the United States.

The accuracy of his observations is evidenced by the permanence of his reputation among those palæontologists of a later generation that has arisen since his day. It is not often that, nearly twenty-five years after the death of a man whose time was devoted to purely scientific pursuits, interest in his life and work have been maintained in such a way as to render a memorial like this possible, and I may therefore close by again congratulating both those who initiated and those who have aided by subscribing towards the production of this portrait.

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### POWERS OF ADAPTATION IN FISHES.

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By PROFESSOR EDWARD E. PRINCE, Dominion Commissioner of Fisheries.  
Ottawa.

Fishes are frequently classed as fresh-water species and marine species, but there are many which occupy a kind of neutral position, and have the habit of spending part of their time in fresh water and part in the sea. The salmon, sea-trout, smelt, striped bass, sturgeon, shad, &c., are familiar examples, many of them being anadromous, and ascending into fresh water for spawning purposes, while a few are catadromous, like the eel, and deposit their spawn in the sea. The power of adaptation

implied in this change of environment is most remarkable, and appears, in many instances at least, to be acquired during the life of the individual. Thus, a newly-hatched salmon soon dies if placed in sea-water, and the eggs of that species are also fatally affected by the same treatment ; yet later in life the salmon lives indifferently in salt water and in river water. Further, many species, which normally migrate, have lost the habit and, like the land-locked salmon, smelt, flounder, or herring, may pass their days without ever tasting salt water. Some curious instances of extreme changes of habitat in certain mollusks are on record, as, for instance, the bed of cockles (*Cardium edule*) which was described before the Wernerian Society in Edinburgh in 1825 as existing in a Yorkshire peat moss 40 miles from the sea. These shell-fish lived in a sandy channel, communicating with the river Tees, and were precisely like those distributed over the vast beds, eight or ten square miles in extent, at the estuary of that river. To the taste, however, they were distinctly less salt in flavour. A Mr. Brand, more than a hundred years earlier, had described, in an account of the Orkney Isles, a bed of cockles in the fields a mile from the sea. They were in a deep furrow to which salt water might have had access during an exceptional storm. Specimens of the sea-whelk (*Buccinum undatum*) have been found in a fresh-water lake on the island of Yell, a mile and a half from the sea, and as the apex or tip was fractured it was thought that sea-birds or crows had carried them to their new location. Yet, the shell being somewhat thinner in texture, and more distinctly banded, it seems more probable that they had lived for a long period in their fresh-water environment, and thus differed from the marine forms.

Oysters, as is well known, flourish in brackish water, and can endure transference to water almost destitute of salinity ; but they do not appear to breed or maintain a healthy state, they merely fatten and increase in size.

Many fishes in the same way are unfavourably affected if prevented from performing their usual migrations from or to salt water. Dr. Barfurth discovered that the ovaries become diseased, and the eggs degenerate in fishes which are prevented from normally migrating. The same observer has recorded the fact

that the ill-effects reappear in the following season, the eggs and brood of the fish, permitted after confinement to ascend to the spawning grounds, being very inferior and clearly affected detrimentally. The eminent Scottish authority, Professor W. C. McIntosh, some years ago described flounders that became egg-bound and swollen while confined in salt-water tanks; and ultimately they sickened and died.

The results, in all cases, are not so unfavourable. Sir J. G. Maitland kept some sea-salmon fry from March, 1881, when they were hatched, until 1884, and took the eggs and milt, so that he secured young salmon fry of small parent fish (smolts) which had never been to sea. Dr. Francis Day has told us that some of the young brood had attained a length of  $5\frac{1}{2}$  inches in 1886. The retention of sea-salmon in fresh water is found usually to retard their growth, and in one of the earliest experiments (at Lier, in Norway) the weight reached in five years was under two pounds, less than one-tenth of that normally reached by migratory salmon. Sea-salmon planted in Lake Huron prior to 1883 were reported by the late Mr. Wilmot to be smaller than those found along the coast. The ouananiche of Lake St. John, P. Q., like their land-locked congeners in Lake Onawa and other waters in Maine, and the Chamcook Lakes in New Brunswick, are smaller than sea-salmon. In many cases access to the sea is possible; but if from some geological or other natural cause the fish were originally prevented from descending to the sea, the catadromous habit appears not to have been resumed, partly no doubt owing to the abundance of food in their fresh-water habitat. Land-locked smelt are very often abundant in waters containing land-locked salmon, and they afford an ample supply of food. Pacific salmon exhibit the same phenomenon, of which Kennerley's salmon is an example; but the spring salmon artificially land-locked in California in 1875 or earlier, bred, and their progeny reached a weight of eight or ten pounds, though on account of scarcity of food, another series were found in nine years to barely reach a weight of two pounds. The spring salmon or quinnat is a large species ranging from 15 to 50 or 60 pounds or even more. The salmon retained at Tadousac, and in certain small lakes adjacent to the Restigouche proved to be

stunted, and weighed less than a quarter the weight normally reached at the age of the specimens referred to. The adaptability of smelt (*Osmerus mordax*) has long been known. Nearly seventy years ago Col. Meynell acclimatised smelt and bred them in a small sheet of water in England, and quite a number of lakes in New Brunswick, Lake Utopia and others contain land-locked smelt.

Only one or two members of the cod family (*Gadidae*) are indigenous to fresh water. All the rest are marine, the fresh-water species being the cusk or burbot, often called ling or lawyer. The tom-cod (*Microgadus*), while it prefers saline or brackish, water can survive in a fresh-water environment, and occurs in abundance in Lake St. Peter, below Montreal. An allied form, the silver hake (*Merluccius bilinearis*) is recorded as abundant in Darling's Lake, near Rothesay, N.B., attracted from the sea by the ascending schools of gaspereaux, which are their favourite food. In the Baltic Sea, the true cod, as well as the haddock, pollock, and other gadoids, occur, but reach only one-quarter of the size which these fishes attain in the sea. In the Bras d'Or Lakes cod are stated to be large (sometimes 56 or 58 pounds), but the head is of disproportionate size, as though they were not well fed. They are caught through the ice at Whycocomagh, far inland and in water of low salinity.

Of the herring tribe at least five species come up into fresh water annually, and some have become land-locked like the gaspereaux or alewives (*Pomolobus pseudharengus*) of Lake Ontario and Lakes Cayuga and Seneca (N. Y. State) and other inland waters. They are often erroneously called shad or menhaden, and they die in immense numbers in early summer owing to some unfavourable circumstance connected, doubtless, with their non-sea-going habit. True sea-herring are not known to be land-locked in Canada; but in Iceland and in the Baltic a fresh-water variety occurs. Some of the Baltic herring were kept for a long period in tanks by Professor McIntosh in Scotland, the water supplied to them being perfectly fresh. They were somewhat stunted.

Many fish when permanently shut off from the sea improve in size and table qualities. Dr. J. C. Mitchell, an authority on the



fishes of Egypt, affirms that three species of mullet reached a large size and were of finer flavour after retention in fresh water than those in salt or brackish water. In Florida red fish (*Pagrus*) confined in a fresh-water lake were found 38 pounds in weight, and improved in delicacy of flavour, while numerous other marine species survived the change, but some sharks and sting-rays succumbed, owing, it was surmised, to the winter cold of 1885. The shark tribe are essentially marine, and ill-able to adapt themselves to non-marine surroundings. I know of one record only of a marine species found far from the ocean, viz., a questionable instance of a dogfish, which was stated to have followed the salmon schools for a distance of 1,500 miles from the Pacific shore. The fish was recorded to have been killed up the Bruno River, Nevada, by the wheel of a waggon crossing a ford. There are, it is true, some fresh-water sharks, like *Carcharias gangetica* in the Ganges, and the Senegal saw-fish, also Indian and South American rays (*Narcine*, *Torpedo*, &c.). Certain whales also are non-marine, such as the small *Platanista gangetica* in the Ganges, and *Inia* and *Pontoporia*, belonging to the Grampus and Porpoise family, and found in the Amazon and other South American rivers. The white beluga ascends the St. Lawrence for 150 miles, and goes up the Saguenay River for some distance.

The carps, of which our suckers and mullets are examples, are credited with much plasticity. The German carp can not only endure but survive changes of a remarkable character, living in mud and existing far from lakes or streams for a long period. Certain suckers can endure alkaline and other chemical impurities, and an extraordinarily high temperature. In that wonderful volcanic geyser area, the Yellowstone Park, Professor Jordan found suckers and chubs in water of 85° F. and 88° F. and young trout in a temperature of about 75° F.

The catfish and bull-heads are notoriously tenacious of life. Thoreau, indeed, said that *Ameiurus nebulosus* opens and shuts its mouth for half an hour after its head has been cut off; but there are only one or two questionable instances of their surviving removal from favourable surroundings. More experiments are, however, desirable. If, as Bloch stated, the delicate grayling (*Thymallus*) can flourish in brackish water, contrary to Sir

Humphrey Davy's dictum that salmon and trout will do so, but the fastidious grayling cannot do so, it is possible that the variety of fishes capable of acclimatisation in saline, alkaline or other waters may be considerable. The sticklebacks, while normally frequenting fresh water, except *G. spinachia*, flourish in brackish water, and in shore pools reached by high tides. The marine flat-fishes, the flounder, &c., are found up rivers far from the sea, while the striped bass has been successfully retained for years in fresh water, but the climax is reached in that paradoxical fish, the blenny of Ceylon and the Celebes, which habitually lives on damp rocks, leaping from one to the other, and shunning the water to avoid being drowned! *Periophthalmus*, as it is called on account of its projecting eyes, leaps, when pursued, like a frog, and, as Dr. Günther says, seems to "prefer escaping in that way to swimming beneath the surface."

The plasticity and adaptability of various fishes to new surroundings is not only a matter of peculiar biological interest, it is of eminent practical importance. Hence the brief sketch which I have prepared has been amplified and in a somewhat detailed form will appear as a special report in the forthcoming Blue Book of the Fisheries Department to be laid before Parliament at the approaching session. The subject is one needing fuller investigation. If barren waters remote from the sea, and unfavourable, from conditions of temperature, alkalinity, and the like, for indigenous inland species, can be stocked with fine species of fish, marine or brackish in their habitat, the possibility of conferring immense benefit upon the public becomes plainly apparent. From our present fragmentary knowledge it may be surmised that no small number of species have such powers of endurance as to facilitate the work of acclimatization.

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NOTES ON THE ACADIAN OWL (*NYCTALA ACADICA*)  
IN CAPTIVITY.

---

By F. NORMAN BEATTIE, Guelph, Ont.

On the fourth of November, 1899, while strolling through a small swale near this city, I noticed an Acadian Owl with a field mouse in its claws, perched on a small bush. Thinking I might capture him, I sent my companion around in front to engage his attention while I sneaked up behind to grab him. The dodge worked, and I soon had him safely stowed in the pocket of my coat. He did not seem to mind being caught in the least, not even snapping his bill, but he objected when I took his mouse away. We took him home and let him loose in a small room which is not used for anything in particular. He immediately took possession, and now he started to puff himself up and snap his bill at anyone who went near. This wore off in a short time, though he always resented being handled. For some time he did not take readily to beef, leaving it strictly alone if he could get anything else, but sometimes I was forced to give it to him, and in the course of a few weeks he overcame his dislike to it and ate it freely. His favourite food was mice, which, unfortunately, I was not always able to give him. However, he was also fond of a squirrel or a small bird. His method of eating a bird was peculiar. First he would pounce down upon it as if it were alive and then, holding it down with one foot, would pull out a fist-full of feathers with the other. He would repeat this operation, changing feet each time, till most of the larger feathers were out; then he would pull off the head and swallow the body if small enough; if not, he would pull it apart, holding it with one foot and pulling with his beak. I never knew him to swallow a bird's head though he always did a mouse's. He invariably pounced down upon his food and seized it firmly in his claws as he evidently was in the habit of doing with live game.

He could gulp a surprisingly large piece of beef, in fact, when several pieces were given him he always chose the largest first. If too large to swallow whole he would take a few bites and then put down the remainder.

In the case of mice he always pulled off the head and swallowed it first; in fact, the mouse he had when I caught him was minus the head. Before eating the body he gave it a couple of rolls about in his mouth and crushed the bones with his bill. He always waited a while after swallowing the head, before he attacked the body. In most cases he put his food down in short order, but sometimes when satisfied he would perch himself on a piece of beef and take an occasional nip at it.

I never tried him with crickets or grasshoppers, but a Screech Owl which I kept the previous spring, ate them readily as it did earth worms also. The latter did not seem to contain much nourishment, for the Owl became very thin during the week I fed him on them.

On the evening of the day I caught the Acadian Owl he threw up two pellets, one containing fur and bones, the other fur and the crushed skull of a mouse. All skulls which he ejected were crushed and covered with fur. I am unable to say whether more pellets were thrown up after birds than after mice but I am of the opinion that such was the case, as those ejected after mice were more compact. The bones contained in the pellets were in small pieces and badly splintered. I never saw him in the act of regurgitation, but I am of the opinion that more pellets were ejected during the morning and evening, as most new ones were found then, especially in the evening.

For the first two weeks I had him, I never heard him make a sound beyond the snapping of his bill; but after this he would favour us at night with a series of little squeals or shrieks, or he would often give vent to a single note. Each note certainly had some resemblance to the sound made by a file drawn once across a saw, but when several were uttered at once I failed to perceive the resemblance. *Perhaps this was due to the proximity and my knowledge of the origin of the sound.* His notes were generally heard in the evening and early morning, and never in the day-time. He frequently squealed just after attacking a piece of meat or any other article of food. I once caught him jerking away at the skinned body of a squirrel and squealing his best.

During the day, when not disturbed or when not eating, he struck a very queer looking position to go to sleep. He would

draw himself up perfectly erect with his feathers close to his body, making himself look far taller and thinner than usual. He would then slowly close his eyelids in a funny crooked line and go to sleep. His whole appearance changed in the evening, as, with feathers fluffed out and body bent forward, he would move his head from side to side and peer with an anxious expression into all the nicks and crannies in the room.

I was always conscious of his flight even when not watching him, owing to a slight breeze which his wings made in the room, but even when he flew close to my head I could not distinguish the faintest sound.

Although I supplied him with a box of sand in which was sunk a dish of water, I never saw him either drink or bathe, and the water did not seem to decrease, but got dirty in a few days. His feathers never looked as if they had been near water.

But my pet came to a tragic end at last in the following manner. I paid him a visit one morning, and, unnoticed by me, the cat followed me into the room but did not follow me out again. Shortly after there was a slight tussle, followed by a faint shriek and then all was still. Going into the room I saw the cat with my pet in her mouth. The cat had evidently got the owl in a corner, and I knew how he would back up and show fight, and so the tussle I heard is explained. One of the cat's fangs had penetrated its skull just over the eye and all one side of the head was smashed.

When skinned the bird proved to be a male and was in fairly good condition, though not fat. During the few months I had him, he proved a most interesting pet, and I was sorry indeed to lose him.

CORRECTION.—A most unfortunate error occurred in the Notice of Prof. Bailey's Botany on page 196 of the last number. In line 13 the word "subject" should read pupil.

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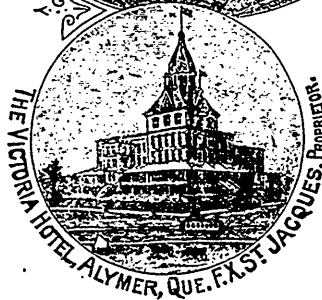
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