

Technical and Bibliographic Notes / Notes techniques et bibliographiques

The Institute has attempted to obtain the best original copy available for filming. Features of this copy which may be bibliographically unique, which may alter any of the images in the reproduction, or which may significantly change the usual method of filming, are checked below.

L'Institut a microfilmé le meilleur exemplaire qu'il lui a été possible de se procurer. Les détails de cet exemplaire qui sont peut-être uniques du point de vue bibliographique, qui peuvent modifier une image reproduite, ou qui peuvent exiger une modification dans la méthode normale de filmage sont indiqués ci-dessous.

Coloured covers/  
Couverture de couleur

Coloured pages/  
Pages de couleur

Covers damaged/  
Couverture endommagée

Pages damaged/  
Pages endommagées

Covers restored and/or laminated/  
Couverture restaurée et/ou pelliculée

Pages restored and/or laminated/  
Pages restaurées et/ou pelliculées

Cover title missing/  
Le titre de couverture manque

Pages discoloured, stained or foxed/  
Pages décolorées, tachetées ou piquées

Coloured maps/  
Cartes géographiques en couleur

Pages detached/  
Pages détachées

Coloured ink (i.e. other than blue or black)/  
Encre de couleur (i.e. autre que bleue ou noire)

Showthrough/  
Transparence

Coloured plates and/or illustrations/  
Planches et/ou illustrations en couleur

Quality of print varies/  
Qualité inégale de l'impression

Bound with other material/  
Relié avec d'autres documents

Continuous pagination/  
Pagination continue

Tight binding may cause shadows or distortion along interior margin/  
La reliure serrée peut causer de l'ombre ou de la distorsion le long de la marge intérieure

Includes index(es)/  
Comprend un (des) index

Blank leaves added during restoration may appear within the text. Whenever possible, these have been omitted from filming/  
Il se peut que certaines pages blanches ajoutées lors d'une restauration apparaissent dans le texte, mais, lorsque cela était possible, ces pages n'ont pas été filmées.

Title on header taken from: /  
Le titre de l'en-tête provient:

Title page of issue/  
Page de titre de la livraison

Caption of issue/  
Titre de départ de la livraison

Masthead/  
Générique (périodiques) de la livraison

Additional comments: /  
Commentaires supplémentaires:

This item is filmed at the reduction ratio checked below /  
Ce document est filmé au taux de réduction indiqué ci-dessous.

10X	14X	18X	22X	26X	30X
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12X	16X	20X	24X	28X	32X

February, 1888.

THE  
\* OTTAWA NATURALIST \*

VOLUME I. No. XI.

The  
\* TRANSACTIONS \*  
Of the  
\* Ottawa Field-Naturalists' Club \*

(Organized March, 1879. Incorporated March, 1884.)

CONTENTS.

	Page
Testimony of Ottawa Clays and Gravels to the Expansion of the Gulf of St. Lawrence and Canadian Lakes within the Human Period. Amos Bowman .....	149
Soirees .....	162

OTTAWA, CANADA:  
Citizen Printing and Publishing Company, Metcalfe St.

1888.

Published Monthly at \$1.00 per annum.

*Patron :*

HIS EXCELLENCY THE MARQUIS OF LANSDOWNE,  
GOVERNOR GENERAL OF CANADA.

*President :* R. B. WHYTE.

*Vice-Presidents :* 1ST, PROF. J. MACOUN | 2ND, PROF. S. WOODS.

*Secretary :* W. H. HARRINGTON. (Post Office Dept.)

*Treasurer :* JAMES FLETCHER. (Library of Parliament.)

*Librarian :* T. J. MACLAUGHLIN. (Dept. Public Works.)

*Committee :* DR. H. B. SMALL, | H. M. AMI, | DR. GEO. BAPTIE.

*Standing Committees of Council :*

*Publishing*—PROF. S. WOODS, W. H. HARRINGTON, JAMES FLETCHER.

*Excursions*—T. J. MACLAUGHLIN, H. M. AMI, DR. BAPTIE.

*Soirées*—PROF. J. MACOUN, PROF. S. WOODS, DR. SMALL.

*Readers :*

*Geology*—H. M. AMI, REV. PROF. MARSAN, JOHN STEWART.

*Botany*—J. FLETCHER, DR. SMALL, DR. BAPTIE.

*Conchology*—F. R. LATCHFORD, H. B. SMALL.

*Entomology*—W. H. HARRINGTON, J. FLETCHER, T. J. MACLAUGHLIN.

*Ornithology*—G. R. WHITE, PROF. MACOUN.

*Editor :* W. H. HARRINGTON.

The Librarian will furnish the Publications of the Club at the following rates :—

Transactions, Part 1, Not sold singly	}	\$1.00 for Vol. I.
“ 2, 25 Cents.		
“ 3, 25 “		
“ 4, 25 “	}	\$1.00 for Vol. II.
“ 5, 30 “		
“ 9, 40 “		
“ 7, 30 “		

(Less 10% to members.)

The Ottawa Naturalist, \$1.00 per annum:

Extra copy to members, .75 “

Monthly parts, 10 cents each, \$1.00 per doz.

To members, 8 “ .75 “

TESTIMONY OF OTTAWA CLAYS AND GRAVELS TO THE  
EXPANSION OF THE GULF OF ST. LAWRENCE  
AND CANADIAN LAKES WITHIN THE  
HUMAN PERIOD.

BY AMOS BOWMAN.

(Read 5th January, 1888.)

It was my good fortune during the past summer to participate in many of the delightful excursions of the Ottawa Field-Naturalists' Club. The publication of some maps of mining operations in the Cariboo District, B.C., kept me out of the field of the gold-bearing gravels but not entirely out of the larger field of surface geology, and of the ancient rivers, which had a history in this country, as in most countries, before the present streams began their work of shaping the hills and valleys as we now know them.

Our first excursion to which I will make reference, was that to the Hogs Back, on the Rideau River, four miles south of Ottawa. Boulder clays were seen on the right bank above the falls; and next overlying them the ledæ clays along the canal, continuing to Ottawa City. These prepared us by laying a foundation for a section of the post tertiary or pleistocene tertiary, sometimes also called quaternary, of the neighbourhood, all these terms having nearly the same meaning.

The meaning of this pleistocene history of the country which is most significant to us is that of which we have a faint glimmering in tradition. It has been handed down by different races both savage and civilized; and is recorded in the sacred writings; dating from the most remote history of mankind, when writing was first invented to record the ancient traditions. It is that of the great flood, or sin flood, of which Noah was the hero, according to our version. In making allusion here to the myth of Noah I do so simply to remind you of a most notable feature of the pleistocene epoch, the record of which is so well marked in our surface geology that it is capable of being read with ease by any one; the memory of which has so impressed itself upon aboriginal mankind.

It had two remarkable features; the ice or glacial period, the record of which is seen in the boulder clays and later the great subsidence, or flood and lake period, the record of which is seen in the leda clays. The book of the boulder clays is more ragged and torn than that of the leda clays, yet it is quite readable, especially to those who have witnessed the action of glaciers, or solid ice streams. At the Hogs Back we saw simply boulders mixed irregularly in clay lying upon a smooth bed rock. In the valley of the Rifle ground we saw only boulders.

The principal difficulty in reading the simple record of the boulder clays, arises from the fact that our ice streams often became confluent by overflowing the dividing ridges, and the boulder clays are necessarily covered in most localities hereabouts by the later deposits of clay and sand. At the Quyon Creek, and at very many other places when looked for, the polished bed rock and tumbled clay containing boulders can be seen underlying the hills and benches, and the flat expansions into country fields of the leda clays. One of these ice streams which came down the valley of the Gatineau left its debris in a terminal moraine behind Hull, directly opposite the Parliament Buildings. But this an old story, which you have all read—on the shores of Lake Deschenes and elsewhere.

I must not omit to mention the fact, well known to all geologists, that the gravels and other deposits of the glacial or flood period have yielded along with their shells, and their fossil fish, and mammalian bones, undoubted fossil human remains, from many, and scattered parts of Europe and America. They are chiefly arrow heads and utensils less perishable than bones, in washes of the streams,—not unlike those exhibited in the Geological Survey Museum. It is not strange therefore that tradition has taken cognisance, however vaguely, of the period of the floods.

The fact of the humble ancestry of mankind has been firmly established in recent years, by scientific proof that is no longer disputed. We may confidently look therefore in the gravels of the tertiary streams if we can find them, and identify them, for the evidences of mankind and his companions of that period.

Our excursion to Kings Mountain, twelve miles west of Ottawa, took us to the top of the leda clays and higher; to the level of the

saxicava sands (in our section), and higher still. From the summit we got a view of a vast and interesting horizon.

Allow me to recall to you the scene of that delightful day on the summit, and to photograph, not the glorious country in sight, but the Field-Naturalists' Club, for future reference. A hundred people and more, of scientific culture and occupation, resident at the Capital of the Dominion—including botanists, entomologists, geologists, palaeontologists and other specialists of reputation and standing, ladies and children—with nets and collecting cases are grouped on the summit of a *roche moutonnée* and its adjacent slopes. They have come in omnibuses and buggies; and in ascending the mountain afoot they have learned each a pleasant lesson from the lips of Nature. Recall the freshness of those living truths, of which the biological leaders spoke; the pages of the first day of the creation which the geological leader told us how to read with our own eyes. Recall the company—the thoughtful men, the bright women and children, and tell me whether or not, having seen that picture, you believe the Capital of the Dominion, (now publishing its monthly scientific periodical, THE OTTAWA NATURALIST) has a respectable constituency of scientific men and women to-day? Ottawa is becoming more and more representative of the Dominion. Its scientific constituency has been organized; henceforth it has a more important duty to perform.

East, west and south the mountain overlooks a plain, which we saw in approaching Chelsea, was in large part a terrace, composed of leda clay. At Chelsea this is 270 feet above the sea; 150 feet above the Ottawa river, and 80 feet above the Ottawa Post Office.

Between Chelsea and Kingsmere we rose over hills of sand. About the level of Kingsmere a general upper level of the sand hills skirts the mountain on the southern and eastern side, as you will recall, and recognize by this sketch of the mountain as seen from Parliament Hill, Ottawa City. [Sketch on board—drawn in the form of a section—of the clays, sands and gravels from the level of the Gatineau river.]

I made it my business to trace afoot the upper surface of the sand hills, from Kingsmere to the south-eastern corner of the mountain,

and to ascend the mountain from Welch's farm where its upper surface in the sketch appears to be flat and level as seen from Ottawa City. My object in doing so was to ascertain first whether the sand hills constitute a true terrace; and further to ascertain whether the summit of the mountain was itself flat topped, by reason of the levelling influence of water.

The sand hills are composed of a clean yellow sand, very little intermixed with boulders. They are entirely of detrital origin of later age than the leda clays; and are simply higher members of the saxicava sands. The bench level above Welch's farm was found to be 680 feet above the sea, and on a general level with the sand hills nearest to Kingsmere.

That the Welch terrace is of marine origin, and a shore line of the pleistocene flood period, will be made clear to you by a little reflection. No marine fossils can be produced by me at this time, in support of the proposition, yet I can make it without reserve; because the mountain faces openly the wide expanse of plains which were at that comparatively recent date the enlarged gulf or inland sea of the St. Lawrence.

If further evidence be required I will refer you to Sir Wm. Logan's Geology of Canada, 1863, citing the elevations of marine clays along the shores of this inland sea, at Ha Ha Bay 600 feet above the sea, at Grenville 500 feet, and of similar clays skirting the hills all along its northern shore between Ha Ha Bay and the valley of the Ottawa. He cites saxicava sands at the falls of Bell River at 400 feet, at Beauport 350 feet, and on Montreal mountain 470 feet above the sea.

As the formation of clays on the one hand, and sands on the other, is dependant, however, upon local conditions, and is not a feature of succession in time, it is well to remember that the leda and saxicava shells can only be made use of as names for local, and limited portions of the section we are constructing. Clays, sands and gravels may alternate, and occur again and again throughout the series, according to drainage and lowest water level of the locality and time.

Next ascending from Welch's terrace to the summit of the flat topped mountain (seen NE of us from the summit of King's mountain) I found the elevation to be 910 feet above the sea;

very little lower than King's mountain. The general surface of the top proved to be nearly flat. It was strewn with loose and rounded boulders; clay and sand filling up the interstices between rocky parts, to a general even surface, more soil than rock. Did the water which undoubtedly made, and at the same time levelled Welch's terrace, rise 230 feet higher and level also the summit of the mountain, or was it ice that levelled and filled up its interstices? This question I would not undertake to decide, without abundant and conclusive evidence. Such it was not in my power to procure in a day's excursion. But the evidence as it stands, including the lines of the sketch, I think you will agree with me, is in favour of water. I do not remember having seen anywhere else the results of ice action displaying so nice a sense of the horizontal, upon a mountain top. According to the testimony of Mr. Welch (whatever it may be worth) clays and sands continued indefinitely northwards on the mountain along with the boulders, filling up and levelling up irregularities for many miles up the Gatineau valley at slightly increasing levels, until it assumed the character of a plain, rather than that of a mountain.

Not without interest in the same connection are the facts reported by New England geologists, and quoted by Sir Wm. Logan, in regard to the terraces fringing the mountainous region directly across the pleistocene sea of the St. Lawrence from Kings Mountain. At Ripton, Vermont there is a terrace 2196 ft. above the sea. At Lake Memphremagog are found clays 798 ft., and a terrace 1264 ft. above the sea. In the White Mountains Prof. Hitchcock reports terraces 2449, and 2665 ft. above the sea; and the list could be greatly extended. No marine fossils appear to have been found in any of these terraces. Is the negative evidence conclusive that they are not sea terraces?

September 17th the Club proceeded up the Gatineau valley to Kirk's Ferry, where the leda clays, themselves in the form of lofty hills and benches, picturesquely surround old hummocks and islands of Laurentian rock, the combination producing a novel and pleasing landscape. Mountain and terrace contrasting with terraced plains furnish many ideal landscapes along these shores of the glacial Laurentian gulf or sea, in this part of Canada. The clays of Kirk's Ferry appear to have been cut off from those of Chelsea by an intervening canon, but they



occur at the same level, and were doubtless formerly, or are still, continuous.

A little above Chelsea the clays are overlaid by a heavy wash of stream boulders representing the position of the Gatineau river during a later stage in its history. [Shown on section.]

October 22nd the last excursion of the season was made to the mouth of Green's Creek, five or six miles east of Ottawa, and to the sulphur springs, for the purpose of collecting fossils from the leda clays. You are already well acquainted with these; yet it is a pleasing realization of the flood period described, to see these still living inhabitants of the waters of Labrador and of Hudson's Bay imbedded in boulders now under the wheat fields of inland Ontario. I did not carry with me any barometers on this occasion, but estimated the average top of the terraces of the clay at the riverside 30 to 40 ft. above the summer stage of the Ottawa, or 160 feet above the sea; the sulphur springs, several miles up Green's Creek, at about the same height; the leda clays adjacent 50 ft. higher; the overlying sands and interbedded clays of High Bluff 220 ft. above the sea. The latter were observed on another occasion spreading over the entire country at the head of Green's Creek; and farther throughout Carleton and Russell counties at about the same level—250 ft. above the sea—as far as Duncanville covering and forming the watershed between Ottawa City and Cornwall on the St. Lawrence; exhibiting in Russell county some of the best farming land of Ontario.

The width of the exposed sea bottom of the leda clays from King's mountain to Lake Champlain was greater than are now any of the Canadian lakes,—140 miles—and over, in many places.

I have drawn a longitudinal section of the St. Lawrence, including the Canadian lakes, on which are exhibited the elevations and relative positions with reference to the drainage outlet of the terraces, of the known surface of the inland sea of the St. Lawrence to which I have referred. [Shown on the wall.]

I will now ask you to accompany me farther inland toward that portion of the valley of the St. Lawrence which is at present filled by the great Canadian lakes. Let us inquire into the relation of the farms of the salt water region hereabouts, to those of the freshwater region surrounding these lakes.

The extension inland of the pleistocene gulf or sea of the St. Lawrence is the first thought to suggest itself. But how far up did the salt water extend? is the question. Marine fossils collected, and reported by Sir William Logan and his assistants, proved the extension as far as the Archaean peninsula, or isthmus which extended from the Chats Rapids, on the Ottawa River 25 miles above Ottawa, to Kingston in the direction of the Adirondacks. Beyond this ridge is the valley of the great lakes of the St. Lawrence into which I am not aware any evidence has been produced of the presence of the waters of the sea. I spent Sunday, November 6th, in repeating a former excursion of the Club which I did not accompany to the Chats Rapids, with a view to studying the character of this ancient ridge, or peninsula, where it is crossed by the Ottawa River. At Quyon, on the left bank, travelling northwards I rose over 100 ft. in  $2\frac{1}{2}$  miles to the level of a flat wide plain, which extended up the river, past the Chats Rapids to Shawville 14 miles, and to Clark's 7 miles beyond Quyon.

At Quyon, Shawville, and Clark's the saxicava sands were seen overlaid by heavy gravel deposits of a river formation of the pleistocene. Marine fossils have indeed been reported by Sir William Logan as far up the Ottawa valley as Lake Coulonge, 80 miles above Ottawa City; and I think Mr. Ami can tell you of localities beyond that, which have furnished the characteristic fossils of Green's Creek.

There was a peculiarity at Quyon, however, which is worthy of mention—the hummocky surface of the leda clays, produced by glacial action. The ice action was plainly later than the clay deposits; consequently it had nothing to do with the waters which deposited the clays.

On the line of the Canada Pacific from Carleton Junction to Peterborough, where I crossed the Archaean peninsula, during my recent holiday vacation, glacial action on a great scale was again observed, following a line evidently having a relation to this ancient peninsula. There were smooth and level, or slightly rolling forms; then suddenly the characteristic pinnacles of Waterloo county, less developed than in Watfloo, but accompanied, or perhaps replaced, a little further east by the characteristic smaller glacial hummocks of Quyon. As ocular evidence of this glacial action I will direct your

attention to Rand & McNally's new map of Canada [exhibited] where the nests of lakes tell the story better than I can. I have drawn two lines on it including the region of these lakes—which is seen to be a little above, and westward of the Cambro-Silurian beach on the Geological Survey map.

The railway levels of the Toronto Canada Pacific branch, crossing the belt from west to east, show a gradual descent, at a low elevation above the sea, from Tweed in the valley of the Moira River 324 ft., to Perth station in the valley of the Rideau 184 ft. above the sea. There is a summit between, 20 miles east of Sharbot Lake, in the middle of the lake belt, 505 ft. above the sea.

This summit is distant from Welch's terrace on Kings mountain 60 miles in a direct line; and its elevation is 160 ft. lower than the terrace. The railway levels are from the section of the old Ontario and Quebec, now Canada Pacific Railway; my own elevation of Welch's terrace was obtained by means of two good aneroid barometers read at Hull station 185 ft. above the sea, at Kings mountain, and again at Hull the same day on returning,—so as to eliminate at once the weather, and any instrumental irregularities.

Now let us take the train to Brockville, and examine what the valley of the St. Lawrence has to tell of the connection between the pleistocene salt water sea, and the valley of the great Canadian lakes. The Geological Survey reports have so fully described the country of the Archæan neck below Kingston, that I need not recall many points. Kingston at the foot of Lake Ontario is 246 ft. above the sea, as shown on my section. All the surrounding country is low and level. The ledges are visible at many points along the St. Lawrence, between Kingston and Brockville, either on the Canadian or the American side. To make a long story short the condition of things is precisely that described at Quyon. To this I have to make the exception of the fact that marine fossils have not been found in these clays above Brockville as they are above Quyon. That these clays are continuous with the valley of the great lakes, and are identical with the lake region clays, I can simply state on the authority of Mr. G. K. Gilbert who has made a study of this region, and of the pleistocene outlet of Lake Ontario in the State of New York, including the localities under consideration.

You will observe that I have paid more particular attention to the higher levels of the flood period, or the pleistocene drainage, than to the pliocene, or later tertiary drainage, when our humble but interesting ancestors must have already spread themselves by their characteristic enterprise, over all the "known and unknown" parts of the temperate latitudes of the globe. The great valley of the St. Lawrence which is now filled by Lakes Ontario, Erie, Huron and Superior undoubtedly existed in the Pliocene tertiary, that is, before the advent of the flood period. It must also have had an outlet.

The confluent ice body into which the ice streams developed at the period of extreme precipitation and cold ended southwards in Pennsylvania and Ohio as is delineated by H. Carville Lewis, of the Pennsylvania Geological Survey, (Report 2 in 1884).

Necessarily great river valleys existed before the advent of the ice streams, and of the confluent ice body referred to. They were at first followed by them; but finally in many instances they were filled up and altered in course by the debris of the glaciers; and neatly plastered over, and hidden beyond suspicion, by the loaming clays of the happy Canadian farmer. These ancient rivers of the preceding (tertiary) epoch had already cut down deep into the Cambro-Silurian bed rock; for this country had been untold ages out of water. You cannot go to the Chats Rapids, and to the Grenville and Lachine rapids, and point to the exposed bed rock in evidence of the depth of the former erosion, because the ancient streams, as is well known, have been diverted in many well known cases.

Suppose this country to be raised 1,000 feet higher above the sea, and new streams to have dug down until they unearthed the old ones, in patches and remnants; these filled with gold to tempt the miner to a frenzy of investigation, and you will have before you the conditions of the mining industry of surface geology on the Pacific Coast. Every body in that school becomes a geologist by profession. The Chinaman and the white man together become experts, because their fortune depends upon their reading nature skilfully and correctly.

In reading the record of the boulder clays and of the leda clays of this country we read the history of its former rivers, and naturally of its inhabitants, its vegetable and animal life, the kinds that existed before the flood of our own most ancient and interesting tradition.

If you ask what else the gravels and clays can tell us that we may read for ourselves, I can mention then besides the arctic leda and saxicava shells, and the Hudson Bay fish of Green's Creek, belonging to the flood period referred to, the leaves and woods and mammalian bones of the more ancient rivers to which I have referred as generally buried out of sight by the boulder clays and the leda clays. The upper courses of all these ancient streams were necessarily higher, and in many places the debris which filled them must have been since exposed; sometimes accidentally, as in connection with coal mining in Pennsylvania; in wells and borings, for coal oil, or salt, or other minerals. Exposures may exist where our eyes have not learned to read them. As you know, a milder climate than the present preceded the cold period and its flood phenomena. So it was on the Pacific Coast, in Greenland, and generally in northern America and Europe during the middle and later tertia.

River gravels of pliocene age ante-dating the present mammalian creation—the genus *homo* only excepted—have been abundantly exposed and identified in the auriferous gravels of the Pacific Coast. They are filled up river valleys like ours, which have been re-excavated by natural operations, and sifted by men in quest of gold with a thoroughness no other quest could ever have accomplished. During the years 1869, 1870, 1871, it was my lot to be engaged in their study, in connection with the Geological Survey of California. Leaves, wood, mammalian bones and human relics, consisting of implements and bones were industriously collected. The plant life was thoroughly studied, and reported on by Leo Lesquereux who stands at the head of the vegetable biologists. Their pliocene age has been established, and the facts have been accessible to all men in published form—have lain, in fact, in the public libraries of Ottawa for a dozen years. An article in the *Overland Monthly*, written by myself about 1873, which described a prolific find of mortars and pestles in a mountain of basalt covered gravel, with a precision not to be escaped from, had a wide popular circulation and has slept on the shelves of a hundred libraries.

To generous Louis Agassiz, and to the circumstance of his visiting the Pacific Coast at that time, the world is indebted for the machinery

of publication\* which has worked a change in the scientific world; formerly unwilling, now it is ready to accept these facts. Arthur Wallace, returning from a recent visit to the Pacific Coast, writes, regarding these finds of human remains in the pliocene tertiary river valleys of the Pacific Coast, that so far from being improbable, and strange, the non-existence of such remains in the pliocene period would be far more remarkable, improbable and strange, in the light of to-day.

For further information on the pre-glacial drainage of Lake Ontario I refer you to the observations of J. W. Spencer, formerly of Hamilton, and of the Geological Survey of Canada, published by the Philosophical Society of Washington, 1881. Mr. Spencer has presented many facts that are interesting on the pliocene erosion, or former valley of the lakes, in the region within reach from Hamilton; and also on the connection of the valleys of the Mississippi region where he is at present located.

It remains for me to trace a little further, and to review the facts regarding the pleistocene period, not of erosions or deep cut valleys, but of flood, and filling up of the ancient valleys; of terraces, and of plains to which we owe so much that is beautiful in the wide "level and rolling" expanse which is the paradise of the Canadian farmer. The subject goes beyond my capacity; the poet and the artist must do justice to this favored land of lakes, of rich agricultural soil, and of maple forest, that was only yesterday the bottom of a shallow sea. I have seen many countries, and frankly, I do not believe that nature—intent on rearing a vigorous race—in all the world has given its children another like it.

Probably a majority of the persons present who have followed the line of facts presented, will have drawn their own conclusions, in advance of what I shall say. If my facts are to be trusted, the evidence seems pretty conclusive that the sea penetrated into, and occupied the valley of the great lakes for a time at least during the pleistocene epoch. It is not my business or purpose at present to account for the absence of marine fossils in the valley of the St. Lawrence above

---

\*Whitney's Auriferous Gravels, in *Memoirs of the Museum of Comparative Zoology*, Cambridge, 1880.

Brockville, while they have been found up the Ottawa in position and elevation corresponding to Lake Ontario.

Having climbed Mount Washington I will say that I cannot conceive of any terraces on the flanks at any latitude like 2,665 feet, as reported by Prof. Hitchcock, of any other origin than that of sea terraces. A different conclusion could be arrived at on the hypothesis of a recent change of level, whereby the region of the four great lakes could be supposed to have been depressed. But I have described to you the Ottawa leda clay terraces as extending northward beyond the Archean neck, which has been reared as a dividing line between salt water, and the fresh waters of the pleistocene epoch. I have shown that the ice phenomena of that region are superficial, and later than the clays; that a separating ridge in the sixty miles between Kings Mountain and Sharbot Lake, by reason of change of level, is untenable; while the continuity of the St. Lawrence River and Ontario Lake shore clays confirm these facts. If by levelling along the terraces, a change of level can be shown to have occurred the facts I have given will still remain to be disposed of. Such levels have been taken by Messrs. Gilbert and Upham, on both sides of the American boundary line. In spite of the difficulty of identification of terraces they may readily establish important points connected with the pleistocene history of the lakes.

But if you would exclude the salt water sea of the lower St. Lawrence from the one great fresh water lake which united the areas of the four Canadian lakes another material must be produced that could do it other than ridges or soil of the surface. An ice dam has been suggested. It would have lain along the region of the belt of little lakes and glacial hummocks described between the Chats Rapids and Kingston. I have yet to hear from any one who has ever seen such an ice dam, in any of the icy regions of the globe. It must have been more than an ice dam; an ice stream which had the effect of a dam. A concentrated ice stream flowing in the direction of the united upper Gatineau, Coulouge and upper Ottawa rivers might well have filled the gap between King's mountain and the Adirondacks—and so replenished the melting action of warmer water, against which diminishing influence no other ice dam could have maintained itself. Such an ice dam—or

ice jam, I beg leave to amend--would account satisfactorily for the absence of marine fossils in the lake region.

It would not alter the fact of the flooding of the lake region in the period of the leda clays, the same as if such ice dam had not had any existence. If such ice dam existed, it was toward the close of the flood period, and only after the clays I have described had been laid down along the old river valleys, and over all the lower places.

In regard to the shore lines and terraces of the huge shallow St. Lawrence sea or lake which united the four Canadian lakes during the pleistocene epoch, on the sides toward Hudson Bay and Winnipeg Lake respectively, where ice dams also would appear to have been necessary to exclude salt water, Dr. Bell and Mr. Lawson, who have worked in those regions, Dr. Dawson who has studied the country beyond, and others will probably be able to contribute many more interesting facts, the mere statement of which may carry their own explanation with them



## SOLREES.

SECOND.—On Thursday, the 5th January, Mr. Amos Bowman, of the Geological Survey Staff, explained the significance of the clays, sands and gravels of this district, and drew especial attention to their mode of occurrence at the localities visited by the Club Excursions. By means of a longitudinal section of the valley of the St. Lawrence, including the Great Lakes, and a map marked with blue outlines, he showed the widest expansion, and greatest elevation which the waters of this great basin attained in the Pleistocene period. Diagrams were also drawn on the blackboard showing the relations of the clays and sands to the gravel deposits formed by the rivers when these ran at corresponding elevations. The level of the Welch terrace, on the side of the mountain, near Chelsea, was shown by the section to over-top the hills of Ontario, and to intersect the grade of the St. Lawrence at Sault Ste. Marie. The paper, which was highly appreciated by all present, will be found in the present number.

Mr. H. B. Small said that he had listened with very much pleasure to the lecture, which had presented to the members in a very clear manner the very important subject treated of. It seemed to him especially a proof of the great value of the Club outings, as a means of elucidating such lectures, for if the localities referred to by Mr. Bowman had not been visited by the members, it would have been impossible for them to have so fully realized the character and extent of the deposits in question. Mr. Stewart stated that he had seen in Madoc nodules, obtained from Deer Creek, in the County of Hastings, which exactly resembled those obtained from Green's Creek, near Ottawa, but that not having had an opportunity of opening these nodules he could not say whether they actually contained fossils. In reply to a question by Mr. R. B. Whyte as to whether the boulders, which occur in large numbers between the Ottawa River and the Chelsea Mountains were deposited by glaciers, Mr. Bowman explained that ice was the only known agent for the transportation of such masses. Mr. Ami made some remarks as to the evidence of glacial action in certain localities mentioned, and to the deposition of certain deposits of gravel at Britannia, but owing to the late hour the discussion was not prolonged.

THIRD.—Prof. Macoun delivered, on Thursday, the 19th January, an address on "Our Forest Trees," considered both from the geological records, and from their present occurrence. The concluding portion of the address, calling attention to the enormous annual waste of our forests, due to careless lumbering, and frequent bush fires, appealed especially to the audience, for at Ottawa people have continual evidences of this destruction presented to them.

With reference to the lecturer's theory that our trees originated in the north and had been gradually pressed southward by the increasing cold of their original habitat, the Rev. Prof. Marsan asked why more species of trees were not now found in Europe, where the climate more nearly resembles that of the Tertiary period, than in Canada. In reply Prof. Macoun explained that the area of Europe had once been much greater, but owing to subsidence large tracts had been covered by the sea, and with the increasing cold the trees were driven seaward and finally became extinct, whereas on the American continent the species had an uninterrupted retreat southward. Mr. Ami made some interesting remarks on the cretaceous formations discovered by Dr. Dawson in British Columbia, and the great forests and animals of which they give evidence, and which show the same agreement with the flora and fauna of Japan at that time, as the present forests of that country do to those of America as pointed out by the lecturer. Prof. Macoun mentioned that at that remote time the Rocky Mountains had not yet been upheaved, and that a vast plain—more or less undulating and broken—stretched from the Laurontides to the Pacific, and probably even to Japan. Mr. George Holland did not think that the citizens of Ottawa could be accused of indifference in regard to the action of the mill-owners in filling the river with sawdust, as they had no means of preventing it. In the destruction of our forests there was a race between the lumberman and the settler, and by much the greater damage was done by the latter. He was obliged under the laws of the Province from which he obtained his land to destroy a certain quantity of the forest on penalty of eviction, and in his anxiety and endeavour to do so, more of the forest was destroyed in one year by fire, than would be cut down in a decade by the lumberman whose interest it was to conserve his limits. Mr. H. B. Small desired to thank the lecturer for the

vigorous notes of alarm he had sounded. It was a lamentable fact that but few remnants of the vast virgin forests could now be found. There had been at Casselman a considerable area untouched, but this was now fast being destroyed. There remained a section of original forest in Ontario upon the head waters of the Petewawa, Madawaska and Muskoka rivers, which it had been proposed to set apart as a Provincial Park, for the conservation of the forest and also of the larger animals which are so rapidly being exterminated. He had much pleasure in moving a vote of thanks to Prof. Macoun for his valuable address. Mr. Ballantyne, in seconding the vote of thanks, referred to the economic questions which had been brought forward, and to the action taken by the Ontario Government toward ascertaining the best methods for preserving and replanting the forest areas. Rev. Prof. Marsan asked why they did not avail themselves of the experience of other countries in this direction, instead of spending so much time in such investigations as had just been mentioned, while there was a continual destruction going on, the effects of which could never be remedied. Of minerals there was an inexhaustible store, so that waste of them did not so greatly matter, but the vegetable and animal supplies for man's use were limited, and being under his control should be carefully preserved for the requirements of the future.

Mr. J. Stewart read a brief paper giving a synopsis of geological work performed during the past summer by Mr. W. R. Billings, Mr. T. W. E. Sowter and himself in various localities. Several new genera and species of Crinoids, etc., had been discovered, as well as many additions to the published list of fossils for this district. In reply to a question by Mr. H. B. Small regarding the opening of clay nodules, Mr. Stewart explained the method of alternate boiling and freezing adopted by him. Mr. Ami stated that he had also found this plan very effectual, and that in some cases the splitting occurred during the act of boiling.

Mr. Ami then read some notes on his examination of the New Edinburgh exposures of the Utica, accompanied by a list of the species collected from these very fossiliferous rocks, indicating those new to the Club lists.

JUN 13 1888

HENRY WATTERS,  
 Chemist and Druggist,  
 Corner of Sparks and Bank Streets,  
 OTTAWA.

# KNABE

Grand, Square and Upright  
**PIANO-FORTES.**  
 These Instruments have been before the Public for nearly fifty years, and upon their excellence alone have attained an Unpurpassed Pre-eminence which establishes them as UNSEQUALLED in Tone, Touch, Workmanship and Durability. Every Piano Fully Warranted for Five Years.  
**J. L. ORME & SON,**  
 SOLE AGENTS. OTTAWA, ONT.

C. ROSS & Co. are offering this month a very large assortment of New Saxony Costume Cloths, specially adapted for nice Spring Suits, at the low price of 25c. per yard.  
 A beautiful selection of Dress Silks is being offered at 75c. per yard.  
 Two large lots of Black Satin Rhadames, at 75c. and \$1.25 respectively, are well worth the attention of buyers; they are very cheap.  
 Samples will be sent, on application, to those living in the country.

C. ROSS & CO.

### BOOK LIST.

- Studies of Plant Life in Canada, by M. C. P. Traill, Illustrated with coloured lithos from drawings by Mrs. Chamberlin ..... \$5.50
- Our Arctic Province, Alaska and the Seal Islands, by Henry W. Elliott ..... 5.00
- Myths and Marvels of Astronomy, by R. A. Proctor ..... 2.10
- Regiment: the Art of Fire and Gravel, by Kenneth Donnelly ..... 2.10
- Manual Training, the Solution of Social and Biological Problems, by Chas. H. Hunt ..... 5.25
- Men of the Reign, a Biographical Dictionary of Eminent Persons of British and Colonial Birth who have died during the Reign of Queen Victoria .... 5.25
- A Popular History of Astronomy during the Nineteenth century, by Clarke ..... 4.50
- The English Parliaments, in its Transformations through a thousand years, by Dr. Rudolf Guest ... 1.00
- Methods of Historical Study, by Edward Freeman ... 5.00
- The Railways of the Republic, by J. F. Hudson. .... 2.10

J. DURIE & SON, SPARKS ST., OTTAWA.

G. W. McCULLOUGH,  
 ALL RAIL  
 Anthracite & Bituminous Coal  
 RUSSELL HOUSE BLOCK.

THE LARGEST STOCK OF  
**CHILDREN'S SLEIGHS**  
 IN THE CITY AT  
**BUTTERWORTH & CO.**  
 110 SPARKS STREET.

A. J. STEPHENS,  
**FINE SHOES.**  
 102 SPARKS ST.  
*Boots and Shoes Made to Measure.*

M. M. FYKE,  
 MEN'S OUTFITTER,  
 99 SPARKS ST.,  
 OTTAWA, - - - ONTARIO.

R. J. DEVLIN,  
 HATS AND FURS.

OTTAWA LADIES' COLLEGE  
 For terms apply to the  
 PRINCIPAL. - - REV. W. D. BALLANTYNE.