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
- [ ] Covers damaged/ Couverture endommagée
- [ ] Covers restored and/or laminated/ Couverture restaurée et/ou pelliculée
- [ ] Cover title missing/ Le titre de couverture manque
- [ ] Coloured maps/ Cartes géographiques en couleur
- [ ] Coloured ink (i.e. other than blue or black)/ Encre de couleur (i.e. autre que bleue ou noire)
- [ ] Coloured plates and/or illustrations/ Planches et/ou illustrations en couleur
- [x] Bound with other material/ Relié avec d'autres documents
- [x] 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
- [ ] 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.

- [ ] Coloured pages/ Pages de couleur
- [ ] Pages damaged/ Pages endommagées
- [ ] Pages restored and/or laminated/ Pages restaurées et/ou pelliculées
- [x] Pages discoloured, stained or foxed/ Pages décolorées, tachetées ou piquées
- [ ] Pages detached/ Pages détachées
- [x] Showthrough/ Transparence
- [ ] Quality of print varies/ Qualité inégale de l'impression
- [x] Continuous pagination/ Pagination continue
- [ ] Includes index(es)/ Comprend un (des) index

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	12X	14X	16X	18X	20X	22X	24X	26X	28X	30X	32X
					✓						

THE

CANADIAN RECORD

OF SCIENCE.

VOL. III. JULY, 1888. NO. 3.

Notes on some of the Birds and Mammals of the Hudson's Bay Co's. Territories and the Arctic Coast.

By John Rae, M.D., LL.D., F.R.S., F.R.G.S., &c.

During a residence of twenty years in various parts of the Hudson's Bay Co's. Territories, embracing the extreme south of James's Bay, Hudson's Bay and north to the Arctic Sea, I had, as a sportsman, many opportunities of paying considerable attention to the habits and peculiarities of the fauna—especially birds—over a rather extensive field of observation, the result of which I shall attempt to give in the following remarks, some of which may perhaps be new, others disputed, or possibly well known.

My first ten years in this wild country were spent at Moose Factory, the Hudson's Bay Company's depot, in the southern department, lat. 51° N., long. 81° W., where the salt-marshes along the coast afford favorite feeding grounds to a great number and variety of water-fowl on their migrations to and from their breeding place in the north, and

nearly all my spare time, at these seasons, was spent in shooting and acquiring some knowledge of the peculiarities of the game I was in pursuit of. First let me say something of that magnificent bird, the Canada Goose (*Anser Canadensis*), one of the finest of its order in the world.

This is the earliest of the spring water-fowl migrants, and makes its appearance at Moose, with extreme regularity, on the 23rd of April. So much is this the case that during my ten years stay there, we had a goose at our mess dinner table on St. George's day, first seen and shot on that day; and this I learnt had been the case for a long series of years previously. I may add that this species of goose arrived with about equal regularity at York Factory, latitude 57° N., 420 miles further north, but a week later.

The Cree Indians, at both these places, assert positively that a small brown bird uses this goose as a convenient means of transport to the north, and that they have been often seen flying off when their aerial conveyance was either shot or shot at. The little passenger has been pointed out to me, but I have forgotten its name. Certainly it makes its appearance at the same time these geese do, which, by the way, are the only kind that are said to carry passengers. The natives of the Mackenzie River, more than a 1000 miles to the south-west, tell the same story, so I believe in its truth.

According to my experience and belief, there is another, but less numerous, variety of the Canada goose; the male of this bird is usually distinguished by a ruddy brown colour of the plumage on the breast, by the extreme loudness and sonorousness of the call, and by the so much greater size, that there is a difference made in the quantity served out as rations to the men. The line of flight of this larger variety is also different, as they pass chiefly by Rupert's River, about 100 miles to the east of Moose, and thence on to the east main coast of Hudson's Bay, on which lands they breed, not going very far north, nor crossing as far as I know, Hudson's Strait—as none are mentioned as having been seen at the Meteorological station, under Mr.

Payne, at Hubert's Bay, on the south shore of the Strait. A few are sometimes obtained at Moose, by which I had an opportunity of comparing them with the smaller and more common variety.

This *Anser Canadensis* (Major?) instead of being found feeding during its autumn visit on the low marshy shores of the bay, is seen on the higher and more rocky ground on the east coast, where its principal food is berries of various kinds.

By far the most numerous of the goose tribe that visit Moose and Albany marshes in the autumn are the snow goose (*A. hyperboreus*), and the blue wavy or blue-winged goose of Edwards. Some forty-five years ago, when I was at Moose, only the blue-winged wavy was seen at Rupert's River, and no snow geese; and it is so at the present time. About equal numbers of both kinds used of old to visit Moose, and such is the case now; but half a century ago not a single blue-winged goose was to be seen at Albany River, 100 miles north of Moose, while now they are about as numerous at the former place as the snow goose, and both are more abundant at Albany than at any other part of the west shore of Hudson's Bay. As far as I can learn, no blue-winged geese are ever seen at York Factory, latitude 57° N., nor at any of the lines of flight of the snow goose further to the west.

As these two species resemble each other in form, size, and call, but not in colour; and as they often feed together, the blue-winged was for a long time considered as the young of the white wavy, an erroneous opinion, which I endeavoured to correct, after seeing a great many of both kinds of birds.[1] I showed that the young of the snow goose was of a light grey colour, slightly darker on the head and neck, while the young of Edward's blue winged-wavy,[2] was much darker, of a bluish-grey, approaching to black on

[1] See my little book entitled "Expedition to the Polar Seas" (1846-7), published by Boone, London.

[2] The term Wavy is a corruption of the Indian word "whey-whey, an imitation of the call of the goose.

the head and neck. To prove the correctness of this, I obtained the specimens shown on the table, namely, an old and young snow goose, and an old and young blue-winged, shot in autumn on their return from breeding in the north.

In the Transactions of the Royal Society of Canada for 1882, Section IV. p. 49, there is a paper entitled "Notes on the Birds of Hudson's Bay,"[1] in which we are told that "there appears to be no doubt that the *blue-wavies are only the young of the white.*" This is, of course, a mistake, but there are other inaccuracies in the same paper. For example, it states that minick, gadwall and grey duck, are one and the same bird. The pintail, (*Dafila acuta*) is the minick, a name given to it by the Indians in imitation of its call. The long-tailed duck is called in the paper *Dafila acuta*, but this is the scientific name of the pintail. The long-tail or (Ka-ca-ca-mee) of the Indians is *F. glacialis.*

The same paper says "that in the breeding season the male of the willow grouse has the head and neck of a reddish pheasant color, with the exception of the wings, which have a good deal of white," and that in the winter the white of the living bird "has a beautifully delicate rosy tint, which forms a considerable contrast with the surrounding snow." The summer plumage resembles the plumage of the Scottish cock grouse, but the wing feathers are always white, whilst the "rosy tint" is only to be seen on fine, mild and sunny days, *never* during cold dull weather.

After this brief digression let me return to my subject. The snow and blue-winged geese have a peculiarity I have never noticed in any other species. Previous to taking their southern flight from Hudson's Bay, they are for several days almost constantly on the open sea, never feeding, but busy washing themselves, taking short and rapid flights, and apparently having a good romp and great enjoyment. They are at this time very fat, and when shot, their stomachs and intestines are found perfectly empty, resembling, I am told, in this respect, those of salmon, prior to the hard work of ascending rivers to the

[1] By R. Bell, M.D., F.G.S., &c.

spawning-beds. After this spell of fasting, ablution and athletics have been gone through, the geese are evidently prepared for their long flight of many hundreds of miles to the south. On the first favourable opportunity, which means a fresh breeze of northerly or north-westerly wind, they take wing in batches of thirty or more, circling round until they attain a safe altitude and then bearing away before the wind on about a true southerly course, never resting, I believe, until they reach winter quarters, many hundred miles distant. The Canada goose, on the contrary, stops to feed by the way, especially on the lakes in which wild rice abounds, which brings both ducks and geese to a much finer condition for the table than any other kind of food that they can obtain. Both the blue and white wavy are excellent, wholesome food, and one of these with a pound of flour or bread forms a days rations much liked by the men, especially when fresh. Many thousands are cured by salting and packed in barrels for the use of the Hudson Bay Co's. people, and the Indians of or near the coast, besides living upon them during a part of spring and autumn, "bone" and smoke-dry a great many for winter use, and also prepare much of the fat, to use with their hares or fish.

All kinds of grouse in Canada with which I am acquainted have the well known habit, during winter, of passing the night under the snow to protect themselves from the cold; but possibly a practise which most of them more or less follow, when the snow is in the right condition for doing so, has not been generally observed. The bird is not content to make its bed close to the door by which it has entered the snow, but generally bores a tunnel at the distance of a few inches under the surface to a distance of three or more feet, before it settles down for the night. The reason why the bird should go through so much apparently useless labour—for its night's bedroom would have been equally warm had it gone only a few inches beyond the door—was at first difficult of explanation, but a little more experience taught me to admire the intelligence of the

bird; for during my walks through the woods, I frequently came to places where a fox, lynx, marten, &c., had, in the night, approached cautiously (judging by the short foot-steps), and made a spring at the hole where the snow had been entered. Had the bird remained near the entrance it would certainly have been killed, instead of which it had flown up a yard or more away and escaped uninjured. The prairie hens, a good many of which are to be found near Moose, show great intelligence in this respect, and in very cold weather even take their siesta during the interval between their breakfast and supper under the snow. I have often in the day-time seen them "pop" up their heads through the snow, without taking wing, before I got within gun range, no doubt to observe if it were an enemy that was approaching.

Without including the white grouse, peculiar to the Rocky Mountains, there are, I believe, three other kinds to be found in the northern parts of British North America. First, there is the willow grouse *Tetrao* (*Lagopus*) *saliceti* Sw. & R.—*albus* Aud., the most numerous of all, met with more or less abundantly at different seasons, at or near the arctic coast, on the barren lands and along the shores of Hudson's Bay, &c.

This bird, as I have already said, not only re mbles the Scottish cock grouse in its summer plumage, with the exception of the wing-feathers being white in the former at all seasons, but in the pairing season their call and movements are so identical, that I consider them to be the same bird, modified to suit different winter climates.

The other recognized white grouse (*T. rupertris*) is so well marked by its smaller size, its more slender beak, its different call and the black patch or streak from the beak to the eye, that there can be no possibility of mistaking it for the other species. It bears a very close resemblance to the ptarmigan of Scotland. The third variety differs very considerably from both the above. Although about the same size as the willow bird, its beak appears shorter, its feet smaller, and its call perfectly different,

whilst its usual habitat, winter and summer, is chiefly on the islands (such as Wollaston and Victoria Lands) north of the Arctic coast. Here I saw a good many cock birds in the spring of 1851, but shot only a few, as they were very shy, possibly with the object of drawing me away from their wives, none of which were seen, as they were resting, and lay close on some of the lands uncovered by snow, where their already brown plumage was not readily seen. The cock retains its winter plumage to a much later date in spring than the hen does. These birds do not all migrate to the south to pass the winter.

All over the wooded portion of what is, or was, usually called the Hudson's Bay Company's Territory, east of the Rocky Mountains, comprising an extent of country equal to a quarter of Europe, the American hare (*Lepus Americanus*) is to be found in greater or less numbers; but it may not be generally known that these animals are every ten years attacked by an epidemic, so fatal, that from being in great numbers, they gradually die off until scarcely any are left, after which they begin to increase, and at the end of ten years are again at their maximum. I have myself, seen two cycles of this curious occurrence, and am acquainted with men in the Hudson's Bay Company's service who have witnessed four or five of these events. For instance, a friend wrote to me a few months ago, saying that 1884–85, were years of abundance, and 1880–81, years of scarcity, and that 1895–96 will again probably be years of plenty. My friend, the late Sir John Richardson, a distinguished naturalist and keen observer, states somewhere in "Fauna" "that the hares migrate." He must have relied upon erroneous information, and his residence in the country was at no one time long enough to enable him to observe for himself. After the epidemic commences, the hares are found dead in their forms, usually under small pine trees, the branches and thick brush of which grow close down to the ground. It is difficult to account, satisfactorily, for this regularly recurring and terrible epidemic, but it may be produced as follows: The hares are not spread broad-cast over the

country, but congregate at certain localities, say a mile or two in extent, where their favorite food of various kinds abounds. I believe these grounds after a time become poisoned by the excreta from the multitudes of hares, just as is the case with domestic poultry when kept too long on the same piece of land, or with grouse in Scotland, when allowed to increase too much. In winter when the grouse collect in great packs, and select as a shelter from westerly storms some favorite lee hill-side, I have seen the ground thickly covered with their "droppings," even in Orkney, where grouse have never, as far as I know, been numerous enough to be attacked with disease.

The effect of these epidemics is very peculiar and important, to the Indian, the fur trader and the fur-bearing animals in the far north-west. When the hares are numerous, the Indian pitches his tent at one of the locations I have named, and immediately cuts down a number of small pine and spruce trees as barriers, in which small gaps are cut for the hares in their "runs" to pass through. At the same time birch and other trees, the bark of which forms a favorite food of the hares, are felled, and on these they fatten rapidly.

Then many snares, perhaps a hundred or more, are set in the gaps mentioned, these snares are generally set and attended by the wife and children (if any), whilst the Indian himself constructs ranges of traps for the marten, fisher, lynx, &c., (which come to feed on the hares), extending for perhaps ten miles in two or three directions. These ranges are visited two or three times a week, the animals caught, taken out, and the traps re-set and freshly baited with meat or fish. In this manner the Indian passes a by no means laborious winter, his food being easily obtained, and the skins of the hares making excellent warm sleeping robes[1] and clothes for the children, and at the same time, he makes a good "*fur hunt.*"

[1] In making these fur-blankets, the hare-skins are cut up into strips, sewed together into a long line, which is roughly netted together, and although the fingers may be pushed through anywhere, it is one of the warmest robes known.

When the hares are scarce, the Indian has to go to a fishery to obtain a supply of food, or to travel about in search of deer or other large animals for food, whilst at the same time the fur-bearing carnivora, get scattered all over the country, also in search of food, and are not so readily trapped, and have thus an opportunity of increasing in numbers until the next season of abundant hares comes round.

There is a curious practise sometimes resorted to—not however common, as far as my observation extends—by the muskrats, to enable them to reach the food at all parts of the pond in which their house is built. In early winter, when the ice begins to form, the rats keep small holes open in different directions at a distance from their house, and build little huts of mud and weeds over these, into which they can enter and eat their food taken from the bottom of the pond, without having to swim all the way back to their house to do so. It has been only in large ponds or swamps that I have seen this done, and probably where there was an extra large number of rats in one house. On one occasion, when snowshoeing through a swampy part of the north-west, one of my men went very quietly up to one of these little shelters, and with a heavy blow of his axe knocked it over, and inside a poor little rat was found with some of the food it had been eating. It was knocked on the head, and in the evening formed part of the men's supper.

In 1851, in the early part of June, when on my way from the Arctic Sea, where I had been making a long sledge journey of more than 1000 miles, I was surprised to meet thousands of lemmings travelling with all the speed in their power to the north. On some of the tributaries of the Coppermine River the ice had broken up, and at these it was curious to see these little animals running up or down the southern bank of the stream looking for a smooth place with little current at which to swim across, having found which, they immediately jumped in, swam with great rapidity, and gave themselves a shake, as a dog would do, when they reached the opposite side, and then

continued their advance as before. This was in latitude between 67° and 69° north; so the sun was visible all the twenty-four hours, and we travelled at night so as to have his light on our backs. Had we been travelling in the day time, we would not have seen one of our little friends, as they then hide themselves under the snow or stones. Having accidentally lost the small quantity of food we had with us, by the man carrying it falling when fording a rapid, our chief food for two or three days was these lemmings, which we found very good when roasted between two thin slabs of limestone, heated by andromeda as fuel. Our three dogs also picked up as many as they required. It is well known that the lemmings of Norway and Sweden frequently migrate in immense numbers, but I did not think that those of America did so. They are found very far north, as they were abundant where the Nares Expedition wintered, in latitude 82° north, up Smith's sound. Here, as elsewhere, they formed a considerable portion of the food of the white fox.

That beautiful animal, the arctic hare, has a rather artful dodge which it resorts to, evidently with the object of throwing his enemies off the scent. After feeding at night in the lower grounds, it generally resorts to some higher position to lie hid during the day, and the sportsman in following his or her track, is surprised to come to a place where there are several tracks one over another, causing confusion. On going further, he comes to the end of the track altogether, the animal having jumped off somewhere; and on retracing his steps, carefully inspecting both sides, two little marks are seen in the snow at a distance of twenty feet or more from the track, always on the *lee side*, so that a fox or wolf could not catch the scent. These long jumps are repeated three or four times,—the animal evidently either using only his hind legs, or putting all his four feet close together. Experience soon taught me that the hare was in his form at no great distance from these "jumping off" places, and a sharp look-out had to be kept, as if you happened to walk directly for him he

would usually slip away under shelter of the large stone or rock near which he lay. When noticed, the sportsman should walk as if apparently passing by the hare, taking care not to look directly at him, but at the same time approaching, and when near enough, wheel round and fire; for you must do with the hare as with the ptarmigan among the rocky hills of Scotland—take him *any way*; otherwise he is in a moment round the corner and safe.

These hares seem to have puzzled the officers and crew of McClure's ship in the Arctic, when he wintered in Prince of Wales sound. They were so numerous as to be seen in droves of hundreds at a time, yet only seven were killed in a month by the sportsmen, in a crew of about sixty persons. On a somewhat similar occasion, but with fewer hares, I shot ten in little more than an hour, and carried them to our snow hut, their average weight being about 8 lbs. each.

Whilst walking one day in August along the shore of Victoria Land, latitude 69° north, the tide ebbing, I heard a clattering among the small limestone debris on the beach, which reminded me of a sound very common and often heard many years before in winter, on the shores of the Orkney Islands. On cautiously looking over the bank, there, sure enough, I noticed a family of turnstones (*Tringa interpres*), two old and three young, busy turning over stones and feeding on the insects underneath. They looked so happy and were so fearless, that I had not the heart to shoot any of them for specimens.

The American golden plover, commonly called the "*ox-eye*," must breed in immense numbers, at least as far north as 70° to 71°, as I saw large flocks of them flying to the south towards the end of August, when on the south-east corner of Victoria Land, on the shore of Victoria strait, in 1851. Great numbers of snow geese were at the same time noticed making their way apparently to Back's Great Fish River, and thence probably to Great Slave and Athabasca Lakes. The Coppermine River is also one of the lines of flight of these birds, both in going to and returning from their breeding places. They were very abundant in the autumn

of 1848, and in the spring of 1851, near the mouth of the Coppermine River when I was there, and not being difficult of approach, I shot a good many. Those killed in the spring were very fat.

Perhaps I may mention that it is, especially to the sportsman or naturalist, a very pretty sight to see the snow and blue-winged goose (wavy) arrive at the marshes of James' Bay, after their long flight from their breeding place. A strong breeze of northerly wind usually accompanies their advent, and their call is generally heard before they are seen, high up in the air, going at express railway speed. Suddenly several of the leaders of the flock, no doubt old birds, make a dive downwards, apparently in the most frantic and reckless manner, followed by others in a more or less adroit manner, making a great cackling all the time, until the whole have got pretty low down, when having fixed upon a resting place, they wheel, round head to wind, and alight on the marsh. Flock follows flock, all going through similar manœuvres, each new arrival being received with noisy and hearty congratulations of welcome by their predecessors.

It may not be out of place to notice, that I do not think any snow or blue-winged geese breed on any part of the shores of Arctic America proper lying west of Hudson's Bay and east of the McKenzie, unless it be in some large marshes near the mouth of that great river on the Melville Peninsula, whereas most of, if not all, the blue-winged "wavies" breed on lands and islands east of Hudson's Bay.

On Sporocarps Discovered by Prof. E. Orton in the Erian Shale of Columbus, Ohio.

By Sir J. Wm. Dawson, F.R.S., &c.

In a paper published in this journal in 1884, I directed attention to certain specimens from Brazil and from Ohio, which I placed in connection with the curious round bodies from the Erian or Devonian of Kettle Point, Lake Huron, discovered by Sir W. E. Logan, and which I described as *Sporangites Huronensis*. These bodies were shown to be macrospores, and, on the analogy of the Brazilian species, to have been probably enclosed in sporocarps resembling those of the modern genus of Rhizocarps known as Salvinia, and found floating in water, with a few green leaves and rounded sporocarps on the bases of the leaves or at the proximal ends of the roots. These curious little plants, insignificant in the modern world, would seem to have been vastly abundant in the Erian period, inasmuch as hundreds of feet of the Ohio black shale are filled with them; and this formation extends across the State of Ohio, and is found in New York and in Ontario as well. But though the macrospores are thus abundant, the sporocarps, which it was presumed had contained them, were absent. Quite recently, however, Prof. Orton has found at Columbus, Ohio,[1] well-preserved sporocarps flattened like those from Brazil, exhibiting their cellular structure quite distinctly under the microscope, and sometimes showing the impressions of the contained macrospores. Along with these sporocarps were others of quite different form, and apparently belonging to a very distinct species, though probably of the same general type—that is, allied or belonging to the Rhizocarps. Prof. Orton has kindly furnished me with specimens of these curious bodies, and the following notes relate to their characters. What should now be looked for is some indication of the foliage of these interesting plants, which may prove to have been like that of the modern Sal-

[1] The specimens were collected by Mr. C. J. Walsh.

vinia, or perhaps somewhat more advanced in complexity of structure, as these old forms of vegetation usually present types of structure in advance of those of their modern successors in the same groups.

The specimens occur plentifully on the surfaces of a firm dark gray shale. They are perfectly flattened and carbonised, and so loosely attached that they can readily be removed, as thin pellicles, which when partially broken, often show their double walls. As opaque objects, under a low power they present a shining surface marked with cellular areolation. In this they resemble the Sporocarps of *Protosalvinia Braziliensis.*[1] When removed from the matrix, and immersed in water or in Canadian balsam, they become transparent, and show their thick-walled cellular structure very distinctly. The transparency is somewhat increased by boiling for a short time in nitric acid.

There are two distinct forms on the surfaces of the shale —one, which is the more common, perfectly circular; the other, elongate obovate, and notched at the apex, sometimes so much as to give a bifurcate appearance.

1.—*Sporocarps of Protosalvinia Huronensis.*

These are the circular specimens. I refer them to this species, because its macrospores are the most common fossils of this shale, because they resemble those of *P. Braziliensis,* and because some of the specimens show impressions of contained macrospores similar in size to those of the species *Huronensis.*

They are rather larger than the sporocarps of *P. Braziliensis,* some being four millimetres in diameter. They are, therefore, considerably larger than the sporocarps of the modern *Salvinia* of Europe. In structure they are coarsely cellular, more thick-walled and larger-celled than those of *P. Braziliensis,* probably indicating a good specific difference. Both of these ancient sporocarps are composed of coarser cells and more dense in texture than those of

[1] Record of Science, 1884.

Salvinia natans, though indicating a plant of similar general type. I have stated in my previous paper the probability that such sporocarps would be found, and their discovery is therefore very satisfactory.

2.—*Sporocarpon furcatum.*

The smaller and probably immature specimens of this organism are obovate and broadly truncate below, with a slight emargination at the apex. Larger and probably mature specimens have a very deep slit at the apex, or divide so as to give a bifurcate appearance. Length of one of the larger specimens, 5.5 millimeters; breadth, near the apex, 2 m.m.; at base, 1 m.m. Surface with fine cellular reticulation, which, when seen as a transparent object, appears as a network of thick-walled cells, rather finer than that in the previous species, but of the same general character. Toward the base. it becomes more lax, as if verging into an ordinary epidermal tissue. No contained spores or macrospores were observed; but it can be seen that the specimens are not mere fronds, but have a double wall and are really flattened sacs.

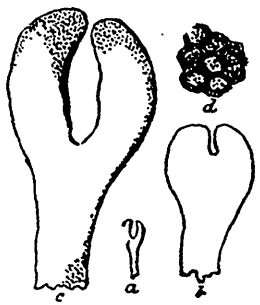

FIG. 1. SPOROCARPON FURCATUM.

(*a*) Natural size. (*b*) Young specimen (mag.). (*c*) Full grown specimen (mag.), showing cellular areolation. (*d*) Cellular structure, highly magnified.

These objects are, therefore, to be regarded as sporocarps or spore-cases of some unknown plant, saccate in form, and

dividing at the distal end into two sacculi, the dehiscence of which seems to have been by a slit on the inner side of each division. This last property and their form recall the spore-cases of the ferns of the genus *Archaeopteris*, which are, however, different in other respects. They still more nearly resemble the spore-cases of Psilophyton (see figures in my Report on the Erian Flora of Canada, 1871), but the latter are entirely separate and supported upon slender stalks. Some tendency to the double or divided form of these Sporocarps, though much less pronounced, occurs in the *Protosalvinia bilobata* from Brazil.[1]

I should suppose that these bodies belonged to a genus distinct from Protosalvinia, but ordinally related to it. The form of the base would seem to imply that they grew on a frondose or thick pedicel. Possibly they may have been attached to the sides or bases of fronds; but this must for the present remain uncertain.

Williamson has used the generic name *Sporocarpon* for conceptacles of various forms and structures from the carboniferous, of which he remarks that he has formed no opinion of their relations, but which may have been Rhizocarpean, inasmuch as the nearest modern analogues of some of them appear to be the sporocarps of Pilularia. For this reason I have thought it best to place the present species in this provisional genus, till farther information can be obtained as to the nature of the other organs of the plant to which they belonged. It would now be a very desirable discovery to find the vegetative organs of these ancient plants. For other facts bearing on the affinities of these organisms, I would refer to the papers above cited, and to my little work, "The Geological History of Plants."[2]

[1] Record of Science, 1884. Bulletin Chicago Academy, 1886.

[2] Appletons, New York, 1888.

Note on Graptolites from Dease River, B.C.

By Prof. Charles Lapworth, F.R.S.

In June, 1887, a small collection of Graptolites was obtained by Dr. G. M. Dawson on Dease River, in the extreme northern and inland portion of British Columbia, about lat. 59° 45′, long. 129°. These fossils were derived from certain dark-coloured, carbonaceous and often calcareous shales, which, in association with quartzites and other rocks, characterize a considerable area on the lower part of the Dease, as well as on the Liard River, above the confluence. The collection referred to was transmitted by Mr. J. F. Whiteaves to Prof. Lapworth, whose special studies on Graptolites are well known. It is believed that the following preliminary note by Prof. Lapworth will be of interest, as the occurrence of Graptolites on the Dease River extends very far to the north-westward of our previous knowledge of the occurrence of these forms in North America. In 1886 a similar small collection was obtained by Mr. R. G. McConnell near the line of the Canadian Pacific Railway, in the Kicking Horse (Wapta) Pass. This and the new locality here described are the only ones which have yet been found to yield Graptolites in the entire western portion of the Dominion.

Prof. Lapworth, under date December 13th, writes as follows:—

I have, to-day, gone over the specimens of Graptolites, collected by Dr. Dawson, from the rocks of the Dease River, British Columbia. I find that they are identical with those examined by me from the rocks of the Kicking Horse Pass, some time last year. The species I notice in the Dease River collection are:

Diplograptus euglyphus, Lapworth.
Climacograptus comp: *antiquus*, Lapworth.
Cryptograptus tricornis, Carruthers.
Glossograptus ciliatus, Emmons.
Didymograptus comp: *sagittarius*, Hall.
New form, allied to Cœnograptus.

These graptolite-bearing rocks are clearly of about Middle Ordovician age. They contain forms I would refer to the second or Black River Trenton period: i.e. they are newer than the Point Lévis series, and older than the Hudson and Utica groups. The association of forms is such as we find in Britain and Western Europe, in the passage beds between the Llandeilo and Caradoc Limestones. The rocks in Canada and New York, with which these Dease River beds may be best compared, are the Marsouin beds of the St. Lawrence Valley, and the Norman's Kill beds of New York. The Dease River beds may perhaps be a little older than these.

Mr. C. White described some Graptolites from beds in the mountain region of the West, several years ago, which may belong to the same horizon as the Dease River zones, though they have a somewhat more recent aspect.

The specific identification of the Dease River fossils, I regard as provisional. While the species correspond broadly with those found in their eastern equivalents, they have certain peculiarities which may, after further study, or on the discovery of better and more perfect specimens, lead to their separation as distinct species or varieties.

It is exceedingly interesting to find Graptolites in a region so far removed from the Atlantic basin, and also to note that the typical association of Llandeilo-Bala genera and species is still retained practically unmodified.

The Great Lake Basins of Canada.

By A. T. Drummond.

In a paper read recently before the Royal Society of Canada, on "The Origin of Some Geographical Features in Canada," Dr. Bell alluded more particularly to the lake region of the Dominion, including in this not only what is

Note.—This preliminary note comprises a short extract from the closing lecture in Science, delivered by the author before the authorities of Queen's University on April 23rd of this year, and its publication has been suggested by Dr. Bell's more recent paper, above alluded to, read before the Royal Society.

popularly known as the Great Lakes, but also those vast stretches of water which form the sources or expansions of the Mackenzie, Churchill and other rivers which fall into the Arctic Sea or Hudson Bay. Lake Superior was alluded to as being in part of volcanic origin, whilst the vast basin of Hudson Bay was referred to as being in some respects due to similar causes. On the other hand, Lake Athabasca, Great Slave Lake, Lake Winnipeg, the Georgian Bay and Lake Ontario lie more or less along the line where the limestones and sandstones meet the older Laurentian and Huronian strata, and he attributed their excavation to the action in post-tertiary times of glaciers, which, descending from the then greater elevations to the northward, had in their southern course torn away, one after another, the upturned edges of these softer limestones and sandstones. This process going on for ages, resulted in the formation of these lake basins.

Dr. Bell also pointed out that dykes of greenstone, &c., often formed the original lines along which the channels of rivers, arms of lakes, and fiords were by denuding forces cut.

The whole subject still merits careful investigation. Dr. Bell's opinion that the Great Lake basins have a glacial origin, is the commonly received impression among scientists. Too much importance has, however, been attached to the influence of glaciers. It has been recently shown by Prof. J. W. Spencer that they have much less eroding power than has been attributed to them. If we draw reasonable conclusions, especially from correlated physical conditions as they now exist, serious difficulties present themselves in the way of accepting the theory, still adhered to by American geologists, of a vast, continuous, continental glacier covering the Arctic and northern temperate regions of North America, and with its enormous tongues of ice forking into Massachusetts, New York, Indiana, Illinois, Iowa and Wisconsin. Equally are there difficulties in the way of accepting the great thickness of the ice-sheet, which some, judging from the crushing power of a column of ice,

have estimated in places at several miles. Scientists have apparently somewhat overlooked the vast effects of erosion by atmospheric and other agencies in Miocene and Pliocene ages which immediately preceded the glacial epoch, and the great deposits of decomposed rock which must have accumulated during these ages in northern temperate America. Nor have they fully considered the immense elevation, if even by accumulated ice, necessary in our Laurentian area and southwestward, to admit of great glaciers finding their way in a massive stream for, as in the Lake Michigan glacier, four hundred and more miles from the Laurentian or Huronian mountains, and, generally, in a direction which is presently up instead of down the natural incline of the St. Lawrence valley and Great Lake basins. For a glacier from the Laurentian mountains to have reached even the head of Lake Michigan would, at the rate of progress of the enormous Humboldt glacier in Greenland, as measured by Dr. Hayes, have taken about 21,000 years; and whilst the climates are, for argument, assumed to have been similar, the Greenland slope is greater than that through Lake Michigan could possibly have been.

If, again, the Great Lake basins had been each overspread by a vast moving glacier, there is a strong probability that during the onward progress and the subsequent slow recession of the ice, the inequalities of the lake bottoms must have been worn away or largely filled up with the debris which continually accompanied the glaciers. Nevertheless, Lake Michigan has a depth varying from 700 to 1800 feet, and, excepting Lakes Erie and St. Clair, the other lakes have equally varying depths.

It has, also, not been considered that continental glaciers even only one mile in thickness, extending over the Arctic and northern temperate regions of Europe, Asia and America, would represent a depth of about 500 to 600 feet taken uniformly everywhere from the waters of the ocean and transformed into ice, even supposing that a milder climate existed at the Antartic Pole. Apart from the effects on the general level of the continents which the weight of

these enormous masses of ice would have, and of the heat generated underneath which would probably prevent any excessive accumulation, the withdrawal of a depth of 600 feet of water from the North Atlantic Ocean would have moved the whole United States coast line from Texas to Maine about seventy-five to one hundred miles seaward of its present position, would have rendered the Gulf of St. Lawrence dry land, and brought to the surface the Great Banks of Newfoundland, would have obliterated the German Ocean, thus connecting Great Britain with the continent of Europe, and would have almost formed an isthmus between Great Britain and Iceland. How far are we prepared to accept these results as occurring simultaneously at this time? Some of them actually did occur at other periods, but through the slow elevation of the land.

The subject of the origin of the Great Lakes is still beset with some difficulties. Whitney, and more recently R. D. Irving, have shown that Lake Superior throughout its whole area is a synclinal trough or depression, and that the Keweenaw series of rocks in its upper and lower divisions probably underlies nearly the whole lake. This, then, largely dispels the idea of the glacial origin of this lake. When this depression took place is a more difficult question. Through its western half the axis of the depression lies in a southwesterly direction and, in a general sense, parallel to the trap overflows of the western shore, showing that they may both be due to the same force.

Again, Lakes Erie and St. Clair, which without doubt have at one time been united more intimately than now, are probably the most recent in origin of the Great Lakes. The county of Essex, which now separates them, has quite the characteristics of the modern prairie, and its formation is undoubtedly due to similar causes. Centuries of growth and decay of rich grasses and sedges in the extensive marshes here bordering the lake, gradually contributed a loamy soil, which even now is not much above the level of Lake St. Clair. These two lakes lie in very shallow depressions in the Erie clays—Lake Erie in its southwestern half

having a maximum depth of about seventy feet, whilst Lake St. Clair has a maximum depth of only twelve feet. These lakes appear rather to be shallow overflows caused by the restricted passage now of the waters over the Niagara escarpment in the one case, and through the Detroit River in the other, than to be due to physical forces which, operating in past ages, excavated preparatory basins for them. There can be no doubt that, as Dr. Hunt suggests, the post-tertiary clays of south-western Ontario now occupy the basin of what may have in earlier times been a much larger lake or inland sea.

Regarding the operation generally of glacial forces in contributing in some respects to the features of our Great Lakes, we can conclude that our whole Laurentian and Huronian country north of these lakes and of the St. Lawrence was elevated into great mountain chains, that, with the colder climate, enormous glaciers everywhere flowed down the mountain sides and over the country beyond, and that contemporaneously, probably towards the close of the age, there were, as has been shown by Sir William Dawson, extensive depressions in the eastern parts of Canada, and of the northern United States, which admitted tha Arctic current laden with huge icebergs up the St. Lawrence and across the basin of the Great Lakes; or, what is more probable, that the Great Lakes formed an inland sea which extended over parts of the Northern States as well. Across this inland sea and towards the Mississippi River, which was probably then its outlet, floated numberless icebergs, the offshoots of the Laurentian glaciers to the northward, freighted with their loads of boulders and debris, which were dropped on the sea bottom as the bergs melted, or were broken by contact with other bergs or with rocks. Our North-West, as far as the Rocky Mountains, was at this time, or subsequently, the floor of an even vaster sea, with the prevailing winds or currents carrying, in the direction of these mountains, fleets of icebergs from the great glaciers on the eastern borders of the sea, which were then on a line with the present Lake

Winnipeg. Further, whilst during a part of this colder period, there was a high northern temperate vegetation, including in it such trees as the balsam poplar, the white cedar, and the mountain maple, there is some evidence in the North-West that since the close of tertiary times there have been two separate periods of cold, intermediate between which was a milder period when a vegetation on a considerable scale flourished. During perhaps each of these periods of cold the central parts of the continent formed a great inland, probably fresh water, sea, of the later of which the present Lakes Manitoba, Winnipegosis and Winnipeg are the remnants.

Proceedings of Royal Society of Canada.[1]

With Notes by A. T. Drummond.

Under the presidency of Dr. Lawson, of Dalhousie College, Halifax, the Royal Society of Canada commenced on the 21st May the sessions of its annual meeting at Ottawa. There was a smaller attendance of members than could have been desired. The great length of the journey to Ottawa must no doubt deter some members from being annually present, and unforeseen reasons must occasionally prevent others; but the absence of so many members is apt to be construed into a lack of appreciation by them of the Society's work, and is, besides, discouraging to those who have interesting papers to read. It was thought by some that a change in the date of the annual meeting might secure a better attendance.

President's Address.

The annual address of the President was listened to, as usual, with great interest The following extracts give the leading features of Dr. Lawson's address :—

[1] Abstracts marked with an asterisk have for the most part been specially prepared for the Record by the authors of the papers.

"My first duty on this occasion is to express to you, fellow members, my personal acknowledgment and thanks for the honour you have bestowed in placing me in the high position of President of the Royal Society of Canada, an office whose character is sufficiently shown by the mere mention of the names of those whom you selected to fill it in former years—Sir William Dawson, Dr. Chauveau, Dr. Sterry Hunt, Dr. Daniel Wilson, Monsignor Hamel. It would be difficult to select five other living names more intimately associated than those with the intellectual, educational and industrial developement of Canada, or engraven in clearer lines in the records of our literature and science, or more deeply impressed upon the hearts of those classes of our people who are thoughtful, intelligent and enterprising. I might well then shrink from taking this chair and attempting to discharge the duties that pertain to it. If I had thought that your selection had been made solely on the ground of personal fitness, or as an acknowledgment of work done or to be done in any individual capacity, I should have hesitated to assent to your choice, or to attempt the task which acceptance involved. But the considerations which led to my acquiescence were of a different kind. I felt that we were working together for the success of this society, not as an end in itself, but as a means—an organization—whereby we might be enabled, in some measure, to contribute our part in accomplishing the country's good, promote literary and scientific research and discovery, educational improvement, industrial development and general intellectual activity throughout this Dominion; that we were charged with this work, and each bound not to shrink from the part that might be allotted to him; that we were here, moreover, as members not only in our individual capacities, for what we might do with our own hands, but also as the representatives of other active labourers in the several departments of knowledge scattered through the various provinces; that once a year we might one and all come to the common meeting place, not merely to give account of the results reached by our personal

efforts, in the way of trying to push forward the boundaries of the known or to clear the way for discoveries by others, but that we were also expected to bring in our hands the offerings of co-workers with whom we were more or less closely associated in our respective districts. For these reasons I was led to regard your choice of a president from the extreme eastern part of our long and wide country as a choice deliberately made in pursuance of a wise and safe policy, often referred to in our deliberations, that aims not only at recognizing every department of literature and science, and every form of intellectual activity, but also as offering, to the fullest possible extent, fair representation and encouragement to every province and every part of the Dominion. I trust that this policy, and the principle upon which it is based, will long continue to guide the deliberations of the members and council of this society in the selection of officers, so far as compatible with efficiency, and of its several sections, in the nomination of members.

"These remarks naturally suggest a fact of another kind, viz., that a large amount of the executive business during the year, when the Society is not in session, and when it is inconvenient for distant members of council to attend, has necessarily to be performed by a small number of those who reside within convenient distances of Ottawa or Montreal. Responsibilities and labour thus devolve upon the few that should otherwise be spread over the many. This is especially the case in regard to the publication of transactions, which involves a serious amount of irksome labour. If we, the distant members, cannot lighten it any, it may be permissible to say that while not insensible of the unavoidable disadvantages under which we labour, and which often limit our participation in the Society's operations in many ways, we yet have but one feeling in regard to the laborious and thoroughly efficient manner in which, through many difficulties, the work of publication has been carried on. We are grateful for this to our active members in Montreal and Ottawa, whose labours are apt to be overlooked, and especially to our active secretary, who is styled

honorary, on the sound principle, I presume, that the greater the labour the greater the honour. We have also the comfortable assurance, expressed in many tangible ways and not as a mere sentiment, that by seeking to maintain the activity of the distant provinces, the Society will have the surest guarantee against the tendency to centralization, which seemed to some of us from the first to menace it, and the best prospect of success in carrying out its aim of permanent usefulness to the whole Dominion.

"We first assembled as a society in the railway committee room in the parliament buildings on the 25th of May, 1882, and have come together annually since then, so that we are now engaged in our seventh year's work. The record of the preceding six years is contained in our five volumes of proceedings and transactions, a perusal of which enables us to ascertain to what extent the objects set before us are being accomplished.

"But from the very nature of our organization, being divided off into sections for facilitating work, and meeting in separate rooms, we are apt, as working members ourselves, to be but imperfectly cognizant of the full extent of what is actually being accomplished by the Society as a whole. If it be so among ourselves, how much more is a paucity or total absence of knowledge of what we are doing likely to prevail among those who are merely onlookers. When we are here assembled together, the members of all sections, and favoured by the presence of friends who manifest an interest in our proceedings, I do not know that the hour can be spent more profitably than by adverting to some of the work of the past year, completed by the publication of the fifth volume of transactions, now ready for distribution."

Dr. Lawson then adverted in detail to the several subjects upon which the members had contributed papers during the year, and, first, to the great importance of a system of observations of tides and currents in the waters of the Dominion, in regard to which the Society had been co-operating with the British Association for the Advancement of Science, with

the view of pressing the matter upon the attention of the Home and Dominion Governments. The report on a scientific federation of the Empire had been discussed in correspondence between Sir William Dawson and Prof. Stokes, President of the Royal Society of London, and the matter of the International Geological Congress had been referred to Section IV. During the past year, forty-five memoirs had been published by the Society, out of about seventy read. In his address last year he had called attention to the preponderance—not unlooked for—of papers in the fourth section over those especially in the sections of French and of English literature. In the new volume, this discrepancy well nigh disappears, and in the programme for the present year there is a further increase in the literary sections, so that, apparently, the contributions of English literature have doubled, and of French trebled, in the course of two years. On the other hand, the difficulty of reaching perfection in literary production, where we are dealing with progressive science, was illustrated by the fact that of forty papers submitted and read last year in the section for geology and biology only twenty-one reached the printer's hands. The first section, French literature and history, was referred to as the special repository for choice literature and for researches in the very earliest Canadian history, the beginnings of European life in Canada. The Abbé Casgrain's elaborate memoir on the Acadians was specially dwelt upon as a valuable contribution to a striking episode that had been so invested with poetic imagery that the scalpel of science was needed to lay the truth bare. No more fitting company than the members of this Society could undertake the work, formed as they are of compatriots representing the two races, using the two languages, and bound together by a singleness of purpose to seek the truth. In the second section, English literature and history, the several contributions of Mr. Lesperance, Mr. Ganong, Sir Adams Archibald, Mr. Reade, Dr. Boas, Mr. Lucien Turner and Dr. George Dawson were spoken of in turn, and their special bearings indicated, either as regards results obtained or as aids in the

promotion of research. In the third section, mathematical, physical and chemical sciences, Mr. Macfarlane's address was specially spoken of as indicating the industrial results of chemistry; Mr. Hoffman's analyses of native Canadian platinum; the contributions of Mr. McGill and Dr. Ellis to analytical processes; Dr. Ruttan's paper on digestibility of bread as affected by baking powders and alum; Dr. Harrington's observations on the flow of sap in the western maple; Mr. Coleman on microscopic petrography, and Mr. Bovey's investigation in regard to girders. In the fourth section, geology and biology, the Abbé Laflamme gives a valuable contribution to the history of science and medicine in Canada, in a biographical study of Dr. Michael Sarrazin, whose name was linked by the renowned early French botanist, Tournefort, to our pitcher plant, Sarracenia. Prof. Penhallow's review of Canadian botany from the first settlement of New France to the eighteenth century was fully referred to in special relation to the early connection of the history of botany in Canada and in Europe; Dierville having carried Acadian plants to Tournefort, and Peter Kalm, of Abo, in Sweden, having, through encouragement of Linné, spent four years in Lower Canada collecting plants, which he cultivated afterwards in his garden, whilst Menzies, the Scotch botanist who accompanied Vancouver, collected on our Northwest coasts and around the Halifax harbour before the close of the last century. Dr. C. Hart Merriam answers in the affirmative, for the hoary bat, the question, Do any Canadian bats migrate? Messrs. Hay, of St. John, and A. H. Mackay, of Pictou, give a list of the marine algæ of the Maritime Provinces, which will necessarily be useful to students, to whom these plants present an inviting aspect as an illimitable field for study of life histories.

Dr. T. Wesley Mills, in his able paper on the mental endowments of squirrels, brings these creatures forward in a new light. Prof. Fowler tabulates the Arctic plants of New Brunswick, and Mr. Payne gives his observations made on the periodical phenomena of vegetation throughout the season at Cape Prince of Wales, Hudson Strait. In

geology we have Mr. Gilpin's accounts of the faults and foldings of the coal-field of Pictou, Nova Scotia; Sir Wm. Dawson's valuable addition to what he has already done in regard to our fossil flora; Prof. Bailey's notes on the physiography and geology of Aroostook, Me., in connection with regions of New Brunswick and Quebec, etc. Mr. McKellar communicates a paper on the corelation of the Animikie and Huronian rocks of Lake Superior; Dr. Franz Boas, on the geography and geology of Baffin Land, with interesting observations on ice action. Mr. Lucien Turner describes the physical and geological character of the Ungava district of Labrador, fully three-fourths of which is bare rock, mainly Laurentian, showing disintegration of the higher altitudes, while the lower and older rocks are smoothly polished by glacial action; the climate is severe, the vegetation dwarfed. Prof. Spencer, formerly of King's College, Windsor, communicates two papers on Glacial Erosion in Norway, and the theory of Glacial Motion. In the first he describes from personal observation the three largest snowfields in Norway (one of which has an area of 580 square miles), all of which send down glaciers to within 50 to 1200 feet of the sea; in the second, he adopts the old (J. D. Forbes) theory of fluidity as the most acceptable explanation of the motion of glaciers. The petroleum field of Ontario, its history, theory of origin, and the operations carried on, are all described by Dr. Bell, the president of the section. Mr. Matthew, of St. John, continues his illustrations of the fauna of the St. John group, and describes the remarkable trilobite, found by himself, apparently the largest hitherto discovered, which he appropriately honours with the title—*Paradoxides Regina.*

The President then remarked: "At the double risk of proving tedious to hearers and unsatisfactory to authors, I have given this sample of a year's work to indicate the nature and extent of the researches in which our members are engaged. Referring to the uses of scientific periodicals and societies devoted to special branches, or with local objects, it was a main object of the Royal Society to foster

these, and encourage the publication by them of matter of immediate and local interest, whilst its own transactions would form a repository for finished memoirs of as complete a character as the state of knowledge will permit, and adequately illustrated, for permanent use, and not merely designed to furnish information on their special subjects, but also to form foundations and guides for further research. Hitherto, information in regard to any question in Canadian history, literature or science, had to be looked for through the scattered papers in periodicals, and proceedings of societies published in many countries and in different languages. Our transactions are now a storehouse for everything that may be judged of permanent value in relation to science and literature in Canada. We may hope that year by year the publication will increase in volume and in cumulative value, and that the student seeking for the latest information on any subject may be able to turn to it with some confidence that his needs will be supplied."

The contributions to literature and science presented to the Society during the present meeting were numerous, and not inferior in character to those of other meetings.

Among the interesting papers in the literary sections were those on the Indian tribes of British Columbia and their languages. The Rev. A. J. Hall submitted a grammar of the Kwakiool people of Vancouver Island, whilst Dr. Franz Boas presented two papers—one on the Indian tribes of British Columbia and the other on the Nanaimo Indians. The higher civilization of many of these west coast Indians, and the very mountainous character of much of British Columbia, preventing the rapid inroads of the white man, may possibly even lead to an increase in the numbers of the tribes there. Thus these investigations may have more than an ethnological value. The whole subject of the North-Western tribes has engaged the attention of a committee of the British Association for the Advancement of Science, and recently a circular of inquiry has been issued

with a view of eliciting information from those who have in past years had, or now have upon the spot, the opportunity of observing the differences in language, the social customs, and the mental and physical characteristics of the different tribes of Indians. Education has now been tried for some years in a few localities. What success has attended the effort? Has there been any proof or disproof of the received impression that the children of the Indians show, up to a certain point, a fair capacity for mental work, but that at this point the intellectual development appears to cease? If this impression is correct, has the cause been studied? Many such interesting fields of inquiry are suggested by the circular.

Among the papers in geology and biology were the following:—

*On the Nymphæaceæ.**

By George Lawson, Ph.D., LL.D.

"An account was given of the general conformation and of the arrangement of tissue systems in the organs of these plants, and of special features in their organization and minute anatomy. The South American Water Lily, *Victoria Regia*, had been, years ago, carefully studied by Planchon, whose researches were published in Flores des Serres, Vol. VI., p. 249, &c., and by Trecul, who illustrated the more important facts of its structure, and the development of organs, in the Annals des Sciences Naturelles, Botanique, 4 ser., I., pp. 145-172. Some facts well known a quarter of a century ago seem to be forgotten now. Lately, De Bary, in the Comparative Anatomy of Phanerogams and Ferns, and J. H. Blake, of Cambridge, in the new Annals of Botany (August, 1887), question the explanations given of the structure of the prickles of the *Victoria*, and especially the character of the ostiole or depression at its apex. The author of the present paper had shown, as long ago as 1855, the true character of these prickles, and that the ostiole had no special function, as had been argued (and in-

ferentially was not pathological as now suggested by Blake), but 'a simple depression in the apex of the prickle of no physiological importance.' (Proceedings Bot. Soc. Edin., November, 1855, on the structure of *Victoria Regia*, Lindl. By George Lawson.) In the same paper it was shown that the stomatodes or perforations of the leaf were not mere holes, caused by insects, as argued by Trecul, and accepted on his statement by Blake, but special structures of uniform size, formed by surrounding modified cells, and comparable with the more complete reductions of parenchymatous tissue seen in submerged plants and in *Ouvirandra fenestralis;* moreover their special function in *Victoria* was indicated.

"A statement is given of the historical facts connected with the nomenclature of the Nymphæaceæ, with regard to the proposal recently made by some American and English botanists to give up the generic name *Nymphæa* to the group now well known as *Nuphar*, and to re-instate Salisbury's name *Castalia* for the true Water Lilies. The paper also contains a synopsis of species.

"A series of coloured drawings illustrated the minute structure of the *Victoria*. These were made from a plant that flowered in the autumn of 1851, in the nursery of Knight & Perry, King's Road, London, and another grown in the Botanic Garden, Glasgow, in 1855. They show the epidermis and stomata—the latter with chlorophyll granules —of the upper surface of the leaf; the surface cells, hairs, and base hairs, of the lower surface; the prickles, in several aspects and sections, showing internal tissue, ostiole, &c.; the air spaces of the leaves, with the large stellate processes projecting into them sculptured with bead-like markings as in diatoms; colour-cells of the lower surface; stomatodes, or perforations, surrounded by oblong cells filled with deep rose-coloured contents; surface petal-cells, with crimped cell-walls and filled with rosy colouring matter, of varying depth of shade."

*Revision of the Canadian Equiseta.**

By GEORGE LAWSON, Ph.D., LL.D.

"The genus *Equisetum*, Tournefort, is composed of a comparatively small number of existing species. They are plants with subterranean or submerged rhizomes, sending up hollow, jointed stems, which are either simple (unbranched) or bear verticils of branches at the joints, similar to the stems, but smaller in size. Both stem and branches are longitudinally grooved, and punctated with lines of stomata along the grooves. These plants are leafless, the foliar organs being reduced and cohering into tubular sheaths at the joints, with the leaf-points only free as teeth. The cuticle is more or less highly silicified, so that in some species the plant retains its form after its vegetable matter has been removed. The genus constitutes a natural order by itself, well defined both by structural characters of the vegetable organization and peculiarities in the reproductive organs. Even regarded as an order, these plants are isolated, cut off from near relationship with other groups. This fact, taken in connection with the differences of minute structure and modes of growth observable among the existing forms, and their wide geographical distribution, indicates that they may be a remnant of what was formerly a more multitudinous group of species and varieties. Linnæus (who is not the author of the genus, although always so credited) gave, in the Species Plantarum, seven species, of which only one (*E. giganteum*) was then (1764) known to exist in America. Alex. Braun, of Carlsruhe, prepared a Monograph of the North American species, which was translated from the author's MS by the late Dr. George Engelmann, of St. Louis, and, with some additions, published in the American Journal of Science for October-December, 1843 (vol XLVI., No. 1, pp. 81–91). A synopsis of the Canadian species was published by the writer in the Edinburgh Botanical Society's Transactions, in 1863 (vol. VII., pp. 558–564), and subsequent additions were made, in the Synopsis of Canadian Ferns and Filicoid Plants, in 1864 (Trans. Bot. Soc., Ed., VIII., pp. 20–50,

and Canadian Naturalist, 1864). In 1866, Dr. J. Milde, a most painstaking Silesian botanist, published his magnificent 'Monographia Equisetorum' (pp. 600), and subsequently (1867) the 'Filices Europæ et Atlantidis,' including the Equiseta. Mr. J. G. Parker, F.R.S., has more recently (1887) issued from Kew a 'Handbook of the Fern Allies,' in which several of Milde's species are reduced. The object of the present paper is to place before Canadian botanists a concise statement of what is known respecting our species,—which may be enumerated as follows:—*Eq. arvense*, Linn.; *maximum*, Lam.; *pratense*, Ehrh.; *silvaticum*, Linn.; *palustre*, Linn.; *limosum*, Linn.; *ramosissimum*, Desf.; *hiemale*, Linn.; *robustum*, A. Braun; *lœvigatum*, A. Braun; *variegatum*, Schleich; *scirpoides*, Michaux; —twelve in number, with several varieties and abnormal forms, and one species (*litorale* Kuhlw.) apparently attributed to Canada in error. Some of the species are widely spread over the globe, others are of more limited range. Of extra-Canadian species, three are South American, one is Japanese, one East Indian, one doubtfully distinct belongs to tropical Asia, and one is European. Of the total number of good species—twenty—we have twelve in Canada, and a reputed thirteenth.

"A map of the hemisphere of greatest extent of land was shown, with the distribution of the principal species of Eqiusetum laid down in different shades of Indian ink, the species of greatest range being shown by light shading, the others deeper according to their restriction. The Equiseta form a definite belt around the northern hemisphere, stragglers passing into South America and other parts of the southern hemisphere."

Contributions to the Bryology of the Dominion of Canada.

By Profs. Kindberg and Macoun.

The first systematic attempt to catalogue our Canadian Cryptogams was made in 1865 by Mr. D. A. P. Watt, with the aid of Mr. Geo. Barnston, Mr. B. Billings, Prof. Macoun and myself, and the results were published at the time in

the *Canadian Naturalist.* Canada then comprised simply the two provinces of Ontario and Quebec. The lists were necessarily very incomplete, as but little attention had been paid to the Cryptogams. Nevertheless, my collection of lichens then comprised 156 species, increased shortly afterwards to 187 species; whilst Mr. Watt's list of mosses, to which Prof. Macoun was a large contributor, numbered 211 species. Since this time, Prof. Macoun has gradually increased his collection, and now, with the area of the Dominion extending from the Atlantic to the Pacific, and with the Province of British Columbia—so distinct, botanically, from the other provinces—now fairly well explored along the line of railway by him and others, he has been able to present a catalogue of 467 species of mosses, all indigenous to the Dominion, and many, as among the higher forms of plant life, peculiar to the Rocky Mountains and the Pacific coast. Of these, 41 are new to science and are fully described in the paper by Prof. Kindberg, whilst 27 others are new to America, and, with the localities of occurrence, are given below, as interesting from a geographical point of view:—

In Nova Scotia.
Andræa alpestris, Schm.
Sphagnum medium, Limp.
At Gaspe or Anticosti.
Pottia intermedia, Turn.
Webera gracilis, Schl.
Bryum Archangelicum, Schm.
B. elegans, Nees.
Hypnum Vaucheri, Lesq.
Bryum contextum, Hornsch.
In Ontario.
Hypnum Juratyka, Schm.
H. Sommerfeltii, Myr.
Fissidens pusellus, Wills.
On Rocky Mountains.
Dicranum congestum, Lindl.
On Rocky Mountains.
Barbula angustata, Wils.
Bryum Blindii, B.
Mnium inclinatum, Lindl,
Polytrichum sexangulare, Fl.
Orothecium intricatum, Hart.
Thudium decipiens, De N.
Hypnum fastigiatum, Brid.
H. Gouldæ, Schm.
In British Columbia.
Andræa Huntii, Limp.
Barbula ruraliformis, Besch.
Bryum Doni, Grer.
B. murale, Wils.
Heterocladium heteropterum, Bush.
Pottia litoralis, Mut.

Prof. Macoun is understood to be also engaged in investigating the lichens of Canada.

*Observations on Early Ripening Cereals.**

By Wm. Saunders, Director of Experimental Farms, Ottawa.

"In this paper the author gave some interesting and practical results which have been obtained from the distribution, for test, of a variety of spring wheat, known as 'Ladoga' which was imported from Northern Russia in the spring of 1887. From careful observations extending over a series of years in Russia, it has been shown that wheat and other cereals ripen in less time in the northern provinces than they do in the more southern parts of that Empire, the difference in favour of the north varying from 12 to 35 days. While this may be partly attributable to the influence of light during the long summer days, there is no doubt that the cereals in the north have undergone gradual changes by which they have accommodated themselves to a shorter period of growth, and thus acquired an early ripening habit.

"Shortly after the author was appointed Director of the Experimental Farms of Canada, he opened correspondence with seed dealers in Russia with the objece of securing the earliest ripening wheats grown in that country. This correspondence resulted in the purchase of a quantity of Ladoga wheat, a variety much esteemed in Russia, but new to Canada. This wheat was grown near Lake Ladoga, north of St. Petersburgh, in lat. 69—840 miles further north than Ottawa—where the summer season is shorter than in any of the settled portions of the Northwest of Canada. A large proportion of this grain was distributed by mail in 3lb sample bags to such farmers as were found willing to test it and report upon it, the greater part being sent to Manitoba and the Northwest. The reports which have been received place the period of ripening of the Ladoga wheat on an average at from ten to fifteen days earlier than other varieties in cultivation, a difference which, if maintained, will suffice to ensure the ripening of this wheat soon enough to escape the early autumn frosts which in the past have always caused more or less injury to the crop in the Cana-

dian Northwest, and in some years caused heavy losses in many parts of that great wheat growing territory.

"The fertility of the Ladoga wheat is said to be very satisfactory, the average yield from all the returns received being 571bs from the 3lbs of seed, or nineteen fold.

"The quality of the wheat, which is a point of the utmost importance, is being carefully investigated and the evidence thus far obtained on this point is on the whole very satisfactory. Fuller information will be given in the next bulletin to be issued from the central experimental farm. Besides a second supply of Ladoga wheat there has been imported this year a variety of wheat known as Onega, from lat. 62°; barley from lat. 66°, and both barley and rye from lat. 67°. These latter are believed to be from the extreme northern limits at which cereals are grown in Europe in a continental climate. Early ripening cereals are also being songht from other countries, and it is hoped that by persevering effort in this direction, varieties will eventually be obtained which will ripen sufficiently early to relieve the settler in the more frosty districts from the discouragements experienced in the past, and result in extending the limits of the successful cultivation of cereals in Canada, and that thus the experimental farms may become an important aid in the settlement of these distant parts of the Dominion."

*On some remarkable Organisms of the Silurian and Lower Devonian Rocks of Acadia.**

By G. F. Matthew, F.G.S.

"In this paper are described three crustaceans and the Pteraspidian fish (*Diplaspis Acadica*), of which latter preliminary descriptions have been given in the Canadian Record of Science and in the Bulletin of the Natural History Society of New Brunswick. Further particulars are given, and figures showing the form, ornamentation and arrangement of the plates forming the dorsal and ventral armour of the fish. The species is compared with other

genera and species of Pteraspidian fishes, and a near relation to Cyathaspis shown. Remarks on the geological horizon of the species, based on the studies of Billings, Honeyman and others, are added. This species, and the Palæaspis of Claypole, found in Pennsylvania, are thought to be the oldest known forms of the family.

"Besides the description of this fish, the paper contains that of three crustaceans. One of these is a small Ceratiocaris (*C. pusillus*) from the same beds as the fish, viz., Division 2 of the Silurian series of New Brunswick. It is therefore one of the oldest species of this genus, and is remarkable for its narrow carapace and long rostrum.

"Another form described is a crustacean (*Bunodella horrida*) of the sub-class Synziphosura, allied to Bunodes, but with a small carapace and longer body. This also was found in the same beds as the fish plates.

"The third crustacean is a small species (*Erypterella ornata*) possessing features which make it difficult to say whether it should be referred to the Euripterida or Synziphosura. This species is from the plant beds of the Lower Devonian series at St. John, N.B."

*Notes on the Gold-bearing Veins of Nova Scotia.**

By E. Gilpin, Jr., F.G.S.

"In this paper, the writer, after referring to the general geological and mining accounts of the Nova Scotia gold fields, given by him in papers read before the American Institute of Mining Engineers, etc., drew attention to the conditions of folding in the district under consideration The veins occur in the anticlinal folds, and correspond in size, extent, and depth to the facilities afforded by the varying conditions of folding and pressure. Thus, veins are met thinning out in depth, and disappearing laterally, to be succeeded by other veins not necessarily in the same plane, etc.

"The relation of the veins to the strata are those of con-

formability, with the variations and exceptions caused by fracture, and subsequent movements. The district is much interrupted by masses of granite, which apparently do not affect the strata, except locally by metamorphism; and the auriferous veins, so far as the writer's experience goes, are not modified in value by their proximity. The 'pay streaks' or zones of rich ore are described at some length, and compared with those found in fissure or cross-country veins. In referring to the source of the gold in the veins, and especially in their richer portions, the facts are dwelt upon, that the proximity of the granitic masses was not the source of enrichment, nor did the veins, owing to their conformability to the strata and their limitation to the sides of the anticlinal folds, find access to underlying and possibly auriferous strata. The fact of the almost invariable presence of gold in the slate bands would lead to the belief that the gold has been concentrated locally from them, and that the pay streaks merely represent the proximity of the veins to a spot in the original strata, in which the gold had been deposited to an unusual extent. This view would necessitate the careful study and comparison of the pay streaks of the various localities before the question of deeper or 'second' pay streaks could be practically tested."

The Origin of some Geographical Features in Canada.

By Dr. Robert Bell.

The author first referred to the causes which had produced the basins of the great lakes of the Dominion. That of Lake Superior was said to be partly volcanic in its origin; and the immense basin of Hudson Bay had some points in common with it. These basins had been greatly enlarged by the subsequent decay and glacial erosion of the rocks on all sides.

Lake Ontario, Georgian Bay, Lakes Winnipeg, Athabasca, Great Slave and other large lakes of Baffin Land, occupied geographical positions resembling one another.

They all lie between the Archæan rocks and the newer strata dipping away from them. The glaciers of former times descending from the higher grounds of the former against the upturned edges of the softer rocks, tore them up rapidly and carried away the debris, thus leaving the lake basins. But when the glaciers moved from the strata lying upon the Archæan nucleus so as not to tear their edges, then no channels or basins were excavated.

Lakes Erie, Huron, Michigan, Manitoba and Winnipegosis lie in basins worn out of soft strata, dipping at low angles, with harder beds above and below them, which form their margins.

The lake region of North America was almost a continental plain but little elevated above the sea, and hence some of our great lakes lie on or near the water-sheds. Lake Superior is near the highest part of this plain, and the water flows from near its margins to the west, north and south, and its outlet is to the east. By a small artificial cut at Chicago, Lake Michigan discharges into the Mississippi as well as the St. Lawrence, and Lake Huron is on the same level.

Dr. Bell next pointed out the important part played by dykes of greenstone, etc., in producing the original cuts which, by the decay and erosion of the rocks, form the channels of rivers, arms of lakes and fiords on the sea coasts. Parallel faults or dislocations have the same effect. Other river channels, such as those of the northern branches of the Ottawa between Mattawa and Montreal, are excavated along the softer bands in the crystalline rocks.

The thousands of lakes, many of them of considerable size, scattered over the vast Laurentian regions of Northern Canada, were regarded as due to the deep decay of these rocks by long continued atmospheric causes and the subsequent sweeping away of the softened rock by glacial and other denuding agencies. These lakes all lie in rock basins, and, owing to the generally level nature of the country, many of them have two outlets. They are often shallow and full of islands, running in chains, their arrange-

ment and the directions of the bays and points depending on the combined effect of cleavage, stratification and the course of the drift.

The formation of the deep valleys in which the rivers flow in the prairie country was explained, and also the cause of the formation of the ridges and valleys in the continuation of the Appalachian structure in the Eastern Townships and in Gaspé.

*On Some Relations Between the Geology of Maine and New Brunswick.**

By Professor L. W. Bailey.

"This paper contains a review of the geology of the border region of Maine and New Brunswick, as based upon the investigations of the Geological Survey of the latter province during the last twenty years, its purpose being to show more particularly what conclusions of general importance as to this region may be regarded as fairly established, what points are still doubtful, and in what ways the ascertained geology of New Brunswick may be thought to throw light, not only upon that of Maine, but also of the whole of New England.

"After pointing out the importance which the position of the province gives it as a geological indicator, and the fact that this is greatly enhanced by the comparatively large number of fossiliferous horizons recognizable within its limits, a review of the successive formations as passed over in a section from south to north along the boundary line is given, the main points discussed being (1) the Silurian rocks of Passamaquoddy Bay and their relations to the associated formations, with comments upon observations recently made in that vicinity by Prof. N. S. Shaler (*Am. Jour. of Sc.*, July, 1886); (2) the age of the slates and granites which traverse central New Brunswick and pass into Maine along the course of the St. Croix River, the slates being regarded as consisting partly of Cambro-Silurian and partly

of Silurian strata; and (3) the Silurian system of Northern New Brunswick, Maine and Southern Quebec. Comparisons are instituted between the rocks of Lake Temiscouata, in the last named province, and those of Aroostook County, Maine, and large areas of the latter, regarded in the Maine reports as Devonian, are shown to be Silurian. Attempts are, at the same time, made to establish more clearly the equivalency of different portions of the Silurian system, and lists of fossils are given, indicating horizons ranging from the Medina and Clinton to the Lower Helderberg formations."

*On Nematophyton and Allied Forms from the Devonian (Erian) of Gaspé and Baie des Chaleurs.**

By D. P. Penhallow, B.Sc., with Introductory Geological Note by Sir William Dawson, F.R.S., etc.

"The paper stated the facts relating to the original discovery of these plants by Sir William Logan, their geological relations, and the original description of the specimens, with notices of recent exhaustive microscopic examinations of the original specimens and slides recently prepared, and comparisons of these curious plants with allied forms and associated remains of plants. It would appear that these remarkable trees, while evidently plants of the land, though growing in swamps or on the borders of the sea, have structures not now found in arboreal plants, but rather resembling those of algæ and lichens. It was pointed out that this is parallel to the fact seen in the giant Lycopods and Equisetums of the Carboniferous, that ancient forms of vegetation, with few kinds of tissue, emulated the size and complexity of modern Exogens. Nematophyton seemed to be a survival to the time of the Lower Devonian, of a type of tree peculiar, with others akin to it, to the oldest ages of the earth's history. The paper discussed the question as to the probable connection of this plant with the strange seeds or spore-cases named *Pachytheca*, by

Hooker, and *Aetheotesta*, by Brongniart. These were probably its fruits. The long, narrow leaves named *Cordaites angustifolia* may have belonged to the plant, though there is yet no certain proof of this. There is also a probable connection between Nematophyton and the resinous matter found in flakes and patches on the beds in which these singular plants occur. For the curious and complex structures of the stems, reference must be made to the paper itself, and to the figures which illustrate it. These plants are not found higher than the Lower Devonian, on the one hand, and the base of the Silurian, on the other; but they will probably be traced farther back. The associates of Nematophyton in the beds in which it occurs are *Psilophyton, Arthrostegma, Leptophleum*, and a few other forms, all characteristic of the lowest Devonian beds."

*Note on the Preliminary Examination of a Collection of Cretaceous Plants from Port McNeill, Vancouver Island.**

By Sir William Dawson, F.R.S., Etc.

"The plants in question were collected by Dr. G. M. Dawson, F.G.S., of the Geological Survey of Canada, from beds believed to be on the horizon of those of Nanaimo and Comox, or perhaps a little newer. They include a number of apparently new and interesting forms besides others similar to those in the last mentioned localities. The notice is intended to indicate the general features of the collection in advance of more detailed descriptions, which will probably be ready in time for the next meeting of the Society, but not for insertion in the Transactions of the present year. At present it may be stated that the collection has many species in common with the Cretaceous of Nanaimo, and nearly resembles the Upper Cretaceous plants of Atané and Patoot, in Greenland."

Proceedings of the Natural History Society.

The third monthly meeting was held on Monday, January 30th, the President, Sir William Dawson, in the Chair.

The minutes of the last monthly meeting were read and confirmed.

The Hon. Curator reported the following donations:—"Flying fish and West Indian Bat," from Mr. Chas. T. Hart.

Mr. A. H. Mackay, of Pictou, N.S., was elected a corresponding member.

Mr. J. H. R. Molson took the chair at the request of Sir William Dawson, who now exhibited a cast of the new trilobite (*Paradoxides regina*) recently discovered by Mr. Matthews in the Cambrian of New Brunswick, remarking on its great size and the importance of its discovery. He also read a paper on "Fossil Sponges in the Peter Redpath Museum," referring to certain sponges discovered at Little Metis, describing one of them as a species of Protaspingia, and explaining its form and structure in comparison with other sponges, recent and fossil.

Sir William was, on motion of Dr. Mills, seconded by Mr. Beaudry, accorded a hearty vote of thanks for his interesting paper.

The fourth monthly meeting was held on Monday, February 27th, Sir William Dawson in the chair.

The minutes of the last meeting were read and adopted.

The following donations were reported by the Hon. Librarian:—Chemical Reports & Memoirs, 1848, by Thos. Graham, from Mr. E. T. Chambers; Report of the Geological Society, 2 Vols., from Rev. Dr. Smyth; The Scientific American & Supplement for 1887, from Mr. J. A. N. Beaudry. The Hon. Curator reported a donation of 40 Photographs taken in Cuba, from Dr. Wolfred Nelson.

Sir William Dawson read a letter from Dr. Molson, thanking the Society for his election as a corresponding member.

A letter of resignation was read from Dr. T. Sterry Hunt.

It was moved by Prof. T. Wesley Mills, and seconded by Dr. J. Baker Edwards, and

Resolved,—That Dr. T. Sterry Hunt be elected an Hon. member, and be requested to allow his name to be continued on the list of Vice-Presidents, and that this resolution be accompanied with the best wishes of the Society and the hope that he may soon be able to resume his active connection with its work. Carried.

The following members were balloted for and elected:—Dr. Wm. A. Conklin, corresponding member; Dr. W. Johnston, Rev. Jno. Williamson, Chas. T. Hart, F. W. Evans, ordinary members.

Mr. A. McGill's paper on "Water Analysis" was now read by Mr. Joseph Bemrose. A vote of thanks was tendered.

In the absence of Mr. G. M. Matthew's paper on "Cambrian Rocks," it was moved by Dr. Edwards that it be taken as read, as it was being printed in the Record.

The sixth monthly meeting was held on Monday, March 26th, the President, Sir William Dawson, in the chair.

The minutes of the last monthly meeting were read and confirmed.

The following donation was received from Mr. Ernest Ingersoll:—Eggs of Swamson's Buzzard, the Tropic Bird, and Bells Virio; also Unio Shells from East Tennessee, etc (several species).

Mr. H. M. Ami, of the Geological Survey of Canada, now read his paper on "Fossils of the age of the Utica Shale, from Murray Bay."

Sir William Dawson made interesting remarks on the above paper, and tendered the thanks of the Society for same.

The seventh monthly meeting was held on Monday, April 23rd, the President, Sir William Dawson, in the chair.

R. W. McLachlan acted as Secretary in the absence of Mr. Holden.

The minutes of last meeting were read and approved.

The Hon. Treasurer reported progress with the special collection for liquidation of the debt.

Donations of an embroidered buffalo skin and a number of books from Mr. Ingersoll were announced.

Dr. John Rae's paper on "Some of the Birds and Mammals of the Hudson Bay Territories and the Arctic Coast," and a paper by Dr. Anderson on "Chicago Boulder Clay," were read by the President.

The thanks of the Society were tendered for these.

Annual Meeting.

The annual meeting of the Natural History Society was held on the 28th of May, Sir William Dawson, President of the Society, occupied the chair, and delivered the following address:—On the present occasion I think it may be well, by way of variety, to deviate somewhat from our usual custom, and to make some general remarks on the use and function of a society of this nature in the midst of a busy mercantile and manufacturing community, and in a province in which an interest in science is, to say the least, very scantily diffused. When in 1855 I began the educational work, which I have ever since been carrying on here, I regarded the existence of this society at that time with a small membership, but with some able men in its ranks, and with a very valuable museum, as a great encouragement and aid in the introduction of the study of natural science. In some respects I have not been disappointed. The collections of this society were of essential use to me in all the early days of my teaching here. The lectures and meetings and field-days have formed rallying points for our young devotees of natural science. The Society was the means of sustaining the Geological Survey in its earlier struggles, and it was the agency by which the American Association for the Advancement of Science was invited to this city in 1857—a movement which not only brought together a larger number of British and American and Canadian men of science than any previous assemblage,

but which paved the way for the later and more remarkable gathering of the British Association in Montreal in 1884. That these enterprises of our society have had a marked effect in the development of science, not only in Montreal, but throughout Canada, no one can doubt. When I look at the long series of our proceedings, extending from 1856, in the *Canadian Naturalist and Geologist*, and subsequently the CANADIAN RECORD OF SCIENCE, I have another measure of our power for good. The *Canadian Naturalist* was originally planned and issued by a man of rare power and gifts, the late Mr. Billings. When Sir William Logan wisely invited him to Montreal to take the position of palæontologist to the Geological Survey, he became associated with this society, and transferred the infant publication to its fostering care. Through many vicissitudes and difficulties it has continued to be published; and we may point to its volumes as a repertory of the natural history and geology of this country, which stands unrivalled as a collection of information on these subjects, since it includes not merely the original papers submitted to this society, but abstracts and notices of most of the papers and publications on Canada issued elsewhere. No scientific library, in which it is proposed to represent the natural history of that great section of North America which belongs to this Dominion, can afford to be without these volumes. By means of them also, and the separate copies of papers everywhere distributed, Canada is very widely known to scientific men abroad, and though we cannot, in detail and magnitude, rival the publications of the Geological Survey, I believe we have, with our comparatively slender means, done nearly as much to make the natural resources and productions of our country known abroad. We have, besides, furnished an early and convenient means of publication to many of the more important discoveries of the officers of the Survey themselves, as well as to amateur and private workers in natural history fields. The RECORD OF SCIENCE appeals to only a small circle of readers in this province, but it is widely known and read abroad. Our regular

monthly meetings are, as is usual with societies of this kind, slenderly attended. I feel, however, that if the real interest of the papers and of the discussions upon them was better understood by the public, we should have large houses to listen to them. Scarcely any meeting of this society fails to produce some paper or discussion or specimen of great interest to all intelligent persons, and often of vast practical importance. Very many valuable suggestions, bearing on the advancement of material interests and on subjects important to the health and welfare of the community, have originated in this room. A very different statement in regard to attendance may be made respecting our annual Sommerville lectures. These have always been popular, and have attracted large and interested audiences. More especially in recent years, since the lecture committee, under the presidency of Dr. Harrington, has adopted the excellent practice of providing a connected course bearing on some one subject of general interest, they have assumed a higher educational and practical function. The course of last year on physiological subjects was of intense interest and of great public value. That of the present session on "Climate," and this more especially in connection with the climate of Canada and of the vast districts in the North-West, now being opened up for settlement, was in another way equally important. The wise benefaction of Mr. Sommerville, as administered by this Society, has proved a centre and source of mental illumination, and has been conspicuous among us as the only endowment of a course of popular scientific lectures always able and interesting, and entirely free to all. In a country like Canada, changes are constantly taking place in the indigenous and introduced fauna and flora as culture extends—changes which are soon forgotten and of which often no record remains, while rare visitors or occasional natural phenomena or accidentally discovered specimens are being continually lost to science in the hurry of active life. From such losses and untoward accidents, our museum is a means of refuge. It has treasured thousands of specimens which would other-

wise have disappeared, has been a place of refuge and safe-keeping to evidences of rare natural phenomena, and has furnished, in a form accessible to all, classified collections of natural objects of immense value to the scientific student. It would be easy to find in our collections specimens of animals and plants once common on this island or even within the limits of this city, and now locally extinct. It is interesting to see in the old botanical collections of Dr. Holmes, one of the founders of this society, plants credited to swamps on Craig street, and to examine skins of wild animals captured in places where no hunter will again find them till Canadian civilization has passed away and the sites of our towns and farms shall have reverted to the original wilderness. So the traveller may see in our cases the rude implements and manufactures of that aboriginal city of Hochelaga, which preceded Montreal, and was visited 300 years ago by the intrepid yet courteous Cartier, but which has been finally swept away by the encroachments of our streets and terraces of houses. Our collections are relatively small, but in some departments, as in Canadian mammals, birds and insects, they are very complete, and not only afford means of study to the naturalist, but tend to inspire the young with an interest in natural objects. Their value in this respect is also enhanced by the foreign specimens which have been presented to us, and which illustrate some of the most strange and beautiful creatures of foreign lands. Such a museum is more than a mere curiosity shop; it is an actual and arranged presentment of Nature, loved and cared for and augmented by zealous and enthusiastic souls, who, actuated only by affection for Nature and by public spirit, have devoted time and labor to its maintenance, preservation and extension. The report of our honorary curator, Mr. Mason, to whom we are very much indebted for the improvements he has introduced, shows many important donations in the past year and a large number of visitors. Our library is, perhaps, the least advanced part of our equipment. Still we have a large number of valuable and rare scientific books, more especi-

ally the publications of societies abroad, and some of which are not accessible elsewhere in this city. Much has been done of late years by our honorary librarian, Mr. Beaudry, and by the library committee in enlarging our library and binding its numerous periodical publications, but the Society has always lacked the means to develop its usefulness in this direction. In the last session the Society has well sustained its work in the reading and in the publication of papers. I may mention among these the interesting *résumé* by Dr. T. Wesley Mills of the work of the American Association in 1887, and papers by him on important physiological subjects; the papers by Mr. A. T. Drummond on the Prairies of Manitoba and on the Geographical and Geological Relations of British North American Plants; those of Prof. Penhallow on Physiological Botany; that on Fossil Sponges by Dr. Hinde and myself; those on Cambrian and Siluro-Cambrian Fossils by Mr. Matthew and Mr. Ami; Dr. Rae's interesting Notes on Mammals and Birds of the Hudson's Bay Territories, and an important contribution on Water Analysis by Mr. McGill, and on the Climate of the Northwest by Mr. Ingersoll; New Species of Fresh-water Sponges from Newfoundland by Mr. McKay, and a paper on a Destructive Visitation of Field-mice in Nova Scotia by Rev. Dr. Patterson. A number of other subjects, however, occupied our attention at the monthly meetings, and will be found in the RECORD OF SCIENCE. By way of practical conclusion, I need not hesitate to affirm that what the Society has done with very slender means might be largely increased if more ample resources were provided, and that both our fellow-citizens and the Provincial Government are called upon to lend us their aid. It has been well remarked that in societies of this kind the actual work is done gratuitously by scientific laborers who ask for no public recompense, and that all that the state and the general public are called on to do is that smaller part which consists in affording means of publication. No work for the public benefit is so cheaply and economically accomplished as that of scientific societies, and it is for this reason that such societies are so

liberally subsidized in all civilized countries. The benefits flowing from the operations of the great scientific societies of the mother country are of incalculable public value and not to be measured at all by the aids which they receive. In this country in our more limited sphere it is the same; and the useful work of a society like this is limited only by the resources placed at its disposal. In the winter of 1856-7 I had the honor to deliver the introductory course of the Sommerville lectures, and as the audience of that evening has mostly passed away, I may be excused for quoting some sentences at the conclusion of this address. The subject was Natural History in its educational aspects, understanding by education that most practical and useful of all arts which develops men and women fitted to occupy useful and honorable places in the world and to minister not only to their own comfort and happiness but to those of others:—

"Natural History, rising from the collection of individual facts to such large views, does not content itself with merely naming the objects of nature. A naturalist is not merely a man who knows hard names for many common or uncommon things, or who collects rare and curious objects, and can tell something of their habits and structures. His studies lead him to grand generalizations, even to the consideration, in part at least, of the plans that from eternity existed in the infinite mind, and guided the evolution of all material things. Natural history thus rises to the highest ground occupied by her sister sciences, and gives mental training which in grandeur can not be surpassed, inasmuch as it leads her pupils as near as man may approach, to those counsels of the Almighty in the material universe, which are connected, at least by broad analogies, with our own moral and religious interests.

"It follows from the preceding views that the study of nature forms a good training for the rational enjoyment of life. How much of positive pleasure does that man lose who passes through life absorbed with its wants and its artificialities, and regarding with a 'brute, unconscious gaze,' the grand revelation of a higher intelligence in the outer world. It is only in an approximation through our Divine Redeemer to the moral likeness of God, that we can be truly happy; but of the subsidiary pleasures which we are here permitted to enjoy, the contemplation of nature is one of the best and purest. It was the pleasure, the show, the spectacle prepared for man in Eden, and how much true philosophy and taste shine in

the simple words, that in that paradise, God planted trees 'pleasant to the sight,' as well as 'good for food.' Other things being equal, the nearer we can return to this primitive taste, the greater will be our sensuous enjoyment, the better the influence of our pleasures on our moral nature, because they will then depend on the cultivation of tastes at once natural and harmless, and will not lead us to communion with, and reverence for merely human genius, but will conduct us into the presence of the infinite perfection of the Creator.

"I have sought to magnify the office of this society, on educational grounds alone; but I cannot conclude without reminding you that natural science has its utilitarian aspects. All our material wealth is founded on the objects of natural history. All our material civilization consists of such knowledge of these things, as may give us mastery over their uses and properties. Such knowledge is every day finding its reward, not merely in the direct promotion of the happiness of the possessor, but in enabling him to add to the comforts of our race, or to diminish the physical evils to which they are exposed. Into this subject, however, I cannot now enter; and this is the less necessary, since the minds of nearly all intelligent men are sufficiently alive, at least, to the utilitarian value of the natural sciences."

Report of Chairman of Council.

Mr. John S. Shearer then submitted the report of the council, as follows:—

The Council of the "Natural History Society," beg to submit the following report:—

The Session just closed, has been one of much interest and valuable research. The routine business has been regularly performed during the year. Seven regular and three special meetings of the Council have been held, and there have been six regular meetings of the Society, at which papers of great interest were read.

The progress of the Society in membership has not been equal to last year, only twelve ordinary and four corresponding having been elected.

The Library has received considerable attention from the Chairman and Committee, and is now in a fairly satisfactory condition.

The building of the Society is in good order, and a new furnace was put in last winter at a cost of $200.

The hall has again been rented to the congregation worshiping there, at the same rental as last year, the agreement being signed by Mr. T. M. Taylor.

The Provincial Government granted the Society last year $400, in place of $800; the amount which was expected. This reduction in the amount promised us, (and upon which we depended) greatly interfered with the efforts of the editing committee, who are, however, deserving of praise, for the manner in which they have issued the RECORD OF SCIENCE.

At the last meeting of Council, a committee was appointed by of the Society, to draw up a petition, and forward the same to the Hon. Honoré Mercier, Premier of the Province of Quebec, asking the Government for the amount of the *original* grant to the Society of $1,000. The petition was duly completed and forwarded on the 18th of this month, An answer has been received by the Recording Secretary, acknowledging its receipt by the Premier, and stating, that it had been handed to the Rev. Curé Labelle, Assistant Minister of Agriculture and Colonization, for his consideration and attention.

The Annual "Field Day" was held on the 4th of June last, the enterprising village of St. Jerôme having been selected for the occasion. About 100 ladies and gentlemen, started by train from Dalhousie Square Station, C. P. R., to enjoy the day's outing. It is not necessary to go into details here, tails, as a very graphic description of the day has alredy appeared in the RECORD OF SCIENCE, On our arrival at the Montreal station a resolution was passed, thanking Mr. Tuttle, and other officers of the C. P. R., for the courtesies and hospitable treatment, receceived at their hands. In connection with the above, at a meeting of Council held on the 9th day of June 1887, a resolution was unanimously adopted, and sent to W. C. Van Horne, Esq., Vice-President of the C.P.R., tendering to him the cordial thanks of the Society, for having contributed in so large a manner to

make our "Field Day" one of the most interesting and enjoyable in the history of the Society.

The usual course of Sommerville Lectures, six in number, was delivered last winter to large and appreciative audiences, affording those present much pleasure and profit. The museum was open to the public in the evening for one hour before the commencement of the lectures. The subjects, with the names of the lecturers, were as follows:—

Thursday, Feb. 16th—"Climate in Geological Time." By Sir J. W. Dawson, F.R.S., C.M.G.

Thursday, Feb. 23rd—"Climate; the present Atmospheric Conditions of the Globe." By Professor C. H. McLeod, M.A.Sc.

Thursday, March 1st—"Climate in relation to Vegetation." By Professor D. P. Penhallow, B.Sc., F.R.S.C.

Thursday, March 8th—"Weather Probabilities." By Charles Carpmael, M.A., F.R.S.C.

Thursday, March 15th—"The Climate of the Canadian West." By Ernest Ingersoll, Esq.

Thursday, March 22nd—"Climate in relation to Health." By Dr. T. G. Roddick.

The thanks of the Society are certainly due to the distinguished gentlemen, who so kindly delivered the lectures last winter, and to those who contributed to the Museum during the year.

On the 29th January, 1883, through the efforts of the Rev. Robert Campbell, the late Mr. Marler was appointed one of a committee of three to collect funds for a monument to the late Rev. James Sommerville (the founder of the Sommerville Lectures), in Mount Royal Cemetery. Nothing was done in the matter until last year, when the Rev. Dr. Campbell, Mr. A. MacNaugton and the Chairman of Council, succeeded in collecting sufficient funds from members of this society, and others, to put up a monument, with an appropriate inscription, to mark the resting place of one of Montreal's early benefactors. It will not be out of place for me in connection with the above to quote a few words delivered in this hall sometime ago by our honoured President. He says: "Such men are few and deserve commemoration, and it may be well to think also of the fact that, in bearing them in remembrance, we stimulate others to like

noble deeds. Among the many ways open to those who desire beneficially to connect their names with the real progress of this country, none is more fruitful than to follow in the footsteps of Mr. Sommerville, and to aid societies like this, in educating the people by free popular lectures."

The Librarian, Mr. J. A. U. Beaudry, then presented a report on behalf of the Library Committee, showing that much work had been done during the year and that the condition of the library was greatly improved.

The Treasurer, Mr. P. S. Ross, also submitted his annual statement with regard to the financial condition of the Society.

The following officers were elected for the ensuing year:

President—Sir William Dawson.

Vice-Presidents—Sir Donald A. Smith, Messrs. Edward Murphy, J. H. Joseph, Dr. Harrington, J. H. R. Molson, J. S. Shearer, Rev. Dr. Campbell, Geo. Sumner and Dr. J. B. Edwards.

Members of Council—Messrs. A. T. Drummond, Joseph Bemrose, Samuel Finley, Dr. Hingston, W. T. Costigan, Dr. T. W. Mills, J. S. Brown, M. Brissette and Dr. Lapthorn Smith.

Honorary Curator—Mr. Alfred H. Mason.

Honorary Corresponding Secretary—Prof. Penhallow.

Honorary Recording Secretary—Mr. A. Holden.

Treasurer—Mr. P. S. Ross.

At a subsequent meeting of Council, held June 4th, Mr. Samuel Finley was elected Chairman of Council, and the following committees were appointed:—

Editing Committee—Prof. Penhallow, *Chairman;* Dr. Harrington, Dr. T. Wesley Mills, A. T. Drummond, Joseph Bemrose.

Lecture Committee—Dr. Harrington, *Chairman;* Rev. Dr. Campbell, P. S. Ross, A. H. Mason, Dr. J. Baker Edwards.

Library Committee—E. T. Chambers, *Chairman;* J. A. U. Beaudry, F. B. Caulfield, R. W. McLachlan, Joseph Fortier.

House Committee—J. S. Shearer, *Chairman;* J. A. U. Beaudry, J. H. Joseph, Samuel Finley.

Membership Committee—J. Stevenson Brown, Albert Holden, S. Finley, P. S. Ross, J. A. U. Beaudry, Dr. J. Lapthorn Smith, George Sumner, W. T. Costigan.

Annual Field-Day, 1888.

The annual field-days of the Natural History Society are looked forward to by many lovers of Nature with much pleasurable anticipation, and have always been enjoyable events, that of June 18th, 1888, being no exception to the rule. The day was glorious and the choice of locality admirable, being the grounds of Hon. Mr. Papineau at Montebello. The party left Montreal by special train from Dalhousie Square Station, and consisted of Prof. Harrington, Prof. Bovey, J. H. R. Molson, J. S. Shearer, George Sumner, S. Finley, Albert Holden, J. S. Brown, Hollis Shorey; Mr. Gibb, of Abbotsford; Capt. R. C. Adams, R. Miller, J. Henderson, Mrs. J. H. R. Molson, Miss Hill, Miss Cordner, Mrs. and Miss Baylis, Mrs. Lewis, Miss Dawson, Miss K. Drummond, Mrs. E. Day, Mrs. H. B. Stephens, Mrs. and Miss Finley, Miss Botterell, Miss Van Horne, Miss A. Van Horne, Mrs. Adams, Mrs. Sumner, Mrs. Shearer, Mrs. and Miss Ritchie, Miss Evans, Miss Henderson, Mrs. Salter, and many others. Sir William Dawson was unavoidably absent, owing to duties in connection with the recognition of McGill degrees in the provincial examinations for the legal and medical professions.

On the arrival of the party at Montebello at noon, they were joined by a contingent from the Ottawa Field Naturalists' Club, including Mr. J. F. Whiteaves, F.G.S., and Mr. H. Ami, F.G.S.. On arriving at the grounds they were met by Mr. Papineau, who received them with the greatest cordiality and kindness.

The grounds are extensive and laid out with much taste, the prevailing principle being evidently to preserve the natural beauties, and this has been done most skilfully. In a separate building, resembling a chapel somewhat in appearance, is contained a large collection of curiosities, historical paintings, family relics and *objets d'art*. A visit was paid to it by the members, and Mr. Papineau kindly

gave particulars concerning many of the paintings and other objects.

Parties were then formed for the usual collection of geological, entomological and botanical specimens. The geological party was in the hands of Prof. Harrington, the botanical under Mr. Gibb, the entomological under Mr. Albert Holden; and all set about their work enthusiastically. Others dispersed themselves about the grounds in little coteries, and enjoyed more quietly the varied beauty of the site. The broad expanse of the Ottawa with its dark waters, the varied green foliage of the trees, the winding walks with their rustic seats in charming nooks, all formed a most charming *coup d'œil*. The collecting parties having returned to the manor loaded with spoils, a very hearty vote of thanks (on motion of Mr. J. H. R. Molson, seconded by Prof. Bovey) was given to Mr. Papineau, who made a very neat reply. Farewell was then said, and the party returned to the station. Here an agreeable surprise was in store for them, for a car specially fitted up and prettily decorated with flags, hanging baskets, &c., had been added to the train, and the party were invited by Messrs. A. C. and W. S. Burgess, who were in charge, to a most *recherché* repast as the guests of the railway company.

On the homeward journey the results of the competition for prizes were announced as follows:—

Botany (unnamed Collections of Plants)—First prize, Miss Baylis, 67 species; second prize, Mrs. Edmund Day, 62 species. Honorable Mention—Miss M. Van Horne, 59 species; Miss G. Finley, 56 species.

Entomology (named Collections)—First prize, A. F. Winn, 57 species; second prize, J. F. Hansen, 32 species.

Entomology (unnamed)—First prize, E. F. Baynes, 41 species; first prize, W. C. Adams, 41 species. Honorable Mention—E. C. Trenholme, 34 species.

Geology (named Collection)—Prize, Miss Blanche Evans, B.A.

Geology (unnamed Collection)–Prize, Miss A. Van Horne.

On arriving at Dalhousie Square Station, a hearty vote of thanks was passed to the Canadian Pacific Railroad officials for their courtesy.

(*From the Proceedings of the Geological Society of London, May* 23, 1888).

(ABSTRACT).

"On the Eozoic and Palæozoic Rocks of the Atlantic coast of Canada in comparison with those of Western Europe and the Interior of America." By Sir J. W. Dawson, LL.D., F.R.S., F.G.S.

The Author referred to the fact that since 1845 he had contributed to the Proceedings of the Geological Society a number of papers on the geology of the eastern maritime provinces of Canada, and it seemed useful now to sum up the geology of the older formations and make such corrections and comparisons as seemed warranted by the new facts obtained by himself, and by other observers of whom mention is made in the paper.

With reference to the Laurentian, he maintained its claim to be regarded as a regularly stratified system probably divisible into two or three series, and characterized in its middle or upper portion by the accumulation of organic limestone, carbonaceous beds, and iron-ores on a vast scale. He also mentioned the almost universal prevalence in the northern hemisphere of the great plications of the crust which terminated this period, and which necessarily separate it from all succeeding deposits. He next detailed its special development on the coast of the Atlantic, and the similarity of this with that found in Great Britain and elsewhere in the west of Europe.

The Huronian he defined as a littoral series of deposits skirting the shores of the old Laurentian uplifts, and referred to some rocks which may be regarded as more oceanic equivalents. Its characters in Newfoundland, Cape Breton, and New Brunswick were referred to and compared with the Pebidian, &c., in England, The questions as to an Upper Member of the Huronian or an intermediate series, the Basal Cambrian of Matthew in New Brunswick, were discussed.

The very complete series of Cambrian rocks now recognized on the coast-region of Canada was noticed, in connection, with its equivalency in details to the Cambrian of Britain or Scandinavia, and the peculiar geographical conditions implied in the absence of the Lower Cambrian over a large area of inferior America.

In the Ordovician age a marginal and a submarginal area existed on the east coast of America. The former is represented largely by bedded igneous rocks, the latter by the remarkable series named by Logan the Quebec Group, which was noticed in detail in connexion with its equivalents further west, and also in Europe.

The Silurian, Devonian, and Carboniferous were then treated of and detailed evidence shown as to their conformity to the types of Western Europe rather than to those of America.

In conclusion, it was pointed out that though the great systems of formations can be recognized throughout the Northern Hemisphere, their divisions must differ in the maritime and inland regions, and that hard and fast lines should not be drawn at the confines of systems, nor widely different formations of the same age reduced to an arbitrary uniformity of classification not sanctioned by nature. It was also inferred that the evidence pointed to a permanent continuance of the Atlantic basin, though with great changes of its boundaries, and to a remarkable parallelism of the formations deposited on its eastern and western sides.

Discussion.

The President, whilst recognizing the importance of the paper, doubted whether the question of correlation of the Pre-Cambrian rocks on either side of the Atlantic was ripe for discussion.

Dr. Hicks felt sure that the paper would be welcomed on this side of the Atlantic. He agreed with most of the conclusions of the Author, including the correlation of the Huronian with the Pebidian. This was borne out, not only by similarity of lithological characters, but by the exact correspondence of the succeeding beds in the two areas as shown by Mr. G. F. Matthew. The difficulty of correlation lay with the rocks below the Huronian. He noticed that fragments of granitoid rocks occurred in the Huronian as in the Pebidian. He had also called attention to the contrast between the Palæozoic rocks of the ocean borders and those of the interior of the continents, in papers read before the Society and elsewhere.

Dr. Scott referred to Mr. Walcott's work, and mentioned the occurrence of great deposits of Pre-Cambrian rock in Arizona. Where terrestrial species play an important part, difficulties of correlation were much increased.

Dr. Hinde noticed the difference between the coast-geology of America and that of the interior.

Mr. Marr stated that the paper referred very fully to the point noticed by the last speaker.

(*From the Annals of the New York Academy of Science, Vol. IV., No.* 4, 1888.

On an Archæan Plant from the White Crystalline Limestone of Sussex County, N.J. By N. L. Britton.

The abundance of graphite in certain Archæan limestones, and notably in those referred to the Laurentian systems, has often been cited as an indication of the existence of plant life at that remote period, and indeed, has seemed to the writer and others, attributable to no other source, although this view has not found ready acceptance in the minds of many geologists. The mineral generally occurs in these limestones in the form of scattered separated flakes or small masses, often somewhat crystalline in outline, thus affording neither information regarding the nature of the plant from which it has been derived, nor certainty that it is in reality of vegetable origin. Through a fortunate discovery made last September by Mr. J. O. Northrop and myself, I am able to submit evidence that in one belt of Archæan limestone in the Highlands of New Jersey, the graphite has been derived from a plant, and proof that vegetable life existed in that epoch.

The plant-remains appear as black bands on the rock, consisting of very thin films of graphite; in some the thickness reaches about 0.5 mm., but it is generally less. The average width of the bands is about 3 mm., and the greatest continuous length observed about 6 cm., though it is apparent that when entire they are much longer. In many parts of the rock these are matted together to form broad black patches, which are in reality thin carbon strata. The bands and films lie parallel with the bedding of the limestone. No cellular structure has thus far been detected.

As this is undoubtedly the most ancient plant yet discovered, I should suggest for it the generic name *Archæophyton*, and to acknowledge, in an imperfect manner, my obligation to one to whom I am indebted for encouragement and counsel in study and investigation, and at the same time, to associate with this interesting plant the name of one foremost in American Palæobotany, I would denominate the plant *Archæophyton Newberryanum.*

While the imperfect nature of the fossil forbids any definite statement as to its botanical affinity, we may, perhaps, assume its relation to the algae.