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THE

CANADIAN RECORD

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CANADIAN ORTHOPTERA.

BY F. B. CAULFIELD.

(*Concluded.*)

Nemobius vittatus, Harris, is our most abundant species. Its colour is greyish-brown, marked with lines of black. It is of social habits, being found in swarms in the fields during the summer months. I have not heard them shrilling earlier than the beginning of August. Should the season be fine, individuals may be heard as late as the beginning of November. Quebec, common.—Provancher. Montreal, common.—Caulfield. Toronto, common.—Brodie.

Nemobius fasciatus, De Geer. May be distinguished from our other *Nemobii* by the length of its wings. Montreal, not common: also given in the Quebec and Toronto lists.

Nemobius (*Anexipha*) *septentrionalis*, Scudd. Is also on our list. Provancher records one specimen from Quebec, and it is recorded from Rat Portage by Brodie.

All the foregoing species live on the ground, but we have another kind of cricket which spends its life among the leaves and branches of tall weeds and shrubs. It is the

ivory climbing cricket, *Æcanthus niveus*, Scw. The male is ivory white, with very broad, transparent wing-covers, crossed by from three to five oblique raised lines. In the female the wing-covers are longer and narrower, and of a pale green color. The antennæ and legs are long and slender, the hind thighs not being so stout as in the ground crickets. The shrilling of the species is more sustained than that of *Gryllus*, the notes running together like the roll of a drum, swelling and decreasing alternately. They commence shrilling about the first of August, and continue until the frosts of October put an end to their existence.

The eggs are deposited in the stems of plants. The insect is sometimes very injurious to raspberry canes and grape vines, on account of its piercing them with its ovipositor, causing them to wither and die.

Grasshoppers (Locustariæ).

These insects may, with few exceptions, be recognised by their long and slender legs, and by their extremely long bristle-formed antennæ. In the winged species, the wing-covers slope downwards at the sides of the body and overlap a little on the back near the thorax. The ovipositor is generally long, flattened at the sides, and curved like a cimiter.

The shrilling of some of the southern species is quite powerful, and where the insects are very abundant the noise is sometimes unpleasantly loud; but in these northern regions the notes of our grasshoppers are weak, nor are the insects sufficiently numerous to attract much attention.

At the head of the family, systematists place a group of wingless forms represented in Canada by two species, one restricted to the North-West, the other apparently common in Ontario and Quebec.

Centhophilus maculatus, Harris. This curious insect is rather strongly built, with stout hind thighs; the back is arched and has a smooth, shiny appearance, as if varnished. Its general color is brown, thickly covered with spots of a lighter color. Wings entirely absent, ovipositor rather

long and nearly straight. Lives in communities under stones in damp woods, and beneath the loose bark of dead trees. It appears to be carnivorous, as I have taken it in cans baited with meat.

Anticosti, Gulf of St. Lawrence, Verrill.; Quebec, common, Provancher; Montreal, common, Caulfield; Ontario, generally, to north of Lake Superior, Brodie.

Udeopsylla nigra, Scudd. Resembles in form the preceding species, but is shining black, and is heavier and stouter. The ovipositor is rather short and thick at the base.

Common in Manitoba, Brodie and Scudder.

The next group contains the typical insects of the family, the green grasshoppers or Katydids. Most of these possess ample wings and can fly well. Some spend their lives on trees and shrubs, while others inhabit meadows and pastures. They are pretty and inoffensive creatures, not being numerous enough to be injurious, and owing to their retiring habits, and the similarity of their color to the leaves and grasses amidst which they live, are but seldom seen, even in the localities where they are most abundant.

The narrow-winged Katydid, *Phaneroptera curvicauda*, De Geer, is not uncommon in Canada, and during the latter part of summer, may often be observed resting on shrubs and young trees, occasionally taking a short flight from tree to tree. It may be recognised by its narrow and straight wing-covers, and by the male having a cylindrical style curving from below upwards, and resting in the forks of a furcate appendage which projects from the end of the abdomen.

The ovipositor of the female is rather short and curved abruptly upward, the extremity toothed on both sides. The female deposits her eggs in the edges of leaves of trees. I have never seen this species shrilling, although I believe that I have often heard it. Prof. Riley describes its note as a soft *zeep-zeep*, sometimes uttered singly, but generally thrice in succession. The call is occasionally responded to by a faint chirrup from the females, produced by stretching out their wings as if for flight, and is as often heard in the day as at night.

While passing through its earlier stages, this species wears

a more varied dress than the simple green of the adult insect. In the *larva*, the colors are purplish, black and white, arranged in minute squares on the head and body, the antennæ and legs being marked with rings of the same colors. The *pupa* is green, varied with purple on the sides, and adorned with a double row of crimson spots on the dorsal surface. The mature insect is wholly green. It may be found during August and September. My earliest date for it is, August 1885. Province of Quebec, common in August and September, Provancher. Montreal, common, Caulfield. Toronto, common in Ontario generally to north of Lake Superior, Brodie. Red River Settlements, Scudder. A. ♂ Rosseare River, August 30th, and a ♀ the vicinity of Souris River, G. M. Dawson.

The oblong-winged Katydid, *Phylloptera* (*Amblycorypha*) *oblongifolia*, De Geer, is green like the preceding species, but may be distinguished from it by its larger size, and by the oval form of its wing covers. It appears to be rare in eastern Canada, and is not on Provancher list. The only specimens that I have seen are a male and female, given to me by the late Mr. W. D. Shaw (taken, I believe, at Montreal), and three males taken by myself at Montreal, September, 1883. I found them amongst some willow bushes, and in each instance, my attention was attracted by seeing them fly from one bush to another. Dr. Harris states that, when flying, they make a whizzing noise, somewhat like a weaver's shuttle. I was not close enough to hear any sound, nor did I hear them shrilling.

According to Harris, the note of the male, although grating, is feeble. I have not seen any account of the earlier stages of this insect, but in the latter end of June, 1885, I found two larvæ which I think must belong to this species, as they were entirely pale green, and on August 1st, 1885, I found two pupæ, also green (*curicauda* is varied with purple and white, when in nature, and we have no other arboreal species in eastern Canada). Montreal: rare, Caulfield.—Toronto: common, and Ontario generally to north of Lake Superior, Brodie.

The genus *Conocephalus* may be recognized by the head

being conical and extending to a point between the eyes, and by the long, straight ovipositor of the female. *Conocephalus ensiger*, Harris, is the only species recorded from Canada. It is of a pale, green color, the head whitish, and the legs and abdomen brownish green; it measures from an inch and three-quarters to two inches in length.

The female has been observed, by Prof. S. I. Smith, with its ovipositor forced down between the root leaves and the stalk of a species of *Andropogon*, where the eggs are probably deposited. Toronto, common, and Ontario, general, Brodie. Not recorded from the Province of Quebec.

During the latter part of summer, numbers of small fragile-looking grasshoppers may be found in damp fields. They belong to the genus *Xiphidium*, of which we have three species in Canada.

Xiphidium fasciatum, Sew. The general color of this species is green, with a brown stripe on top of the head, and its thorax bordered on each side with darker brown. The dorsal surface is brown, with a yellow stripe on each side, and below this again is a narrow brown strip.

The ovipositor bends abruptly down at the base and is then straight to the tip. Length, three-quarters of an inch from head to tip of the wings, which are a little longer than the wing-covers. Recorded by Provancher as very common in August and September in Province of Quebec; Montreal, common, Caulfield; Toronto, common, and Ontario, generally, to north of Lake Superior, Brodie.

Xiphidium brevipennis, Scudder, is now generally believed to be only a variety of *fasciatum*. Common in same localities as preceding species.

I have not heard either of these species shrilling. According to Mr. Scudder, "*Xiphidium* makes a note very similar to *Orchelimum*, but so faint as to be barely perceptible even close at hand."

Prof. Riley states that *X. fasciatum* oviposits in the cone like willow gall (*Salicis strobiloides.*)

Xiphidium saltans, Scudder, is our rarest species, and appears to be confined to the North-West. Souris River. G. M. Dawson.

The species of *Orchelimum* are almost identical with *Xiphidium* in general appearance and color, but are larger, measuring about an inch and one-tenth in length from head to tip of wing-covers.

O. Vulgare, Harris. The note of this species is described by Mr. Scudder as a trill, followed by a series of very short staccato notes sounding like jip! Toronto, common; Ontario, everywhere, Brodie.

Orchelimum agile, De Geer. This species is common in the neighborhood of Montreal, and may be found in almost every damp field where there are tufts of rank grass or clumps of tall weeds. Concealed in one of these, the male takes his stand and trills his simple love song, which is merely a weak wheezy trill, only audible for the distance of a few feet. When shrilling, the insect slightly raises its wing-covers, and shuffles them together with a shivering motion. It sings in the bright sunshine, and it was by observing the play of light on the wings while in motion that I discovered the insect, as when sitting still it is almost impossible to detect it, so effectively does its green dress conceal it. Montreal, common, end of July to end of September, Caulfield; Toronto, common; Ontario, generally, to north of Lake Superior, Brodie.

Anabrus purpurascens, Uhl., is a large, thick-bodied insect of a dark purplish-brown color, mottled with yellow. The wings are very small and quite useless for the purpose of flight. A western species. West Butte, July 29th. In the vicinity of Woody Mountain, between June 15 and July 7th, and in the neighborhood of the Souris River. G. M. Dawson.

We are now come to the typical family of the order, the locusts. ACRIDIDÆ. In these insects the antennæ are much shorter and thicker than in the preceding families. The wing-covers are generally long and narrow, and slope downwards on the sides like a roof. The under wings are broadly triangular, and when at rest are folded in plaits like a fan. The hind legs are formed for leaping, being stout and muscular. Instead of a long exserted ovipositor like the crickets and grasshoppers, the female is provided

with four wedge-like pieces, placed in pairs above and below, and opening and shutting opposite to each other. When about to deposit her eggs, the female forces these wedges into the earth, these being opened and withdrawn enlarge the opening; the operation being repeated until a hole is formed large and deep enough to admit nearly the whole of the body. The eggs of locusts are generally deposited in the ground; those of the Rocky Mountain locust *Caloptenus spretus*, according to Prof. Riley, are voided in a glistening and glutinous fluid which holds them together and binds them into a cylindrical pod.

Prof. Thomas states that he has obtained the eggs of *Caloptenus femur-rubrum* in rotten wood, in which they were placed without any apparent regularity, and without any connection by any glutinous secretion.

The sounds made by locusts are produced in two ways. First, by rubbing the hind thighs up and down on the wing-covers; and second, by snapping together the edges of the wings and wing-covers during flight.

Our Canadian locusts fall into two sub-families, *Acridinæ* and *Tetiginæ*. To the first belong all the species in which the pronotum (upper surface of thorax) extends only to the base of the wing-covers. This group contains the greater number of our species. To the second belong a small group of species in which the wing-covers are aborted, appearing as small pads, while the pronotum extends as far as, or past, the extremity of the abdomen.

As regards the time of appearance of our locusts, there is a constant succession of species from early spring until late in the fall. A few species (Tetix) hibernate as imago or perfect insects, a few others as larvæ, and some as pupæ, but the greater number pass the winter in the egg, not attaining the perfect condition until August or September.

The first to appear are the species of *Tetix*, which having hibernated in the adult form, may be found as soon as the snow has melted. About the same time, specimens of *Tragocephala infuscata*, and its variety *viridifasciata* in the larval condition, make their appearance, attaining the perfect form by the middle or end of May; and with them

may be found *Hippiscus phœnicoptera*, a large species, with red underwings. By the middle of July these have passed away, their places being filled by swarms of *Camenula pellucida*, associated with *Trimerotropis verriculata*, and one or two others. During August and September the fields fairly swarm with locusts, prominent amongst them being *Melonoplus femur-rubrum*, *Stenobothrus curtipennis*, *Encoptolophus sordida*, while on dry bank and roadsides, *Dissosteira carolina* may be found in equal abundance. By the middle of October nearly all have disappeared, but a few specimens of *Melanoplus* and *Stenobothrus* linger until the autumnal frosts put an end to their existence.

The following are all the locusts known to me as occurring in Canada:—

Chrysocraon conspersum, Harris. Rat Portage, Man., Brodie; Eastern shore of Lake Winnipeg, five specimens, Scudder.

Chlœaltis (*Amblytropidia*) *subhyalina*, Scudder. Province of Quebec, Provancher.

Stenobothrus curtipennis, Harris. Abundant and generally distributed in Canada. Quebec, Provancher; Montreal, Caulfield; Ottawa, Harrington; Ontario, generally, to north of Lake Superior, Brodie.

Stenobothrus propinquans, Scudder. Cap Rouge, Quebec, Provancher.

Arcyptera lineata, Scudder. Province of Quebec, Provancher.

Tragocephala infuscata, Harris, and var. *viridifasciata*. Common and widely distributed. Quebec, Provancher; Montreal, Caulfield; Ontario, generally, to north of Lake Superior, Brodie.

Gomphocerus clepsydra, Scudder. Souris River, G. M. Dawson.

Ædipoda (*Arphia*) *sulphurea*, Burm. Quebec, very rare, Provancher; Toronto, common, and Ontario, generally, in sand hills, Brodie.

Ædipoda (*Arphia*) *terrebrosa*, Scudder. Souris, G. M. Dawson.

Ædipoda (*Arphia*) *frigida*, Scudder. Taken near Wood End in June, G. M. Dawson.

Ædipoda (*Hippiscus*) *phœnicoptera*, Germ. Quebec, common, Provancher; Montreal, rare, Caulfield; Toronto, rare, Brodie; Dufferin, June 13 and 14, G. M. Dawson.

Ædipoda (*Dissosteira*) *carolina*, Linn. Common and generally distributed in Canada. Quebec, Provancher; Montreal, Caulfield; Ontario, generally, to Lake Superior, Brodie; Vancouver's Island, Packard.

Œdipoda (*Trimerotropis*) *verriculata*, Scudder. Quebec, common, Provancher; Montreal, common, Caulfield; Ontario, generally, to Lake Superior, Brodie; Dufferin, G. M. Dawson.

Œdipoda (*Encoptolopha*) *sordida*, Burm. Quebec, very common Montreal, common, Caulfield.

Œdipoda (*Camnula*) *pellucida*, Scudder. Province of Quebec, Provancher; Montreal, common, Caulfield. Variety *atrox*, Scudder; Victoria, Vancouver's Island, Packard.

Œdipoda æqualis, Say. Red River Settlement, Scudder.

Œdipoda trifasciata, Say. Wood End in June, G. M. Dawson.

Pezzotetix borealis, Scudder. A single pair, vicinity of Lake of the Woods, G. M. Dawson.

Pezzotetix Dawsonii, Scudder. Souris River, G. M. Dawson.

Pezzotetix septentrionalis, Saus. Labrador, Saussure.

Caloptenus (*Melanoplus*) *scriptus*, Walk. Vancouver's Island, Walker.

Caloptenus (*Melanoplus*) *bilituratus*, Walk. Souris River, G. M. Dawson; Vancouver's Island, Walker.

Caloptenus (*Melanoplus*) *repletus*, Walk. Vancouver's Island, Walker.

Caloptenus (*Melanoplus*) *femur-rubrum*, Burn. Common and widely distributed in Canada. Quebec, Provancher; Montreal, Caulfield; Ottawa, Harrington; Ontario, generally, to north of Lake Superior, Brodie.

Caloptenus (*Melanoplus*) *parvus*, Provan. Cap Rouge, Quebec; Provancher.

Caloptenus (*Melanoplus*) *femoratus*, Burn. Common and widely distributed in Canada. Quebec, Provancher; Montreal, Caulfield; Ontario, everywhere, Brodie; Lake of the Woods, G. M. Dawson.

Caloptenus spretus, Uhler. Dufferin, Souris River, vicinity of the Lake of the Woods, and the east fork of Milk River, G. M. Dawson.

Caloptenus atlanis, Riley. Quebec, Provancher; Victoria, Vancouver's Island, Packard.

Caloptenus fasciatus, Walk. St. Martin's Falls, Albany River, Hudson's Bay, Walker.

Caloptenus extremus, Walk. Arctic America, Walker.

Caloptenus arcticus, Walk. Arctic America, Walker.

Caloptenus borealis, Feiber. Labrador, Feiber.

Acridium appendiculatum, Uhler. Quebec, Provancher.

Tetix granulata, Kirby. Common, and widely distributed in Canada. Quebec, Provancher; Montreal, Caulfield; Ottawa, Harrington; Ontario, generally, to Lake Superior, Brodie; Vancouver's Island, Packard; Arctic America, Kirby.

Tetix ornata, Say. Quebec, common, Provancher; Ontario, generally, rare, Brodie.

Tetix cuculata, Scudder. Toronto, common; Ontario, generally, rare, Brodie.

Tetix triangularis, Scudder. Quebec, rare, Provancher; Montreal, rare, Caulfield; Ottawa, Harrington; Ontario, generally, to Lake Superior, Brodie.

Tetigidea lateralis, Say. Common and widely distributed in Canada. Quebec, Provancher; Montreal, Caulfield; Ottawa, Harrington; Ontario, generally, to Lake Superior, Brodie.

Tetigidea polymorpha, Burm. Common in same localities as preceding species.

Tetigidea acadica, Scudder. Lake of the Woods, G. M. Dawson.

Batrachidea cristata, Harris. Toronto, rare, Brodie.

The PHASMIDÆ or spectres are represented in Canada by only one species, the well known Walking-stick insect, *Diapheromera femorata* Say, but in tropical countries are numerous and assume strange forms, resembling leaves, thorny branches, &c. Our species is entirely wingless, and looks very much like a small twig. The body is long and cylindrical, and the antennæ and legs are very long and slender. It lives altogether on trees, being generally found on oak and basswood. According to Packard, the egg-sac is flattened elliptical, with a lid in front which can be pushed open by the embryo when about to hatch, and is deposited in the autumn.

Montreal, Caulfield: Ottawa, Harrington: Kingston, Rogers: Ontario, generally, Brodie: Red River Settlements, Scudder.

The COCKROACHES. BLATARIÆ are flattened ovate insects, generally of a dingy brown color, and have an oily and disagreeable smell. The egg capsules are dropped at random, the females not depositing or concealing them in any particular place or manner. Cockroaches are nocturnal insects, hiding during the day in holes and crevices. They are omnivorous creatures, feeding on almost any substance, animal or vegetable.

We have on our lists five genera with seven species. Two of these are European, but have been carried by commerce to various parts of the world. The large, black species, common in houses, and familiar to housewives under the name of "Black Beetle," is the *Stylophyga orientalis*, Lin-

neus. It is an imported species, infesting houses and shipping. Quebec, Provancher: Montreal, common, Caulfield: Toronto, Brodie.

The other imported species is the small, reddish-brown Cockroach, *Ectobia germanica*, Stephens, commonly known in the New England States as the "Croton Bug." It infests houses, and is even more troublesome than the large species, taking up its quarters in wooden partitions and cracks in furniture, soon becoming unpleasantly numerous. Chaudiere Curve, Quebec, Fyles: Montreal, Caulfield: Toronto, Brodie.

Our native species are found under stones and beneath the bark of stumps, and appear to be rare. *Ectobia lithophila*, Harr. Welland and westward, Brodie. *Periplaneta americana*, Linn. Essex County, Ont., Brodie. *Ischnoptera pennsylvanica*, De Geer. This species is light brown, has the wings much longer than the body, and is extremely active. I found a specimen under the bark of an old stump, June 1876, and on the Natural History Society's Field Day to Abbotsford, on June 4th, 1885, I took three specimens, also under bark of a stump. Toronto, not common, Brodie. *Temnopteryx marginata* is a smaller insect, with much shorter wings. I found two specimens under bark of a fallen tree, on Montreal Mountain, June 1876. It has not been taken elsewhere in Canada, so far as known to me.

The Earwigs. Forficulidæ may be distinguished from all other orthoptera, by their narrow, flattened body, short wing-covers, and by the extremity of the abdomen being provided with a forceps, which, in some species, equals the body in length. During the day earwigs generally conceal themselves in holes and crevices, flying actively at night. A few of the smaller species fly during the day. They feed on vegetable matter, and in Europe, where they are numerous, often do much damage by eating the blossoms of Carnations, Dahlias, &c. In this country they are generally rare insects, only one species being recorded from Canada, the *Labia minor* of Linnæus, common to both Europe and America. Cap Rouge and Portneuf, 3 specimens, Provancher: Ottawa, Harrington.

Besides the foregoing species of Orthoptera, there are others on our lists. Some of these are, however, synonyms, while the occurrence of others within our limits is still doubtful.

Additional species will undoubtedly be discovered when more attention has been given to the order, and the remoter districts thoroughly worked up.

On the Correlation of the Geological Structure of the Maritime Provinces of Canada with that of Western Europe.

By Sir Wm. Dawson, F.R.S., etc.

(*Abstract.*)

As early as 1855, in the first edition of Acadian Geology, the author had indicated the close resemblance in structure and mineral productions of Nova Scotia and New Brunswick with the British Islands, and in subsequent editions of the same work, further illustrations were given of this fact. Recent researches by Bailey, Matthew, Fletcher, Ells and others, had still more distinctively indicated this resemblance, as well as the distinctness of the Maritime Geology from that of the great interior plateau of Canada and the United States. In short, as argued by the author in his recent address before the British Association, the geology of the Atlantic margins of America and Europe is substantially the same, and distinct from that found west of the Apalachians in America and in Central and Eastern Europe. In this fact has originated much of the difficulty experienced in correlating the geological formations of Eastern Canada with those of Ontario, of New York and Ohio, as well as similar difficulties in Europe which have led to much controversy and difference of classification and nomenclature. One object of the present communication was to show that the system of classification of Palæozic sediments, employed for the interior plateau of the American continent, required very important modifications when applied to the Atlantic

coast, and that neglect of this had led to serious misconceptions.

The rugged islands of Laurentian and Huronian rocks correspond on both sides of the Atlantic, and show an identity of succession in deposits as well as a sychronism of the great folds and lateral pressures which have disturbed these old formations. The Cambrian sediments and fossils as originally described by Hartt, and more recently and in so great detail by Matthew, are in close correspondence with those of Wales and not identical with those of internal America. The recent paper of Lapworth on the Graptolites affords evidence of the same kind, and shows that these were Atlantic animals in their time. It also throws much additional light on the Quebec group of Logan considered as an Atlantic marginal formation, representing a great lapse of time in the Cambrian and Ordovician periods. The anthor had long ago shown that the Siluro-Cambrian or Ordovician of Nova Scotia conformed more nearly to that of Cumberland and Wales than to the great limestone formations of Quebec, Ontario and New York. The Upper Siiurian also is of the type of that of England and Wales, a fact very marked in its fossil remains as well as in its sediments.

The parallelism in the Erian or Devonian in both countries is most marked, both in rocks and fossils, and while this is apparent in the fishes, as worked up by Mr. Whitecaves, it is no less manifest in the fossil plants as described by the author.

The Carboniferous, in its limited troughs, the character of its beds, and its fossil animals and plants, also points to a closer relationship in that period between the two shores of the Atlantic than between the Atlantic coast and the inland area. This was evidenced by comparative lists of species.

The Trias of Nova Scotia and of Prince Edward Island, as the author had shown in 1868,[1] resembles that of England very closely, in its aqueous deposits and in its associated trappean rocks.

[1] Journal of Geol. Society of London, Vol. VI.

Beyond this the Geology of the Maritime Provinces presents no materials for comparison till we arrive at the boulder drift and other pleistocene deposits. In regard to these, without entering into disputed questions any farther than to say that the observations of the author, as well as those more recently made by Mr. Chalmers, conclusively prove that submergence and local ice-drift were dominant as causes of distribution of boulders and other material, there was evidence of great similarity. The marine beds described by Mr. Matthew at St. John were precise equivalents of the Clyde beds of Scotland, as were the upper shell-bearing beds of Prince Edward Island and Bay de Chaleurs of those in Aberdeenshire and other parts of Scotland, and the Uddevalla beds of Sweden. The boulders drifted from Labrador to Nova Scotia were the representatives of those in Europe scattered southward from Scandinavia, and the local drift in various directions from the hills was the counterpart of that observed in Great Britain. The survival of *Mastodon giganteus* in Cape Breton, to the close of the Pleistocene, is a decided American feature, and so is the absence of any evidence of Pleistocene man.

The conclusion of the author was that, in so far as palæontology and the subdivisions of systems of formations is concerned, the geology of the Maritime Provinces is European, or perhaps more properly Atlantic, rather than American, and is to be correlated rather with the British Islands and Scandinavia than with interior Canada and the United States. The latter country, even on its eastern coast, possesses a much less perfect representation of these Atlantic deposits than that in the Maritime Provinces and Newfoundland, though the recent studies of Crosby, Dale and others, are developing new points of this kind in the geology of New England, and Hitchcock and others have shown that the New Brunswick Geology extends in Maine.

The paper further discusses the bearing of these facts on the successive stages of the physical geography of Eastern America in the Cambrian, Silurian, Erian, Carboniferous and Triassic periods.

The Retention and the Loss of the Hair from a Physiological Standpoint.

By T. Wesley Mills, M.A., M.D.
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In the *Popular Science Monthly* for October last, Mr. Eaton, in a paper entitled "A Bald and Toothless Future," states that as a result of years of observation of public assemblages of people, he is forced to conclude that there is, among men, relatively to women, a very disproportionate amount of baldness; that there may be deficiency of the hair of the head in the male sex to the extent of forty-six per cent.; and that it is more marked the higher the average culture of the assembly examined. This writer attributes the growing tendency to loss of hair prematurely to wearing tightly-fitting hair coverings, living within doors, and keeping the hair closely cropped. The condition is exaggerated by the influence of heredity. Mr. Eaton says:—"There is no reason why bald heads should not yield to the laws of heredity as much as curly heads or red heads." He further thinks that the early failure of the teeth has an analogous explanation with the loss of hair, viz.: decay from lack of use. The changes of conditions affected by modern civilization have rendered both comparatively useless to man.

Mr. Gouinlock, in the same magazine for May of the current year, under the title, "Hats as a Cause for Baldness," while agreeing that we are drifting towards that future indicated by Mr. Eaton, takes much narrower ground, and even combats several of the latter's conclusions. He believes that the common form of baldness is due entirely to the high hat and the hard felt hat that constrict the blood-vessels which nourish the hair bulbs. He also refers to the peculiar circumstances under which the blood-vessels of the head are distributed, so that they are especially exposed to pressure; and to a certain extent he reasons correctly, and, it may be added, zealously, to establish his thesis; but as I shall have occasion to show, his reasoning

is partial and his explanation inadequate. Both these writers have indicated the direction in which the truth lies, but neither gets at it wholly, as I shall now endeavour to show.

That Mr. Eaton is correct in believing that exposure of the body to the sun and air has something to do with hair production, any man may prove to his own satisfaction by leaving his arms or other portions of his body uncovered much more than usual, during a holiday season at the seaside or in the country. But Mr. Eaton states the case altogether too strongly for the influence of heredity. The degree to which such peculiarities as baldness are inherited is one of the most disputed matters; though unquestionably something must be allowed to such tendency, perhaps a good deal.

There can be no doubt that the loss of hair and of teeth prematurely are related in fact. Have such losses a common cause? Mr. Eaton's explanation is *disuse*. Professor Cope would explain the fact stated by dentists, that the last molar (wisdom) tooth and the lateral incisor of the upper jaw frequently do not appear, by what he calls "retardation" of the growth of the jaws, and to successively prolonged delay in the appearance of the teeth; while these again are related to an enlargement of the upper part of the head and of the brain. Is it not possible that all of these causes and perhaps others may combine to effect this result?

Taking up the case against the stiff hat, Mr. Gouinlock explains how readily the arteries can be compressed, especially when the hair is cropped close; he thinks the fact that below the line of pressure the hair remains, while it disappears above it, is quite clear upon his theory; and to account for the presence of hair over the temporal region when absent on the crown, he insists that here the temporal muscle acts as a cushion preventing pressure. But this writer seems to forget that there are superficial and middle temporal arterial branches as well as deep ones, and that it is just these superficial ones (liable to pressure) that have most to do with supplying blood to the hair bulbs. He also takes no account of other methods besides pressure by

which blood can be cut off from a certain region. The familiar phenomena of blushing and pallor show that the nervous system has a controlling influence over the size of small arteries; and the fact that the hair may become grey in a few hours under violent emotion, carries with it the lesson that in some way the nutrition of the hair is regulated by this same nervous system.

To understand the physiological bearings of this subject, the somewhat complex relations of the blood-vessels of the brain, the face, the bones and muscles of the head, and of the scalp must be borne in mind. The arteries of the brain find an outlet for their blood, when it has passed through the capillaries and done its work, in those peculiar venous channels lying on the inner tables of the skull known as "sinuses"; these communicate with the veins of the softer osseous tissue (diploe) lying between the main tables of the cranial bones, which again have connections with the veins on the outside of the head. Now it is plain from this series of connections, that pressure on the scalp must influence the whole vascular system of the head back to the arteries of the brain, unless in some way counteracted. Pressure generally affects veins, from their superficial position, much more than arteries. The bad effects of venous dilation are seen in the slow-healing ulcers on the limbs of those with dilated (varicose) veins. Throughout his paper Mr. Gouinlock has directed his attention almost wholly to arteries rather than to veins. He has nowhere mentioned, what is commonly enough seen by the physician, that anastomotic arterial connections are especially opened up under the exigencies of disease, as from the pressure of tumours, &c.

Would nature refuse to combat the hard hat? Could she not adapt to it in a greater degree than Mr. Gouinlock's theory supposes? In looking at a plate portraying the course of the arteries of the head, it will be noticed that the terminal branches mount to the vertex of the skull and anastomose with their fellows of the opposite side by *very small* offshoots. As it is the smaller branches of arteries that are the most susceptible to changes in calibre,—can in fact be most readily influenced by the nervous mechanism, it is easy

to understand why that part of the scalp, with its hair bulbs supplied by them should, either from pressure or from lessening of calibre in response to nervous influence, be the area most to suffer. Hence the explanation of the fact that baldness of the vertex is the most marked. This must be so, however we account for the mal-nutrition, from the anatomical relations of the various blood-vessels.

The anthropological bearings of the hair are not without interest and importance. We find all varieties of hair, all degrees of hairiness, and great dissimilarity as to distribution over the body in different races of men.

The North American Indians have an abundance of hair on the head, with but little on the face or the rest of the body, while the hairiness of the Ainos has been remarked upon by many observers. Mr. Dickins writing in *Nature* for April 7th of the current year, states that the hair is most abundant in this latter race just where it would be most useful, as over the sternal, inter-scapular and gluteal regions, where, it may be remarked, the related epidermis itself is also thick. Professor Penhallow,[1] who has published several papers in this journal on the Ainos, states, in answer to specific enquiry, that the variety found among the Ainos in respect to relative hairiness, is probably explicable by associated climatic differences. If any large civilized community of the present day be examined, the race differences of men will all be found illustrated in this respect. Thus it is to be noticed that individuals and whole families have, like the Indian, abundance of hair on the head with but little elsewhere, while others are generally hairy like the Ainos. As one might expect from their both being dermal structures, an early development of hair &c., from sexual maturity is associated, I am told by a member of the dental profession of this city, with a correspondingly premature appearance of the wisdom teeth. Perhaps, however, such instances ought to be regarded as illustrations of general acceleration of maturity of the whole organization. It still remains to explain the early baldness of men and the exemption of women. Even if we accede to all that the

[1] Can. Rec. of Sc. II, 119.

writers in *Popular Science* claim, it does not suffice to explain the subject at all adequately. The great increase in the prevalence of all forms of nervous disease, and the modifications wrought in old forms of disease by the greater prominence of the nervous type of human being, points to the fact that our civilization makes calls upon the organization which tell especially on the nervous system. The strain of life falls in general, it will be conceded, most upon men. Man is the bread-winner; his anxieties, struggles, and disappointments, are both many and severe; and man is often prematurely bald for the same reason that he is prematurely old in other respects. Woman is less so because brain stress less frequently falls to her lot. But in connection with this must be taken, to complete the explanation, the fact that as with some races and some males of our own race, the vitality and persistence of the hair of the head in woman is specially marked. That overwork of the brain may influence the cephalic circulation (and so the hair) unfavorably, is evident enough from the dark circles beneath the eyes, owing to venous congestion, on the morning after unduly severe mental exercise, not to mention the headache from a similar cause; and it is not surprising that the vertex of the head, with its relatively variable and feeble blood supply, should suffer most—in a word, that the overworked or overworried man should be bald—unless, as in most women, there is unusual vitality of his hair bulbs. Baldness is one more of the many warnings of our day—one of Nature's protests against the irregular and excessive activity maintained in this restless age.

The Royal Society of Canada is actively forwarding the movement suggested by Sir William Dawson, for an Imperial Union of Geological Surveys and Societies. This is an effort which promises large benefits, and should be heartily supported.

The Distribution and Physical and Past-Geological Relations of British North American Plants.

By A. T. Drummond.

Some years since I had occasion to refer, in some detail, in this journal, to the leading features in the distribution of plants in Ontario and Quebec. Since that time, not only has a federal union of the whole country, from the Atlantic to the Pacific, been consummated, but our knowledge of its flora has been greatly extended, and it is now possible with some reasonable degree of accuracy, to trace the range of most of the phænogamous or flowering plants, and of the horsetails and ferns. The carices and grasses will still need considerable attention from botanical explorers before it will be possible to speak with confidence of their range.

The great breadth here of the continent, extending from Nova Scotia to British Columbia, and its varied physical features and the climatic effects resulting from these, have developed remarkable differences in the flora. There are vast mountain ranges with numerous peaks of great height, enormous stretches of wooded country, extending northward to the extreme limit of trees, great areas of prairie land and of park-like country, extensive inland seas of fresh water, and a coast line of some thousands of miles, not only within the northern temperate zone, but extending even more largely within the Arctic circle. Such marked physical conditions have necessarily given rise to differences in circumstances and climate, and have developed distinctive floras, whilst the present connection of the Dominion, along its southern boundary, with the northern United States, and the past geological history of the northern parts of the continent, have led to marked relations with the floras of foreign countries. It will be the object of this paper to trace the connection of the general flora of the Dominion with the floras of some foreign countries, to illustrate the distinctive floras of the different parts of the Dominion, and to indicate the relations of these dis-

tinctive floras to associated physical and past geological conditions.

The considerable resemblance between the floras of Japan and the River Amur on the one hand and the Northern United States and Canada on the other, has before now attracted attention. A large number of species are identical, whilst some others in America are represented in Japan and the Amur country by varieties which, no doubt, all have more or less their origin in the changed conditions under which the plants in their new homes exist. The more complete knowledge we now have of the range of these species in Canada, has thrown some new light on the interesting problems which arise in tracing the origin of this identity, and the relations of our flora to that of Europe. Messrs. A. Franchet and Lud. Savatier have in their "Enumeratio Plantarum in Japonia," (Paris, 1879), considerably extended our knowledge of the Japanese flora, and I have taken them as the authority for the occurrence of plants in Japan, whilst Maximowicz is my authority for the plants of the Amur. In a list which I have compiled from Franchet and Savatier's volumes, and which excludes all naturalized plants and garden escapes, there are 221 species common to Japan and Canada. The list will be increased, no doubt, as Japan becomes botanically better known. Of this number of identical species, 150 are found in Europe and 85 are also in Alaska. The range of these 221 identical species in Canada, however, suggests some interesting questions. The occurrence of very many European plants in Arctic and temperate America had long ago attracted attention, and had given rise to various hypotheses, that generally accepted being that in some comparatively recent epoch there had been a connection between America and Europe which had resulted in an intermingling of the plants of the two continents. In recent years Prof. Asa Gray has suggested the probability of the migration of European plants to America having been across the continent of Asia, and this suggestion he was led to make by finding in Japan many European and American species. After a careful analysis of the range in Canada of

these identical species, I have not been able to fully follow out the conclusions of others. The analysis may be summarized thus:—

Distribution in Canada.	*Total Identical Species.*	*Also in Europe.*	*Also in Alaska.*
1. Generally distributed from Atlantic to Pacific	89	75	44
2. Somewhat general from Atlantic west to Rockies	42	31	3
3. Not west of Province of Ontario	38	17	1
4. Northern and Arctic in range	32	23	23
5. British Columbia exclusively, but almost entirely northern	11	2	10
6. British Columbia and north-eastward	4	1	3
7. British Columbia, but eastern in United States though not so in Canada	3	1	1
8. Rocky Mountains only	1	0	0
	221	150	85

There is sufficient interest attached to this table to warrant the enumeration of those plants which do not range west of the Province of Ontario, and of those which are exclusively British Columbian.

The letter E affixed to the name of a plant in the accompanying lists indicates that it is also European, the letter A that it is also Alaskan.

I.—Plants not West of the Province of Ontario.

Hepatica triloba, Chaix. [E.] [A.]
Caulophyllum thalictroides, Mx.
Brasenia peltata, Psh.
Viola rostrata, Psh.
V. Canadensis, L.
Geranium Robertianum, L. [E.]
Vicia Cracca, L. [E.]

Waldstenia fragrarioides, Trat.
Penthorum sedoides, L.
Myriophyllum verticellatum, L. [E.]
Lythrum salicaria, L. [E.]
Viburnum lantanoides, Mx.
Cryptotænia Canadensis, D. C.
Galium asprellum, Mx.
Monotropa uniflora, L.
M. Hypopitys, L. [E.]
Polygonum maritimum, L. [E.]
Pilea pumila, Gray.
Betula alba, L. var. [E.]
B. lenta, L.
Symplocarpus foetidus, Salisb.
Zostera marina, L. [E.]
Potamogeton hybridus, Mx.
P. crispus, L. [E.]
Pogonia ophioglossoides, Nutt.
Lipparis liliifolia, Rich.
Trillium erectum, L.
Carex filiformis, L. [E.]
C. vulgaris, Fries. [E.]
C. rostrata, Mx.
Agrostis perennans, Tuck.
Millium effusum, L. [E.]
Scolopendrium vulgare, Smith. [E.]
Athyrium thelypterioides, Mx.
Dryopteris thelypteris, Swartz. [E.]
Polystichum filixmas, Swartz. [E.]
Osmunda cinnamomea, L.
Ophioglossum vulgatum, L. [E.]

II.—Plants Only Found in British Columbia in Canada.

Geranium erianthum, D C. [A.]
Rubus spectabilis, Psh. [A.]
Geum calthifolium, Menz. [A.]
Ribes laxiflorum, Psh. [A.]
Cassiope lycopodioides, Don. [A.]
Rhododendron Kamtschaticum, Pall. [A.]
Trientalis Europea, L. A. [E.]
Swertia perennis, L. A. [E.]
Menyanthes crista-galli, Menz. [A.]
Fritillaria Kamtschatcensis, L. [A.]
Calystegia soldanella, R. Br.

Erythronium grandiflorum, Psh., and *Epipactis gigantea*, Hook., occur in Oregon and Washington Territory and Japan, and may yet be found in British Columbia. *Geum calthifolium*, Menzies, *Geranium erianthum*, D.C., and *Swertia perennis*, L., are recorded from the "north-west coast" and are not yet distinctly localized as from British Columbia. *Menzesia ferruginea*, Smith, *Trautvetterea palmata*, F. & M., and *Spiræa Aruncus*, L., in Canada, belong to the west coast flora, but are also eastern in the United States, and have therefore not been added to the list.

On the Amur there are 78 species not included in Japanese lists, but which also occur in Canada, making in all 299 phænogamous plants, ferns and equisetums common to Canada, and Japan or the Amur. Of these 78 Amur plants, 57 are European and 30 are also Alaskan. Carrying the analysis still further there are seven species not in Japan but common to the Amur and Canada, and which in Canada do not extend, so far as yet known, west of Ontario, and of these seven all are European. Again, of these 78 Amur and Canadian plants, there are four species exclusively in British Columbia in Canada, but all northern in that province and occurring in Alaska, whilst none of them are European.

Considerable interest centres in these brief lists, the one carrying us back to prehistoric times, the other illustrating the influence, among other forces, of currents operating in past ages as well as at the present day. The first list indicates thirty-eight species found to be identical in Japan and Canada, but which in Canada do not range west of the Province of Ontario, and are chiefly not west of Lake Superior, leaving thus an immense gap where they are absent. Two other species, *Phyllodice taxifolia*, Salisb., and *Diapensia Lapponica*, L., which in Canada are northern in range, are not, as yet, known west of Hudson Bay, and may be added to the list of eastern species, making with the Amur species the number forty-seven. Of these, thus common to the eastern side of this continent and Japan and the Amur, only one, *Hepatica triloba*, Chaix, occurs in Alaska, and even there it is not known north of Sitcha. Now, if the migration of European plants was eastward across Asia

and thence to America, can this immense gap be accounted for? Or, are we to draw the conclusion that the migration was not eastward across Asia, but westward to America by connecting stretches of land and by currents, existing in post-pliocene and earlier times, but which subsequent geological changes have effaced? Or, which I think is a more reasonable hypothesis, were there not, to some extent, facilities for migration in both ways, with, it may even be, Canada as the country of origin of many species which afterwards distributed themselves in both Asia and Europe. I shall discuss these three considerations separately.

With regard to the first consideration that, if it is conceded that the migration of plants from Europe took place across Asia, can it be explained why there is such an immense gap in the range of numbers of these European plants, it is to be observed that they are absent from Alaska, from British Columbia, and from the prairies and the vast wooded country to the north of them. The near proximity of Alaska to Siberia, the shallow seas immediately surrounding the Aleutian Islands, the Kurile Islands and the Kamtschatcan coast, and the peculiar lie of these islands, all tend to convey the idea of a probable connection between Asia and America in tertiary times. This connection, a more moderate climate than now exists would have made an effective highway by means of which Siberian, Japanese, and American plants would have intermingled, and such milder climate did exist in early tertiary times there. The Japanese current—the larger branch of which crosses the Pacific Ocean from Japan and skirts the Alaskan and British Columbian coasts—would have also lent its aid during the great lapse of time since, in carrying seeds from the Asiatic to the American coast. It is, however, a singular fact that there are (see list already given) only eleven species which in Canada are exclusively British Columbian, and which at the same time are found in Japan, and that, of these, nine are not only exclusively northern in British Columbia, but are likewise Alaskan, whilst the other two are coast forms. Two only of these eleven species, *Trientalis Europæa* and *Swertia perennis*, are European. This would

at first appear to indicate that the immigration had an eastward flow from Asia rather than a mingling of both American and Asiatic floras. It might, however, be supposed to prove that the migration was only from Japan and the Siberian coast, and was entirely by the Japan current, the direction of which is towards Alaska and then down the Alaskan and British Columbian coasts, any exceptions to the course of this migration being due to exceptional causes. Or, when the fact is considered that out of towards four hundred species, which in Canada do not range east of the Rockies, and most of which do not extend north into Alaska, the two coast forms already referred to, *Calystegia soldanella* R. Br., and *Rubus spectabilis*, Psh., and a rare few, which like *Erythronium grandiflorum*, Psh., and *Epipactis gigantea*, Hook, will no doubt be found in British Columbia, alone likewise occur in Japan, it may rather indicate that the British Columbian flora is of more recent age than the general and northern floras of the Dominion, or, at any rate, that its occurrence in British Columbia is of more recent date than the period when the intermingling of American and Asiatic plants took place. British Columbia is, geologically speaking, recent. The Rocky Mountain region has, at least in the United States, considerable thicknesses of both Miocene and Pliocene strata, and it is therefore certain that the great disturbances which resulted in the final elevation to their present height of these huge mountain ridges which parallel the western coast of North America, took place about or after the close of the Tertiary period. We can even conceive it possible that some of the same great convulsions which produced these mountain chains—one of which extends to the extremity of the Alaskan peninsula—may also have resulted in the severing of the connection between Asia and America, and the creation of the Aleutian and neighbouring islands, where formerly mainland existed. That the present flora of the northern part of this continent was in existence at the close of the Tertiary period, there is little doubt. It was well established at the deposition of the Leda clays of Quebec, and at that time there were many representatives there

of the present European flora. As far back as even the Lignite Tertiary of Eocene age, there were in the New England States and Manitoba, representatives of the modern genera *Populus, Cinnamomum, Fagus, Quercus, Platanus, Sassafras, Nyssa, Carpinus, Aristolochia, Onoclea, Illicium* and *Sapindus,* indicating a somewhat more southern climate than now exists, and some of the species were apparently specifically identical with plants in Canada at the present day. If the view can then be entertained that the intermingling of Asiatic and American species took place prior to the elevation of the Rocky Mountains to their present height, and prior, therefore, to the appearance of British Columbia at that period, it will fully explain the more recent establishment in that province of its present flora and the absence of representatives of that flora in Japan.

The Rocky Mountains, as well as the prairies, would be effective barriers to the spread of many species across the continent. The mountains would present high elevations, special climatic conditions, and a rugged character, whilst the prairies with their vast, open, level, generally treeless stretches of country, would afford constant exposure to drying winds and the sun's rays, and in certain sections, to the not infrequent recurrence of drought. Each of these conditions would, in its turn, prove fatal to the progress of certain trees and plants, and thus, collectively, large numbers would have barriers raised to their range. The prairies have been formed since the elevation of the Rocky Mountains, and are, in some places, still in process of formation. Plants and trees which had not, prior to the formation of these prairies, spread themselves across the continent, would not now be able to extend their range, if the physical and climatic conditions presented by these prairies were unfavourable to progress.

With regard to the second consideration that the migration has been westward from Europe, there is some argument to support it, difficult as it may be from the present relative condition of land and water, to trace any connecting lines of communication. In a paper in this Journal (Canadian Naturalist, vol. 7, p. 221,) when discussing the

marine origin of the Erie clays, so widely distributed in Ontario, I showed that there was some ground for the conclusion that the Alpine flora of the White Mountains of New England, the boreal colonies of plants on the headlands of Lake Superior, the sea-shore species now spread around the Great Lakes, and the fossil plants of the Leda clays near Ottawa had, probably, all—with regard to their present localities—a contemporaneous origin, and were likewise contemporaneous with the formation of the Erie clays. Now, when it is observed that a very large majority of these species, including all recognized in the Leda clays excepting *Potentilla Canadensis* and *Populus balsamifera*, are also found in Europe, the conclusion is inevitable that this intermingling of the floras of the two continents of America and Europe, must have taken place at or prior to the formation of the Leda clays, unless Eastern Canada is to be regarded as the centre of dispersion, and that the general flora of the two continents can date back its origin to or anterior to that time. The identity in species in Europe and America is not, however, confined to certain of the plants hitherto referred to, and to certain of the Arctic plants. There are numerous others of temperate range not found in Japan, which are common to the two continents of America and Europe. Many of them have a general range from the Atlantic to the Pacific, others again do not cross the Rocky Mountains, whilst some, among them the following, do not extend westward beyond Ontario and Quebec:—

Drosera longifolia, L., (in Manitoba also.)
Sagina procumbens, L.
Spergularia rubra, Presl.
Potentilla argentea, L.
Circæa Lutetiana L.
Myriophyllum verticillatum, L.
Scrophularia nodosa, L.
Veronica officinalis, L.
Stachys palustris, L.
Salsola Kali, L.
Typha angustifolia, L.
Naias flexilis, Rostk.
Potamogeton gramineus, L.

Microstylis monophyllos, Lindl.
Juncus articulatus, L.
J. Stygius, L.

These facts clearly prove that if Europe is to be regarded as the point of origin of these various species, their course of distribution must have been westward to Eastern America over some connecting links of communication. If this distribution had been eastward across Asia to this continent, there would have been found full traces of its course not only in Asia but in the vast area of country lying between Ontario and Quebec and the Pacific coast. And yet there are about sixty European species which are not found in Canada west of the Province of Ontario, and a considerable number of these are not in Japan.

The large proportion of these identical species which are arctic, antarctic, alpine, or high northern, would imply means of communication between the two continents in high latitudes or at high elevations, and the full representation of aquatic plants, especially among the *Typhaceæ*, *Lemnaceæ*, *Naidaceæ*, and *Juncaceæ*, would indicate ample facilities for the natural distribution of fresh water plants, as well as a coast line for the maritime plants. Currents, no doubt, frequently account for eccentricities in range, but in this case, the present gulf stream flows in the reverse direction to the hitherto received notion of the course of the migration.

The third consideration that there were facilities for migration, both eastward across Asia and westward to America, and that Canada may even have been the point of origin of many species now apparently native in both Europe and America, is the most reasonable view to take. It has been already shown that there are numerous European species at present thoroughly established throughout the eastern half of Canada, though unknown in the western, which have no representatives in Asia, whilst, on the other hand, there are many European plants limited to the same side of the American continent, which are found native in Japan as well. The conclusion seems inevitable that there must have been facilities for range in both directions.

Another circumstance would seem to show that the migration may have been across America into Asia. The tendency to variation in plants, will result from or be facilitated by the application of new conditions, and once a variation is permanently established, the plant is unlikely to return to its original form under the influence of a still newer set of conditions. The tendency would rather be to further variation. Now, if a species originating in Europe, migrated to America by way of Asia, and variation should take place in Asia, under the influence of the new set of circumstances which its progress across that continent would present, we would hardly expect to find the plant when it, in the long lapse of time, reached America, returning to the original form which it still possesses in Europe. It is much more probable that the American plant, as we now find it, must have come direct from Europe, and that the Asiatic variety was the result of the further migration of the American immigrant into Asia under new conditions which assisted variation, or that the European plant migrated both eastward and westward, undergoing change in the one route and preserving its originality in the other. A third hypothesis is that America was the centre of dispersion. To illustrate these ideas, I give two lists of plants occurring, some on the Amur River, and all in Japan, the one list of species found in both Europe and America, the other of species exclusively American, but each species showing a variation in Japan. My authority for the Japanese varieties are Messrs. Franchet and Savatier.

American and European.

Species in America.	*Represented in Japan by*
Caltha palustris, L.	C. palustris v. Sibirica, Reg.
Cornstium vulgatum. L.	C. vulgatum v. glandulosa, Koch.
Honckenya peploides, Ehrh	H. peploides v. oblongifolia, Gray.
Vicia cracca, L.	V. cracca v. canescens, Max., and v. Japonica, Mig.
Linum perenne, L.	L. perenne v. Sibirica, Mig.
Humulus Lupulus, L.	H. Lupulus v. cordifolia, Max.
Alnus viridis, D.C.	A. viridis v. Sibirica, Reg.
A. incana, Willd	A. incana v. glauca, Ait.
Betula alba, L., in Europe, and v. populifolia, Spach, in Canada	B. alba v. vulgaris, Reg.

Veratrum album, in Europe, and v. Eschscholtzia, Gray, in Canada..... V. album v. grandiflorum, Max.
Chrysoplenium alternifolium, L..... C. alternifolium v. Japonicum, Max.

AMERICAN.

Species in America.	*Represented in Japan by*
Viola pubescens, Ait.....	V. pubescens v. brevistipulata, Fran.
Potentilla Pennsylvanica, L.....	P. Pennsylvanica v. hypoleuca, Reg.
Thuja gigantea, Nutt.....	T. gigantea v. Japonica, Max. Under cultivation only.
Scirpus eriophorum, Max	S. eriophorum v. Nipponica, Fr.
Acer spicatum, Lam	A. spicatum v. Ukurunduense, Midd.

These examples would appear to establish that taking the plants in Europe in the one case and those in Canada in the other, as the types of the species, the variation has taken place with the progress of the plant westward.

Variation has taken place even in the migration of species to British Columbia. Thus, *Actæa spicata*, L., of Europe, has become *Actæa spicata* v. *rubra*, Ait, in Ontario and Quebec, and *A. spicata* v. *arguta*, Torr, in British Columbia and Alaska. *Potentilla anserina*, L., in Europe and Eastern Canada has become *P. anserina* v. *grandis*, Lehm., in British Columbia, and *Sambucus pubens*, Mx., of our eastern provinces has become *S. pubens* v. *arborescens*, T. G., in British Columbia and Alaska.

That there has also been an eastward migration of plants from Asia into America is illustrated by the following plants among others, which occur in both Japan and Alaska, but do not range beyond Alaska eastward or southward into Canada.

Anemone narcissiflora, L.
Potentilla fragiformis, Willd.
Saxifraga Dahurica, Pallas.
Epilobium affine, Bong.
Cnicus Kamtschaticus, Maxion.
Cassiope stelleriana, D. C.
Phyllodice Pallasiana, Don.
Primula cuneifolia, Ledeb.
Gentiana frigida, Hoenke.

(*To be continued.*)

The Royal Society of Canada.

The Sixth Annual Meeting of the Royal Society of Canada was held at Ottawa on the 20th of May. The attendance was fairly large, Section IV. being most strongly represented both by papers presented and by members attending. Among the general measures introduced, it is gratifying to note that initial steps were taken, looking to the establishment of a Society Library.

The address of the President, Rev. T. E. Hamel, which was delivered at the opening of the Wednesday evening meeting, dealt chiefly with the present condition of scientific education and the choice of suitable vocations by young men. Referring to the opportunities for scientific education in Canada, he urged the necessity of giving this important question much more attention than has been bestowed upon it in the past.

The officers elected for the following year were:—

President—Dr. G. Lawson, of Halifax.

Vice-President—Sandford Fleming, C.E., of Ottawa.

Secretary—Dr. J. G. Bourinot, of Ottawa.

Treasurer—Dr. J. A. Grant.

Of the Sections, the presidents elected were:—

I, M. Faucher de St. Maurice, of Quebec; II, Rev. Dr. G. M. Grant, of Kingston; III, Dr. T. Sterry Hunt, of Montreal; IV, Dr. Robert Bell, of Ottawa.

In opening Section III, the President, Mr. Thos. Macfarlane, read an address on "The Utilization of Waste." He referred particularly to improvements made during the last twenty-five years at the Friburg Iron Works, where all arsenical, sulphurous and other fumes are now condensed and converted into merchantable articles, which yield a fair return on the cost of production. The lands surrounding these works are now cropped profitably, whereas in former years the iron masters were obliged to pay heavy sums for damage done by the wasted and noxious vapors. The separation of phosphorus from iron and the direct application of the phosphated slag as a fertilizer, as now being done at Middleburgh, was mentioned as an instance

both of improved manipulation and the profitable application of an inferior element. The sulphur residues of soda works, and the manganese and calcium chloride waste of the bleach manufacture, were also considered.

Several papers of value were read. Among them we may note the following:—

In dealing with milk analysis, Dr. Ellis, of Toronto, gave a *resumé* of the various processes employed, and exhibited a table showing comparative results obtained by each method. Mr. Thos. Macfarlane, of Ottawa, pointed out the advantages of the asbestos method of milk analysis, which seems to possess special merits over the older processes. A known quantity of milk is poured upon the asbestos, dried, weighed and percolated with petroleum ether, the operation being conducted in tubes specially made for the purpose. Expedition and accuracy are advantages gained by this method—a dozen samples being operated upon at once.

Mr. A. McGill, of Ottawa, presented "Notes on the Analysis of Coffee," and among other things showed that the extent of adulteration with chicory, can be readily determined by exhausting with boiling water and taking the specific gravity of the solution at 60° F.

Dr. B. J. Harrington, of Montreal, dealt with "The Sap of the Ash-leaved Maple (*Negundo aceroides*). This paper gave the details of an examination of the sap of the ash-leaved maple, carried out in the month of April last. Two trees, thirteen years old, and grown at Montreal from the seed, were tapped early in April. The sap was examined daily until the 20th of the month, after which the flow ceased entirely. Tables were given, showing the daily variations in the flow and density of the sap, as well as the percentage of sugar, &c. From the results stated, it appears that the average proportion of sugar in the sap of one tree was 2.33 per cent., and in that of the other 2.42 per cent. The mineral constituents of the sap were found to consist chiefly of calcium salts, including a considerable proportion of calcium phosphate. The interest of these determinations is increased from the fact that the sugar obtained was of a very fine flavor and quality, while the ease and rapid-

ity with which the trees can be grown, renders this a somewhat important source of sugar. The paper also contained determinations of sugar in the sap of the true sugar maple (*Acer saccharinum*), the red maple (*Acer rubrum*) and the butternut (*Juglans cinerea*).

The most important paper of the section related to "The Digestibility of Certain Varieties of Bread," by Dr. R. F. Ruttan, of Montreal. The results stated were derived from a series of experiments on bread made with yeast, baking powder, &c., and included statements relative to the retarding influence of several mineral salts upon digestion.

Other papers of this section were as follows:—

"On a Specimen of Canadian Native Platinum from British Columbia," by Dr. G. C. Hoffmann; "Stelliform Snow Crystals, in Relation to Stellate Crystallizations Generally," by Prof. E. J. Chapman; "The Indirect Analysis of Phosphate Samples, as a Check on Commercial Analyses," by Prof. E. J. Chapman; "Extension of the Use of Oblique Co-ordinates in Geometry of Three Dimensions," by Dr. Johnson, and "Investigation as to Maximum Bending Movements at Points of Support of Continuous Girders of *n* Equal Bends," by Prof. H. T. Bovey.

In Section IV. papers of very great interest and value, and embracing more than the usual range of subjects, were presented. Those by Sir Wm. Dawson "On the Correlation of the Geological Structure of the Maritime Provinces of Canada with that of Western Europe," and "Notes on Fossil Woods from the Western Territories of Canada," are printed elsewhere in abstract.

The address by the President of the Section, the Abbé Laflamme, specially related to Dr. Sarrasin as one of the most eminent of the earlier scientists of Canada. Dr. Sarrasin was Royal Physician at Quebec in the early part of the 18th century. He was deeply interested in the study of natural history, but although he discovered our common pitcher plant, which was named in his honor by Tournefort *Sarracenia*, and made several collections of plants, his interest was chiefly in Zoology. In this department of science he did some very valuable work, which was

embodied in memoirs to the Academie des Sciences. Of all those who labored to advance the cause of science in the earlier period of Canadian history, Sarrasin occupies the first place.

Of the botanical papers we note the following:—

The "Marine Algæ of New Brunswick," by Dr. G. U. Hay, referred to the more important species of Marine Algæ found on the eastern and southern coasts of New Brunswick, with notes on their distribution and economic uses. The occurrence of rare forms, such as *Fucus serratus* and *Polysiphonia fibrillosa* were mentioned, with particular reference to the localities in which they are found. To the paper was appended a list of the Marine Algæ of the Maritime Provinces, enumerating with notes, some eighty-four species.

In his paper on the Canadian Species of *Picea*, Dr. George Lawson pointed out that descriptions of three species of *Picea*, natives of Canada, have long existed in botanical works. Lumbermen have also commonly recognized as distinct, the white, red and black spruces, and the real or supposed differences that exist in the qualities of their timber. Yet the specific limits of these three important forest trees have not been clearly defined, and some botanists of unquestionable authority, doubt whether they are not all forms of one species, passing into each other through intermediate variations. The object of this paper was to define with more precision the specific limits of these trees, and their relations to each other. Attention was called to characters, hitherto overlooked, whereby these species may be more clearly distinguished. An attempt was also made to refer to their proper species, the several names used by the numerous writers who have described these trees.

In a contribution to our knowledge of "Arctic Plants Occurring in New Brunswick, with Notes on Their Distribution," by Rev. James Fowler, the author shows that the laws governing the geographical distribution of plants are not fully understood. Their limits are not determined by parallels of latitude, nor altogether by isothermal lines.

The Lapland flora is very rich, the Siberian excessively poor in the same latitude. Before the glacial period a homogeneous flora covered the Arctic regions. It was driven south by the cold and at the return of a higher temperature followed the retreating snows to the north, whence it had originally migrated. During their homeward journey, many forms found congenial retreats in New Brunswick, and they linger there still. The causes that have secured this result are considered in the following aspects:—

I. Geographical position and surface contour. The Province is divided into three geographical sections, each of which possesses characteristics fitting it for the abode of Arctic plants.

II. The Arctic current and its fogs cool the temperature along the sea coast, causing cold rains and sea-breezes in spring. The cold water and fogs of the Bay of Fundy are favorable to the growth of Arctic plants. The average temperature of the seasons along the coast, according to the meteorological reports, shows a cold area.

III. Division of the Arctic regions into five districts. List of Arctic plants in New Brunswick in tabular form, showing the Arctic district in which each occurs.

In "A Review of Canadian Botany from the First Settlement of New France to the year 1800," by Professor D. P. Penhallow, the author brings together the most important facts relating to the general history of the early Canadian botanists. It is shown that, during the long period from the time of Jacques Cartier to the beginning of the present century, the botanists who took any active part in developing the flora of Canada, were very few, and of these none were native born. A just tribute is paid to the early missionaries, whose work in botany, though limited, was often of a valuable character. It was not until a comparatively late period that explorers manifested any special interest in such work, so that prior to the advent of Peter Kalm such progress as was made, depended wholly upon the missionaries and a few resident officers or physicians, whose names, like those of Sarrasin and Gaultier, find a permanent place in the history of botanical progress. Several impor-

tant points receive additional light, and facts of interest in various directions connected with the early flora and history of the country are stated. The paper is the first part of that which, at a later date, will present a complete outline of Canadian botany. It is, therefore, appropriate that it should embrace a list of all the botanical writers for the period named, together with brief biographical data, and a list of each author's publications so far as they relate to the botany of Canada.

In an account of "The Flora of Hudson Strait, with Remarks on the General Distribution of Plants on the Northern Shores of America," Dr. Lawson states that the northern plants form an element of interest in the Canadian flora, and have received special attention from Sir John Richardson, Sir Joseph Hooker, and other writers. Collections have been made from time to time and lists published, as in Myer's "Labrador Flora" and the reports of the Arctic expeditions. But our knowledge of these plants is still necessarily imperfect. Recent collections have been made by Dr. Bell and others at stations in Hudson Strait, and lists published from determinations made by Prof. Macoun. These have been supplemented by additional material and information obtained in the summer of 1886, by Mr. Payne, of the Meteorological Service, and Mr. J. W. Tyrrell, F.L.S.

Mr. Payne made careful observations on the nature of the special localities or habitats where the plants were picked, as regards nature of soil, elevation, protection, &c.; also of the periodical phenomena, dates of budding or sprouting, leafing, flowering, seed ripening and autumn withering. These observations are tabulated. One object of this paper is to assist in removing the hindrance to the collection of material and information of this desirable kind, due to the circumstance that many of our northern plants are imperfectly described under a multiplicity of names through scattered and rare or inaccessible works.

The geological papers were numerous and embraced several of importance. "The Utica Formation in Canada," by H. M. Ami, gave a sketch of that division of the 'Cambrian Silurian' or 'Ordovician System,' in which new facts

in regard to its stratigraphy and palæontology are recorded.

In "Notes on the Physiography and Geology of Aroostook County, Maine," Professor L. W. Bailey, gives a paper supplementary to that published in the Transactions of last year, on "The Geology of Maine, New Brunswick and Quebec." It treats more particularly of that portion of Aroostook County, Maine, which lies along the frontier of New Brunswick, and is included between the St. John River and its tributaries, the Fish River, and the Aroostook. The strata exposed along the last named stream, between Ashland and Presque Isle, are compared with those previously described about Square and Eagle Lakes, on the east branch of Fish River; and additional evidence, derived both from stratigraphy and fossils, is furnished, tending to show that, within the area referred to, the rocks previously regarded as Devonian are really of Silurian age. Indirectly, the facts detailed are of interest as bearing on the geology of Carleton, Victoria and Madawaska counties, New Brunswick, and the region of Lake Temiscouata, in Quebec, in each of which similar relations have been observed.

"Some Recent Developments in Archæan Geology," by Andrew C. Lawson, deals with such recent work in Archæan geology, particularly in the Lake Superior region, as tends to modify commonly accepted notions of rock metamorphism. The various kinds of crystalline rocks which, under the old theory, were regarded as typically metamorphic, are considered briefly, and their true origin and history, as revealed by microscope methods of investigation, are stated. It is held by the writer that the term metamorphic can at present be applied only to a small portion of the rock formerly so designated, and that even this limited application will probably be still further restricted when the rocks become better known.

The stratigraphical and petrographical work of Professor Irving of the U. S. Geological Survey is next briefly reviewed, the principal results of which are the correlation of the Huronian with the Animike and its equivalents on the south shore of Lake Superior; the establishment of the unconformity of these formations to the older rocks, and the

reclaiming of the Huronian in its various geographical groups from the more distinctly crystalline complex rocks which may properly be called Archæan. The rocks of the Archæan complex thus simplified by the removal of the Huronian, are next considered in the light of observations made by the writer in the Lake of the Woods and Rainy Lake regions, and the origin of the rocks commonly called Laurentian, together with their age relatively to other rocks of the Archæan complex, is discussed.

In "Rock Stretching," by the same author, the writer refers briefly to the interesting observations and conclusions of Lehmann, Baltnzer, Reusch and other investigators in Europe on the phenomena of the stretching and squeezing of crystalline rocks under the enormons pressures which have effected the folding of the earth's crust. Instances of stretching are described in rocks from the Rainy Lake region as observed not only in the field, but also, more particularly, in thin sections, under the microscope. Diabases and quartz-porphyries are dealt with more especially, and examples of the shattering and tearing asunder of their constituent minerals are given. An attempt is also made to reduce to measurement the extent to which such stretching may go without the complete obliteration of the original structure of the rock.

In a communication "On the Classification of the Trilobites," Professor. E. J. Chapman, proposes a new grouping of these indistinct crustaceans; one based essentially on structural in place of stratigraphic affinities. Since the very general rejection of Barrande's classification—the leading subdivisions of which are based on a single special character—stratigraphic considerations have unduly influenced, it is contended, the proposed collocations of these types. Many forced and arbitrary groupings have thus been made; and forms, on the other hand, closely related by general structure, have been widely separated. Lines of evolutionary descent, where traceable, become thus obscured. In the proposed classification, four leading sections, with thirteen groups and twenty-three families, are adopted.

A paper by G. F. Matthew on "Illustrations of the Fauna of the St. John Group. No. IV. On the Smaller Eyed Trilobites of Division I, with a Few Remarks on the Species of the Higher Divisions of the Group," deals with trilobites including representaiives of the genera Ellipsocephalus, Agnostus, Liostracus, Ptychoparia and Solenoplura. The author proposes to avoid some of the confusion as to descriptions of trilobites, by limiting the characters by which the several genera are defined. The classifications of the English, German, Scandinavian and American palæontologists are reviewed. Different genera are compared by tabulating their leading characters. The author points out the difference in the young stages, and traces their development. The necessity of recognizing the changes which take place during growth is pointed out. Comparatively little is yet known of the origin of the primordial fauna, and it is shown to be unlikely that the variety of types found at the base of the Cambrian system, all had their beginning then. It may be surmised that the ancestors of the primordial forms had their origin in some hitherto unexplored part of the earth—perhaps the bed of the Atlantic Ocean.

The second part of the paper refers to the higher Cambrian faunas of the Acadian region. The St. John group appears to represent nearly the whole Cambrian age. A collection of fossils from Cape Breton, examined by the author, throws some light on the life of this group of rocks. The fauna of the Potsdam sandstone is considered equivalent to that of the shallow-water deposits of the St. John group.

A paper of considerable interest was that presented by Mr. Amos Bowman, of the Geological Survey, "On the Gold-bearing Rocks of British Columbia." The author described the formations represented in the Cariboo district, with their characteristic localities and subdivisions. The unconsolidated tertiary deposits of Cariboo, better known as its deep-placer mining ground, was also considered, after which followed descriptions of other mining districts in British Columbia, less noted than Cariboo; the

middle and lower Fraser River districts; the Fraser River gold-bearing slates of palæozoic age; the mesozoic and tertiary rocks yielding gold; the later tertiary auriferous deposits generally; the post-tertiary auriferous deposits in the districts described; and finally, an account is given of the discovery of the hidden wealth. It was always a question of enrichment in gold to a stage for profitable mining. The conditions of practicable placer-mining were elucidated, as well as the first gathering of the gold into quartz veins. The paper concludes with a brief description of the orography and the rocks of the Cordilleran system in Canadian territory, their character as compared with the Laurentian-Appallachian system, and the significance of some of the geological features in relation to national development.

Some additional facts relative to glacial action are contributed by Dr. J. W. Spencer, in "Notes on the Erosive Power of Glaciers as seen in Norway." The three principal glaciers of Norway were visited by the author in 1886. It has hitherto been supposed that stones and boulders are always held in the bottom of the glacier with sufficient firmness to cause them to grind or groove the surface of the rock on which the glacier moves, but the author questions this in cases where the temperature is near the melting point, and gives examples of what he saw. Owing to its viscous or plastic nature, the ice then flows around obstacles, instead of abraiding them as a rigid body would do. At low temperatures, ice is capable of holding stones and sand like graver's tools, and when its mass is much mixed with them, it no doubt planes, scratches and polishes the rock-surface. The action of glacier-ice on meeting with solid obstructions, and in ploughing up loose materials, is described from the author's own observations. The tendency of his notes is to show that the erosive power of former glaciers in excavating lake-basins, etc., has, perhaps, been overrated, and he supplies a plea in favour of the action of ice carried forward with greater velocity by ocean currents. The observations of other writers, who agree with him in this view, are quoted, and the conclusion is

reached that the action of land ice is not sufficient to account for our so-called glacial phenomena.

"Illustrations of the Fauna of the St. John Group. No. V. On the Great Acadian Trilobite, Paradoxides Regina," by G. F. Matthew, contains a description of the largest known animal of the Cambrian age. About 1745-40 Linnæus described the *Paradoxides Tessini*, and in 1759 a second species. Two other large species are found in Northern Europe. A Paradoxides was first found in America in 1834, and others have since been discovered on this continent and in Europe. Some of them are very large. They belong to both the first and the second Fauna of Barrande. *Paradoxides Regina* is described, and it is supposed to be the largest known trilobite, one complete specimen measuring fifteen inches in length by twelve in width, while fragments of others indicate still greater proportions. It is closely allied to two other species, but is probably distinct from them.

In "The Diurnal Motion of the Earth in Its Relation to Geological Phenomena," by W. A. Ashe, the author points out the possible connection between the lines of folding or upheavel of the crust of the earth, and the effect of the rotation of the planet on the rigid as compared with the fluid portions, and of the necessity of the solid parts accommodating themselves to the ever-contracting fluid portion. He shows that the area of present active volcanoes ought to be limited by a zone of 45° on either side of the equator, and that the greatest activity ought to be about latitudes 36° 20′ N. and S.; also that the highest mountains should be found about these parallels. The probable flow of ocean currents at different geological periods is indicated. The author maintains that the earth is made up of three distinct elements in equilibrium; first, the solid nucleus, in which the polar diameter is to the equatorial, as 299 is to 300; second, the waters, with a greater difference between their diameters; and third, the atmosphere, with a still greater difference. We would, therefore, have less water and much less atmosphere at the poles than at the equator, but their physical properties and other causes modify this apparently

inevitable result. He then treats of cataclysmal floods, and shows that they are not within the limits of possibility.

Dr. A. P. Coleman contributes a valuable paper on the "Microscopic Petrography of the Drift of Central Ontario." After giving a general description of the drift in Central Ontario, the author enumerates the microscopic characters of the various crystalline rocks (chiefly Laurentian) found in these deposits in the vicinity of Cobourg. He then proceeds to classify them according to Rosenbusch's method under the two classes—acid and basic rocks, distinguishing a massive and a schistose series in each. The drift of Cobourg, which is derived from the north-eastward, is shown to contain a large variety of the older archæan rocks. Hornblende proved to be present in the greater number of specimens examined. The presence of a considerable group of rocks, characterized by containing scapolite as an essential mineral, is the most interesting point brought out in the investigation. This paper is illustrated by six coloured plates of microscopic sections of rocks.

Mr. C. H. Merriam appeared before the Society in behalf of the United States Department of Agriculture, and presented an address relative to economic ornithology. He laid special stress upon the ravages of the rice bird, and indicated the steps that were being taken by the United States authorities to check it. He also dwelt at some length upon the English sparrow in its relation to insects, and its value as a game bird. He also read a paper on the "Migration of Birds," in which he pointed out that their annual increase, which would otherwise reach enormous proportions, was controlled by the conditions attending their passage from one country to another, by reason of which great numbers were killed.

Mr. Ernest E. Thompson discussed a question of much interest in his "Notes on the English Sparrow, *Passer Domesticus*." Reference was made to the extraordinary rate at which this imported bird is multiplying in North America and spreading over the continent, to the exclusion of some of our native sparrows. Its influence on agriculture must be great, and it is very desirable to ascertain as

soon as possible, whether this influence is for good or evil. The experience of the farmers in Britain and other countries is cited, also that of Canadian agriculturists as far as it has gone. The recent invasion of the Muskoka and Nipissing districts by this sparrow, is described in connection with its steady progress westward. The author's personal observations on its encroachment on the domains of the native birds is given. He showed the bird to be essentially a grain-feeder, although the young destroy many grasshoppers. On the other hand, our native birds, as a class, are eminently beneficial to agriculture, and therefore should not be suffered to retreat before the invader. In conclusion, the author gives a table showing the results of his dissection of over 100 gizzards of English sparrows, shot in the vicinity of Toronto.

A paper by Mr. Andrew Downs, "On the Birds and Mammals of Nova Scotia," contains a list of the birds found in Nova Scotia, whether permanent or migratory. Notes are given of their observed distribution in the province, the nature of the localities frequented by them, their food, breeding and habits generally, with the times of arrival and departure of the migratory species. A list is also given of species that have been found, from time to time, in the province, but which are not residents nor regular visitors.

Dr. G. M. Dawson continues his ethnological studies in "Notes and Observations of the Kwakiool People of the Northern Part of Vancouver Island." This paper enumerates the tribal subdivisions of the Kwakiool people, stating the places inhabited by each, and giving particulars as to migrations, changes in village sites, etc., in so far as these can be ascertained. Notes on the mode of life and customs of the people are then given, together with folk-lore, religious ideas, superstitions respecting "medicine" or "sorcery" and traditions attaching to particular localities. The custom of the "potlatch" or "donation feast," as practised by these people and other tribes of the coast of British Columbia, is explained, and some suggestions offered as to the mode to be adopted in bettering the condition of the Indians

of the North-West Coast. To the paper is appended a vocabulary of about 700 words of the language of the tribes referred to in its different dialects.

The meeting as a whole was a successful one, the attendance being fairly large; of the thirty papers in Section IV—not counting those presented by special delegates—one-half were by persons not members of the Society, a number far in excess of former years. This is a tendency which should be promptly discouraged. While it may be desirable to admit the papers of non-members on application, and under suitable restrictions, their solicitation, or their unlimited admission, is an indication which can be viewed only with apprehension. Only an injurious influence can result, since the admission of such papers not only places the regular members at a disadvantage, by consuming time which would otherwise be devoted to discussion, but it reduces the advantage of membership to its lowest terms. The final result must be either an expansion of the Society much beyond its present limits, or a sensible decrease in membership.

Reviews and Book Notices.

The Ainos.

Conspicuous among the exceedingly creditable memoirs issued by the Imperial University of Japan, is a recently issued number—the first from the College of Literature—by Prof. B. H. Chamberlain, on "The Language, Mythology and Geographical Nomenclature of Japan, Viewed in the Light of Aino Studies, including an Ainu Grammar." Although not dealing with the Ainos exhaustively, this memoir covers the ground indicated by the title, very thoroughly and conscientiously, and it is by far the most important recent contribution to our knowledge of these people, that has appeared.

Prof. Chamberlain has been fortunate in securing the co-operation of Mr. Batchelor. This gentleman was intimately

associated with the present writer, a few years since, in studying the Ainos. His familiarity with their language and also with the Japanese language, as well as frequent and continued residence among the Ainos, enables him to present work of the highest value. His "Ainu Grammar" is a most welcome and important contribution, and he is able to speak with an authority no one else can claim.

The experience of Prof. Chamberlain in gaining trustworthy testimony, appears to have been that of all his predecessors, for "As a warning to others who might be inclined to accept statements of fact made by the Ainos with regard to their own history, the present writer would remark that, such statements made by an uncultured people are quite untrustworthy, unless supported by extraneous evidence. Tests of Aino inconsistency and unreliableness, crop up whenever proof can be applied." This will doubtless apply to all barbarous or semi-barbarous people whose moral sense is not yet raised to that level which enables them to distinguish between the value of truth and falsehood; and in the case of the Ainos, this may apply with greater force, on account of the extent to which, for centuries, they have been accustomed to dissimulate in their relations with the Japanese. Our own experience has repeatedly shown that constant and more than ordinarily frequent verification was needed.

The author deals with the physical characteristics of the Ainos very briefly, and only incidentally. He inclines to the view which has so often been expressed, that extreme hairiness is a peculiarity of the people, and refers to ancient Chinese accounts which speak of them as the "Hairy Men." In the absence of exact data, however, we hardly feel satisfied with his explanation that smoothness of skin is the result of crossing with the Japanese. To be sure he notes that such half-breeds are usually smooth, but then he does not attempt to show that the pure type are never otherwise than hairy. While this may be an important factor, our own observations would lead us to believe there are other causes, as already pointed out.[1]

[1] Can. Rec. Sc. II. 119.

The Aryan origin of the Ainos has been insisted upon by several ethnologists, and is indeed the view most generally held at the present time. It is therefore a matter of great interest to find that certain affinities of language are now pointed out, offering as they do, additional proof of the probable correctness of this view.

Resemblances between the Japanese and Aino languages, are very properly shown to be only apparent. Every one familiar with these people, knows that they use many Japanese words and expressions, and from this the inference has more than once been hastily drawn, that there is an intimate relation between the two people. It would be quite as correct, on similar grounds, to establish an affinity between the European and North American Indian. Prof. Chamberlain, however, shows very clearly, that while these languages are fundamentally distinct, they have become more or less blended as a natural consequence of the intimate relations of the two people. Nor could we look for any other result, when such relations have extended over a period of twenty-five centuries. Borrowings from one to the other were frequently made, and thus on the one hand we get the Japanese form in the Aino language, while on the other, Aino names persist wherever these people have once had a habitation. Such names thus become a part of the Japanese language, although, usually, in a perverted form; sometimes the modification is carried so far as to render the original form of the word very obscure and hard to determine. These changes, occurring as they are at the present day, afford a most important clue to similar changes in the past, and thus, as we shall see later, serve a most important purpose in tracing the original distribution of the Ainos Of familiar examples we may give the following:

Atkesh becomes *Akkeshi; Shikot* has been changed to *Chitose; Poronai* is *Horonai*, and a most modern example, since the change has been made within fifteen years, is the conversion of Satsuporo into Sapporo. That these changes have, on the whole, been effected rapidly, and, as in the last case often without any special transitional forms, is well shown by the fact that in the province of Aomori—

the last province in northern Honshiu from which the Ainos were displaced, on their retreat into Yezo—only 5 to 10 per cent. of Aino names are now preserved. Yet the displacement from that province, has been effected only within the last hundred years. The well recognized persistence of Aino names, however, is very properly taken advantage of to determine the former dispersion of the people. This persistence of place names for many centuries, again gives rise to the pertinent query, if certain of them of obscure meaning may not similarly have been derived from the predecessors of the Ainos? for that predecessors there were, is accepted as probable by the best ethnologists, in spite of a few efforts to show that the various kitchen middens with their pottery, originated at the hands of the Ainos.

The most important question involved in the present memoir, is the former distribution of the Ainos, and the evidence directed toward its solution is of great value. The view most generally held is,[1] that they descended from the north and gradually dispersed over the whole of Japan, being afterward gradually driven back by the Japanese. Historical evidence shows that the Ainos were at least as far south as Tokyo, and within recent periods, they have occupied the north of Honshiu. At present, they are exclusively confined to Yezo and the islands to the north, but their range of distribution, like that of the North American Indian, is being continually reduced.

But to the solution of this question, Prof. Chamberlain directs the evidence of place names with such success as to leave little room for doubt. Traces of them are thus found to the extreme southern limits of Japan, and on the islands of Ikē and Tsushima; so that these people were undoubtedly the predecessors of the Japanese all over the Archipelago. And again, the author directs attention to the probability that, since the surnames of ancient families were often derived from villages and places, the names of many families of the present day, doubtless represent the influence of the Aino upon the Japanese language.

[1] Can. Rec. Sc. I, 11.

The distinctive purity of the Aino and Japanese has often been remarked upon as peculiar, in view of the well known inter-marriages occurring all along the lines of contact. This is explained upon the ground that the offspring of the second generation, not only become few in number, but that they are barren or so poorly developed as to terminate the cross—an explanation which appears to meet the case very satisfactorily. Pure races thus continue dominant, while the weaker is continually being thrust more and more toward the extreme limits of existence.

The author concludes his memoir with an extended bibliography, embracing 465 titles. These are chiefly derived from native authors, and in several instances include writings by foreigners.

VEGETABLE MORPHOLOGY.—The Clarendon Press have recently issued a translation of Goebel's "Outlines of Classification and Special Morphology," by H. E. F. Garnsey. This is one of the most welcome of recent botanical works, and gives the student the results of the most recent researches. The style is admirable—the expressions are direct and clear. A particularly commendable feature is the effort to reduce our discouragingly confused terminology to something like uniformity. The result is not as complete as might be desired,—nor is that altogether possible at present—but a vast improvement has been made; homologous structures being designated by the same term throughout. The antiquated distinction of Cryptogam and Phænogam is here done away with, and the intimate relations between the Vascular Cryptogams and the Gymnosperms is more clearly developed. The division of all plants into—I. Thallophytes; II. Bryophytes; III. Pteridophytes; IV. Spermaphytes, is one which commends itself strongly to the modern botanist. The Myxomycetes and Diatomaceœ are very properly placed in separate groups of uncertain affinity; while the old groups, Algæ and Fungi, are here restored. The book should be in possession of every student of botany.

FROST REPORT.—Volume VII. of the *Journal of the Royal*

Horticultural Society is wholly devoted to a report by the Rev. Geo. Henslow on the effects of the severe frost which visited Great Britain in the winters of 1879-80 and 1880-81. The report contains a very large number of facts derived from reports sent in from various parts of Great Britain. In summing up the more important results obtained from these data, Mr. Henslow chiefly points out the fact that age and maturity of structure for any season are most important factors in the ability of plants to resist severe cold. Plants which continue their growth late in the season, are much more susceptible to cold than those which ripen their structure earlier.

Proceedings of the Society.

The fifth monthly meeting of the Society was held on Monday, March 28th, the President, Sir Wm. Dawson, in the chair.

A letter from Mr. Thos. Macfarlane was read relative to the death of Mr. Charles Robb, C.E., when the following resolution was adopted:—

"That this Society has learned with regret, of the decease of Mr. Charles Robb, C.E., who was for a long time one of the most useful members of the Society, and one of its officers, as well as the author of valuable papers contributed to its meetings." It was further resolved that a notice of Mr. Robb's life be published in the Record of Science.

Mr. Joseph Bemrose was elected a delegate to represent this Society at the annual meeting of the Royal Society of Canada.

Mr. Ernest Ingersoll was duly elected a member of the Society.

Specimens of Canadian mica, having garnets and other minerals imbedded in it, were exhibited by Mr. J. A. U. Beaudry.

The President presented a paper, by Dr. G. M. Dawson, on "The Occurrence of Jade in British Columbia," and ex-

hibited several interesting specimens of Jade implements from that locality.

Prof. J. T. Donald then read a paper on "Chemical Notes," wherein he referred particularly to the action of organic matter on iron, and touched upon the value of peat for fuel purposes, as prepared under a new process invented by Mr. Aikman. He also submitted several samples of the prepared fuel.

Sir Wm. Dawson referred to the popular meetings of the Somerville course of lectures, which had been even more interesting than on former occasions, and it was resolved that the thanks of the Society be specially tendered to each of the gentlemen who had contributed to their success.

The sixth monthly meeting was held on Monday, April 25th, Sir Wm. Dawson in the chair.

The minutes of the previous meeting were read and confirmed, when Mr. W. D. Lighthall was nominated to ordinary membership.

The Librarian announced the receipt of several donations to the Library. Prof. Penhallow submitted a biographical sketch of the late Charles Robb.

Dr. J. Baker Edwards, John S. Shearer, Geo. Sumner, A. H. Mason, Prof. Penhallow, A. T. Drummond and W. T. Costigan were appointed a "Field Day Committee" with power to add to their numbers. John S. Shearer, A. T. Drummond and the Recording Secretary, were appointed auditors for the present session.

Prof. Penhallow presented some notes on the Aino which elicited an interesting discussion. Sir Wm. Dawson then presented the outlines of a project, prepared for the Royal Society of Canada, for a union of geological surveys and societies throughout the Empire. This proposition drew forth a number of interesting remarks from several of those present.

The Annual Meeting of the Society was held on Monday, May 30th, the President, Sir Wm. Dawson, in the chair.

The minutes of the last annual meeting and the previous

monthly meeting of the Society were read and confirmed.

Mr. Robert Reford and Dean Carmichael were proposed for membership, and under suspension of the rules, these gentlemen and Mr. W. D. Lighthall were duly elected.

In his annual address the President, Sir Wm. Dawson, referred to the good and useful work done by the Society in the past year, in maintaining and increasing its museum; in providing an interesting and instructive course of free lectures in physiological subjects by eminent specialists, and of a character likely to be most beneficial to the large audiences which had assembled to hear them; in the continued publication of the RECORD OF SCIENCE, and in the commencement of a series of observations on underground temperatures. He then referred to fourteen original papers which had been read and discussed at the meetings. Of these five had been geological, the others had related to botany, zoology, ethnology and chemistry, and ten subjects of a general character. These papers had been published in the RECORD OF SCIENCE and constituted an important contribution to scientific progress in this country. They showed that the original work of members had been distributed somewhat generally over the field cultivated by the society. He noticed the contents of these papers, and showed that while adding new facts to our knowledge of nature, several of them were of a very practical and useful character. In concluding this part of his remarks, he thanked the Provincial Government for the aid given to the publication of the RECORD OF SCIENCE, which he characterized as one of the most useful and creditable exponents of Canadian scientific work. He then referred to the movement for an Imperial geological union, which he had explained in one of the meetings of the Society, which had been sanctioned by many of the most eminent men in Great Britain and its dependencies, and had been adopted by the Royal Society of Canada at its recent meeting. He hoped it would form the beginning of a new era in the geological work of Great Britain and her colonies, and through them would prove a great benefit to the scientific progress of the world. The society proposed to begin its new year with an excursion

to the Laurentian hills of St. Jerome, and he hoped that this and all its other operations for the ensuing session would be eminently successful, and would be characterized by the same harmony and earnest spirit which had prevailed in the past year.

Mr. John S. Shearer next submitted his report as Chairman of the Council.

Report of Chairman of Council.

The Council of the Natural History Society, in submitting for the consideration of the members of this institution, the Annual Report of the work transacted since the last annual meeting, are pleased to be able to state, that the session just closed has been one of the most successful and instructive in the annals of the Society. Not only has it been one of much valuable research and study, but several features introduced into the proceedings during the course of the year, have tended to give it a popular character that cannot fail in commending it more generally to the public and resulting ultimately in benefit to the Society.

The usual amount of routine business has been regularly performed during the year. The Council has held its monthly meetings to the number of eleven, and there have been six regular meetings of the Society, at which valuable and instructive papers were read.

The progress of the Society, as far as membership is concerned, has been on the whole satisfactory, seventeen new members having been elected during the year.

The Museum has been well patronized, having been visited by a total of eighteen hundred persons. During carnival week, it was thrown open free to visitors, when five hundred and eighty-two availed themselves of the privilege.

The Library has received considerable attention during the year and is in a satisfactory condition. The society suffered the loss of an earnest worker in this connection by the death of Mr. Chas. Robb, who devoted much time to arranging the books with Mr. Beaudry, the chairman. The Council is pleased to be able to acknowledge a donation of

valuable books from the Smithsonian Institute of Washington, D.C.

The building of the Society is in good order—further improvements having been made during the year to the ventilation of the hall by the House Committee. The hall has been again leased to Mr. Baynes's congregation for another year, on the same terms as last.

The Council regrets to state that the Provincial Government saw fit last year to reduce the grant from $600 to $400, thus greatly retarding the efforts of the Editing Committee, who, however, are deserving of praise for the manner in which they have issued the Record, notwithstanding much difficulty.

In the early part of the present year, the Council appointed a committee to urge upon the Quebec Government the renewal of the original grant of $1000. A petition was drawn up on behalf of the Society, and forwarded to the Hon. James McShane, Minister of Agriculture and Public Works. In answer to the petition, a telegram has been received from the Hon. Minister, stating that $800 would be given to the Society.

The effort made by the Corresponding Secretary to obtain a grant from the Elizabeth Thompson Science Fund, for the purpose of investigating underground temperatures, has been successful, and the sum of $200 placed in the hands of the Society for that purpose. The Council has appointed a committee to carry out the work.

The Annual Field Day, which has always been looked forward to with great interest by the members and friends of the Society, was held at St. Hilaire, on the 5th June last, and the occasion was one of the utmost success and enjoyment. About 140 ladies and gentlemen, under the direction of the Field Day Committee, visited this beautiful spot. Upon their arrival at the hotel (as is customary on these occasions) the excursionists dispersed in parties, some for botanical and entomological research, others to enjoy the beauties of the lake and the surrounding woods, and a number, among whom where Dean Carmichael, Dr. Harrington and Dr. J. Baker Edwards, ascended to the

summit of the mountain. Addresses were delivered on the mountain top, by Dean Carmichael and Dr. Edwards, after which they all returned to the hotel for lunch. About 3 o'clock, the whole party assembled on the veranda, when Dr. Hunt gave an instructive address on the geological history of the mountain and surrounding country, at the close of which Prof. Penhallow awarded the botanical and entomological prizes as follows:—

Named Plants, 1st, Miss Van Horne.
Unnamed " 1st, Miss O. G. Ritchie.
" " 2nd, Miss Burland.
" Insects, 1st, Mr. Albert Holden.
" " 2nd, Miss Maud Brewster.

The following received honorable mention for their collections: Miss McLea, Miss Reid, Master Eric Harrington and Master Herbert W. Shearer.

The Somerville lectures were more than usually interesting this year, and the attendance was very large and much interest manifested. The lectures, six in number, were delivered in the following order:—

Feb. 17—The Bony System, by Francis J. Shepherd, M.D.
" 24—The Muscular System, by Geo. E. Armstrong, M.D.
Mar. 3—The Nervous System, by James Stewart, M.D.
" 10—The Circulatory System, by T. W. Mills, M.A., M.D.
" 17—The Special Senses, by Frank Butler, M.D.
" 25—The Digestive System, by W. H. Hingston, M.D., D.C.L.

The thanks of the Society have been deservedly tendered to the distinguished lecturers who generously gave their valuable time for the advancement of its interests.

A novel and most pleasing event in the proceedings of the year just closed, was the Conversazione given by the members in their hall and museum on the 20th January last. The suggestion when once made, was taken hold of with great earnestness by some of the more active members, and the result was a most enjoyable reunion which was attended, not only by members, but by a number of prominent citizens, and the evening passed off most successfully. The success of the event was largely owing to the excellence of the arrangements, and special praise is due to the

Microscopical Society, Dr. Harrington, Prof. Penhallow, Dr. Johnson, Dr. Barnes, Dr. Edwards, Prof. McLeod, Mr. J. Stevenson Brown, J. A. U. Beaudry, Dr. Wanless and the Electric Light Company, for the great assistance they rendered in making the entertainment a success.

The Council is proud to be able to acknowledge the honor conferred by the British Association for the Advancement of Science, on our esteemed President, Sir J. Wm. Dawson, in electing him to preside over their annual meeting, which took place at Birmingham, and was attended with marked success. The valuable address of the President has been published in the Record of the Society, and well repays perusal.

The Council appointed Mr. J. Bemrose as the representative of the Society, to the annual meeting of the Royal Society of Canada, which took place at Ottawa, on the 25th instant.

The Field Day of the Society will be held this year at St. Jerome, P.Q., on Saturday, the 4th day of June, when it is hoped the members will unite in making it a success.

The Council, in conclusion, ventures to express the hope that the coming year may be marked by increased prosperity and even greater usefulness, and that the members will endeavour to secure for the Society the hearty support to which it is entitled.

Mr. Joseph Bemrose, as special delegate to the Royal Society of Canada, then presented his report.

The report of the Editorial Committee, submitted by Prof. Penhallow, showed a gratifying progress, during the past year, in making the RECORD OF SCIENCE an exponent of original scientific work in Canada, and in extending the list of exchanges, which now embrace a large number of great value.

The Curator, Mr. A. H. Mason, submitted his report on the Museum, as follows:—

CURATOR'S REPORT.

The work of the Museum has continued steadily during the Session, and there is evidence of marked improvement;

the re-arrangement of specimens, lettering of cases, etc., has helped to make it more attractive to visitors, and Mr. Caulfield has rendered valuable service in accomplishing this.

The collection of birds' eggs, which has become scattered and disarranged, it is proposed to collect and arrange for exhibition. Much remains to be done, and it is hoped the Council will make a grant to meet the necessary incidental expenses. The general catalogue of objects in the Museum is in course of compilation, and proofs will be submitted that it may be completed by next session.

The donations during the Session comprise a young harp seal, *Phoca* (Tagophilas) *Greenlandicus,* Fat, presented by the Rev. D. V. Lucas; nest and eggs of the American robin, *Turdus migratorius,* Linn. (taken at Côte St. Antoine), presented by Dr. Wanless; specimen Strophanthus hispidus, presented by Alfred H. Mason; several specimens from the Bahama Islands, comprising one Millepore and several Madrepore corals; several Alcynoid corals; two peculiar crabs; a large, dried rock-lobster; a Strombus gigas, and several other shells of that family, presented by Prof. T. Wesley Mills.

Upwards of 600 visitors to the Carnival availed themselves of the invitation of the Council to visit the Museum. The general public who attended the Somerville Lectures availed themselves of the opportunity to visit the Museum. It is estimated that upwards of 1800 visitors and students have availed themselves of the advantages afforded by the Museum during the past session. Of these, only 100 paid the admission fee of 10c., and 34 parties of three paid 25c., so that the use of the Museum is practically offered free to the majority of visitors. Hence, we appeal to our members and the general public for assistance, by donating specimens and funds to assist in its further development and improvement.

Our collection of British birds and animals could be considerably improved and enlarged, and we would solicit donations of this nature, suggesting the importation of such

specimens in the skin, that they may be mounted by our own taxidermist.

The Librarian, Mr. J. A. U. Beaudry, presented a gratifying report of progress made in additions to the library, and in changes which would greatly aid the members in gaining more ready access to the books.

The Treasurer, Mr. P. S. Ross, submitted a financial statement setting forth the liabilities and assets of the Society to date, as shown on the following page.

The following officers were elected for the ensuing year:

President—Sir William Dawson.

Vice-Presidents—Dr. T. Sterry Hunt, Sir Donald A. Smith, J. H. R. Molson, J. H. Joseph, Edward Murphy, Dr. B. J. Harrington, Dr. W. H. Hingston, Dr. J. B. Edwards, Major L. A. H. Latour.

Members of Council—John S. Shearer (Chairman), W. T. Costigan, Joseph Bemrose, Dr. T. W. Mills, Samuel Finlay, A. T. Drummond, J. T. Donald, A. Holden, Rev. Robert Campbell.

Honorary Curator—A. H. Mason.

Honorary Treasurer—P. S. Ross.

Corresponding Secretary—D. P. Penhallow.

Recording Secretary—J. S. Brown.

Library Committee—J. A. U. Beaudry, H. R. Ives, E. P. Chambers, F. B. Caulfield, M. H. Brissette.

Lecture Committee—Dr. B. J. Harrington, P. S. Ross, A. H. Mason, Rev. Robert Campbell, Dr. J. B. Edwards.

Editing Committee—D. P. Penhallow, Dr. Harrington, J. Bemrose, Dr. T. W. Mills, A. T. Drummond, E. Ingersoll.

House Committee—J. S. Shearer, J. A. U. Beaudry, J. H. Joseph.

Membership Committee—J. S. Shearer, S. Finlay, W. T. Costigan, J. S. Brown, P. S. Ross, A. H. Mason, Dr. T. W. Mills.

Annual Field Day, 1887.

The Annual Field Day of the Society was held on Saturday, the fourth of June, the thriving village of St. Jerome having been selected as the place to be visited. This town

NATURAL HISTORY SOCIETY OF MONTREAL.

In account with

PHILIP S. ROSS, TREASURER, 1886-87.

Cr.

By Balance in Treasurer's hands, May 1886		232.44	
" Annual Subscriptions, 1886-87		464.00	
" Rents collected, 1886-87		679.50	
" Government Grant		400.00	
" Field day excursion		48.43	
" Grant for underground temperatures	200.00		
Less expended to date	12.90		
		187.10	
			2011.47

Dr.

To Salaries and Commissions		368 28	
" Taxes and Water		144 55	
" Fuel and Light		209.63	
" Caretaker and Incidental Expenses		180 25	
" Insurance		26.00	
" Printing and Advertising		251.17	
" Furniture and Fixings		67.83	
" Repairs		78.50	
" Museum		44.65	
" Advance to Caretaker		10.00	
" Record of Science	401.98		
Less Advertising	32.00		
		369.98	
" Library	242.79		
Less sale Books & donations	88.68		
		154.11	
			1904.95
Balance due by Treasurer			$106.52

Montreal, 1st May, 1887.

Assets.

REAL ESTATE.		
Land donated by McGill University	2000.00	
Building at Original Cost	10629.87	
Furniture, Busts, etc	250.00	
Library	5760.00	
Contents Museum	5000.00	
Fixings for do	500.00	
Caretaker advance	35.00	
Museum Fees	18.65	
Rent due 1st May	125.00	
Cash on hand	106.52	
		24365.04

Liabilities.

Sommerville Lecture Fund	4000 00	
Life Memberships existing 29	1450.00	
Outstanding accounts sundries	100.00	
Underground temperatures	187.10	
Record of Science	200.00	
Conversazione Deficit	45.00	
		5982.10
Surplus Assets over Liabilities		$18382.94

JOHN S. SHEARER, } Auditors.
WM. T. COSTIGAN, }

Montreal, 1st May, 1887.

is situated at the foot of the Laurentian hills, just where the North River is precipitated over a steep and rocky bed, to the level of the bottom lands in the St. Lawrence valley, about thirty-three miles from Montreal. In the early morning, the weather was dull and threatening, and no doubt kept back many who would otherwise have attended, but one hundred and ten, all told, assembled on the platform at Quebec Gate depot, having either faith in the coming of brighter weather or sufficient courage to face the wet, if rain should come. Among those present were Sir William Dawson, president; Mr. J. S. Shearer, Prof. Penhallow, Dr. J. Baker Edwards, Messrs. Alf. H. Masson, A. Holden, Hollis Shorey, W. T. Costigan, J. H. R. Molson, James Slessor, J. A. Robertson, J. Beattie, J. Gowdie, Chas. Gibb, Messrs. Rolland, De Bellefuille, Dunlop, Archambault, S. C. Dawson, Walter Drake, Rev. J. H. Evans, T. B. Caulfield, R. White, and others.

Under the able management of Conductor Dickson, the excursionists were all on board punctually to time, and the train steamed steadily and rapidly away.

Drawing up at the platform of St. Jerome depot, the naturalists were met by Mr. LeClaire (mayor), Mr. Rolland (*fils*), Mr. T. Davis and Mr. Scott, who welcomed them to the town, and informed them that the various works and mills of the neighborhood would be freely open to the inspection of the party. The beautiful park belonging to the manor, known as the "Domain," was also placed at the disposal of the excursionists. Sir William Dawson then sketched out a programme for the day, as follows:—

Geologists, under the direction of Sir William, to walk to the river and study the geology of the district. Botanists, under command of Prof. Penhallow, assisted in the geological department by Mr. Evans, to ride to the Cascades and there search for specimens. Entomologists to hunt up the Domain. As soon as the above programme was mapped out, the different parties proceeded at once to their assigned hunting grounds. Those for the Cascades (including three-fourths of the party) were provided with buggies, carts, omnibuses, hacks, etc., and, in fact, no two vehicles were

alike, and everything that runs on wheels was pressed into the service. The clouds of the morning had by this time rolled by and the heat of the mid-day sun was tempered by a deliciously cool breeze, making a perfect day. The road to the Cascades runs through the main, in fact, *the* street of the town, and the keen eyes of the visitors were quick to notice every point of interest, and they were many, that passed under their view. At the first turn, the Rivière du Nord was seen running close alongside the street, but at a depth of many yards below. At this point, the broad, shallow, rapid-running stream was literally covered, almost choked, with logs in most admirable disorder—crossed, re-crossed and interlaced—as if piled there by the irresistible force of a terrible cyclone. At this point are situated the woollen mills of Mr. Scott, whose motive power is derived from the stream. The street itself is of fair width, and the sidewalks are clean and in good order. The buildings are more picturesque than imposing, few of the houses being more than two stories in height. The leafy verdure of the shade trees, with which the street is liberally supplied, was as grateful to the eye as the refreshing breeze was pleasant to the cheeks of the delighted visitors. Passing the quaint parish church, the bells, ten in number, which are ranged in a row *on the street*, attracted much notice. These bells are destined for churches in parishes settled along the North River under the enterprising guidance of the Curé Labelle. The wooden sidewalk extends for about two miles outside the town proper, and the road is lined with comfortable and picturesque looking wooden cottages, which are mostly as bright and clean as paint and the persistent use of the scrubbing-brush could make them.

The Cascades are about four miles from the railway depôt, and on arrival at this delightful spot the party commenced to scatter, some going to inspect the paper and wood pulp mills situated at the foot of the fall, some seeking out sheltered spots for a mid-day lunch, and some, with all the ardor of enthusiasts, tapping at stones with the heavy geological hammer or digging up strange ferns or roots, or chasing

moths or butterflies. The Cascades themselves defy alike description and criticism. Imagine if you can a steep hill of water, seemingly a mile in length, rushing towards you all the time. The whole river is churned into white foam with violent dashing on the picturesque boulders which are strewn with such profusion in the bed. "The white horses of the sea" charging down in one solid body. Word-painting and color-painting equally fail in giving an idea of a scene where the chief impression is that of measureless velocity and irresistible power. Go spend an hour there yourself and acknowledge that spots of picturesque beauty are to be found without travel to foreign lands, or even to great distances in your own. Looking up the stream, the whole scene is as wild and untouched by the hand of man as it was in the days of Jacques Cartier.

The whole party greatly appreciated from different points of view, the eligibility of the ground chosen, and enjoyed themselves to their heart's content in their several ways. In the afternoon, the procession of carriages re-conveyed the botanists to the depot, with baskets lightened of provisions and cold tea, but weighty with samples of minerals, stones and plants intended for competition. It had been decided to offer prizes for certain subjects, and a few minutes spent in canvassing on the outward journey had realized twenty-seven dollars for this purpose. At the depôt, the specimens were turned over to the Committee to be judged, and after careful inspection the prizes were awarded as follows:—

1st, Plants; named specimens; Miss Van Horne.
1st, unnamed specimens; Miss H. Y. Reid.
2nd, do, Master Pearcie Penhallow.
3rd, do, Master Eric Harrington.
1st, Insects; unnamed specimens; Miss Edwards.
2nd, J. F. Hausen.
3rd, Master Walter Adams.
4th, Master Bertie Holden.
Best collection minerals, unnamed: Miss B. B. Evans.

The work of inspection over, Curé Labelle drove his carriage to the edge of the platform and received quite an

enthusiatic greeting. At the request of Dr. Baker Edwards, he rose in his carriage and commenced an address in French. "Speak in English, father," said Mr. Scott. "Why, you know very well that I can hardly speak in French," replied the curé, laughingly. "No, you must excuse me that I continue in French." He then proceeded to express how much St. Jerome felt honored by the presence of the distinguished party before him. "The name of Sir William Dawson," he said, "was not only known and honored in Montreal, but in all Canada; farther than that, in the great United States, and farther still, in England and all Europe. They could not but feel gratified at the presence of such a man in their town, and his name as President gave a scientific standing to the society. At college he (the speaker) had not been much grounded in geology, but he had found time to study since, and though his knowledge was limited, it had been practical, and the results might be now seen in various industries established in their thriving and busy little town. Now that communication was being made easier and more rapidly between Montreal and St. Jerome, he hoped more frequently to see their scientific men exploring that district, and felt sure they would there find plenty to repay their research. Speaking for himself and his fellow townsmen, he welcomed Sir William Dawson and his friends with all his heart."

Sir Wm. Dawson made a brief reply, and, alluding to the various works now established at St. Jerome, said he hoped yet to live to see that neighborhood a second Birmingham, and trusted that when Montreal would be a comparatively small place, though useful as a shipping port for the products of the St. Jerome district, in the neighborhood of which were great deposits of iron ores, that they, the inhabitants of St. Jerome, would remember old friendships and not look down too much on Montrealers.

Mr. Burgess, with an able staff of assistants, had fitted up a baggage car as an impromptu dining-room. The car was tastefully decorated, and the long table laid out very prettily; a very plentiful cold collation was served, and the excursionists were invited to partake of the hospitality of

the Canadian Pacific Company. Although the quarters were somewhat close, the dexterity of Mr. Burgess's well trained staff enabled every one to obtain a plentiful supply of the good things placed before them, and well earned the encomiums of the pleased guests.

The run back to Montreal was accomplished in remarkably good time, and on arriving, Sir William Dawson requested the excursionists to stay for a few minutes on the platform, while Prof. Penhallow read a short resolution to the following effect:—

"The Natural History Society of Montreal desire to extend their most cordial thanks to Mr. Tuttle and other officers of the Canadian Pacific Railway for the courteous and hospitable treatment received at their hands, all of which has contributed to make this one of the most enjoyable and profitable excursions ever held."

The resolution was seconded by Mr. Shearer and carried by acclamation. Three hearty cheers were given for the C. P. R. and one for Mr. Burgess, and the meeting separated, every one delighted with the day's outing.

At a meeting of the Council held on June 9th, the following resolution was unanimously adopted:—

W. C. Van Horne, Esq.,

Vice-President and General Manager of the C. P. Railway.

Dear Sir:—

The Natural History Society of Montreal beg to extend to you, and to Mr. L. Tuttle and other officers of your Company, their most cordial thanks for the courtesies extended on the occasion of their recent annual excursion to St. Jerome. In doing so, they are pleased to state that the promptness and efficiency which marked all the arrangements on your part, the considerate and courteous attentions of the various employes, and the most hospitable provision of a bountiful and judiciously selected repast which won the special approbation of the ladies, were all features of the occasion which contributed, in a very large measure, to make the Annual Field Day of this year one of the most profitable and enjoyable in the history of this Society.