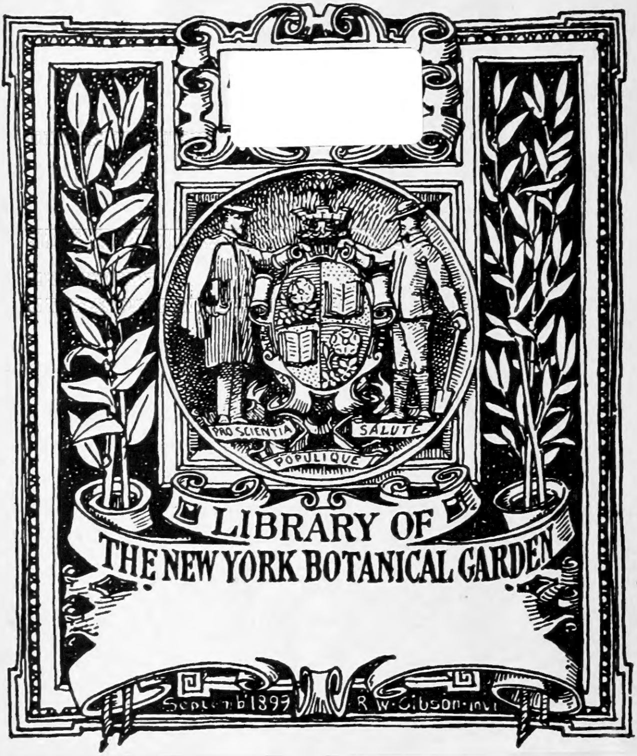

PROCEEDINGS

OF THE

NATURAL HISTORY ASSOCIATION

OF

MIRAMICHI.

NO. I.

PRICE 50 CENTS.

CHATHAM, N. B.:
THE WORLD PRESS.
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INTRODUCTION.

With this number of its proceedings the Miramichi Natural History Association makes its debut on the stage of science, and enters on its career among sister institutions. Relying on the generous and fraternal spirit which marks scientific men and inspires a hearty welcome to new labourers in nature's vineyard, it is confident of a warm reception, and would claim also their kind indulgence of the errors and imperfections of the articles laid before them. Conscious of their inexperience and scanty scientific knowledge, but full of the hope born of youth and enthusiasm, its members are looking onward and upward to a higher level, when by time, devotion, and energy they will, in a manner, acquire such a degree of accuracy of observation and vividness of description, as will render their transactions worthy of a place in the library of scientific exchanges. Until that stage is reached, they must continue to rely on the good will and indulgence of the scientific public.

That such an organization has been formed here to study the natural history and physical and biological phenomena of the region is no surprise to students of science in any way acquainted with its rich, interesting and attractive character as a field of research. Some of these features may be briefly alluded to, and will be seen to belong to the whole region under consideration, namely, the so-called "North Shore," including the four counties, Kent, Northumberland, Gloucester, and Restigouche. (a) It is maritime. (b) It constitutes a large part of the western coast of that great inland sea, the Gulf of St. Lawrence. (c) The insular, peninsular, and boreal character of the surroundings of this sea must stamp the fauna and flora of the region with an immense variety. (d) The winters are almost arctic; the summers, warm temperate, a feature so striking as to cause Jacques Cartier to name the great western arm of this sea the *Baie des Chaleurs.* (e) The bays and coastal waters generally are shallow and sheltered, frequently brackish, and reach a high temperature in summer. (f) Great rivers like the Restigouche and Miramichi sweep from the distant highlands of the interior, and carry into their lower valleys much of the fauna and flora indigenous to their sources. (g) Immense stretches of "primeval forest" cover the interior, which is also studded with lakes, "barrens," and isolated mountains of considerable elevation. (h) It was within the area of greatest erosion during the ice age, and of subsidence and elevation in postglacial times. (i) Its exposed rocks belong principally to the Devonian and Carboniferous periods.

Here then is an array of conditions and characters sufficiently varied and potent to stamp with a surprising diversity the vegitable and animal life of the region, and present the student of nature, present or past, with phenomena worthy of the exercise of his best powers. Nor have its attractions been entirely unheeded, nor its inspiring influence unfelt. Men eminent in science, such as Professor Gill, have here pursued their biological investigations; and the pioneer ichthyologist of the province, Moses H. Perley, enriched his knowledge of fish-lore in this prolific home of the finny tribe. Here Professor Fowler of Queen's College, Kingston, an eminent authority on Botany, grew up and laid the foundation of future success in that branch of science, while Robert Chalmers, F. G. S. A., of the geological staff of Canada, and one of its best authorities on surface geology, acquired, on the slopes of his native hills in Restigouche, the elements and much of the advanced knowledge of that science of which he is such an able exponent. Later, too, the fascinating nature of the botany of this region, especially of the Miramichi, won the devotion of Roderick McKenzie, whose "Wild Flowers of the Miramichi" is a tribute to the floral beauties of the "North Shore."

The marine aquatic life of the Gulf of St. Lawrence, especially of the littoral waters of this region, is so varied, the climate and other conditions so marked and complex, the fauna so representative of all the most valuable food-fishes and the forms on which the latter subsist, the waters of such varying depth and temperature, that some point on the "North Shore," perhaps Miscou, would seem to present the conditions most favorable for the successful working of the Biological Station about to be established by the Dominion of Canada.

Having briefly mentioned a few of the characters and points of interest of the region in question, it only remains to add a few words on the objects of the Association. They are principally the following:

First. To promote the more thorough study and investigation of its natural history, and publish the same from time to time.

Second. To make it an adjunct to popular education, and to encourage the study of natural phenomena and allied matters, by the young.

Third. To popularize the subject, and afford opportunities for mutual instruction, through the medium of lectures.

Fourth. To establish a museum of natural history objects, including ethnological remains, that would be fully representative of the past and present.

Fifth. To investigate subjects of economic importance, such as forestry and fishery matters, with a view to utilizing the knowledge so obtained to the growth and preservation of these industries.

As a reference to the section dealing with the museum and ordinary business of the Association will show, very gratifying progress has been made in the two years of its existence. A large cabinet contains the nucleus of a herbarium, already consisting of over five hundred native plants, determined, mounted, labelled, and arranged in their proper genera and families. The ornithological section of the museum represents over one hundred mounted species, besides many skins. A fair collection of mammals, fishes, reptiles, insects, and other invertebrates.has been made, and the section of archæology is beginning to assume such a shape as promises to become soon fairly representative of the prehistoric status of the aborigines of the "North Shore."

In the large membership, regularity of meetings, programme of lectures, and subjects discussed, will be seen further evidence of the lively interest taken in its work, and the degree of popularity it has won.

It is also a pleasant duty to acknowledge the many obligations the Association is under to Prof. Macoum of the Geological Survey, Ottawa. The distinguished botanist has time and again rendered invaluable assistance in determining many specimens of plants for the herbarium, and in other ways shown a kindly interest in the success of the Association. The same must be said of Geo. U. Hay, Ph. B., President of the Natural History Society of New Brunswick, whose donations to the herbarium were many and valuable and whose appearance as a lecturer was greeted by a large audience.

THE ANOURA OF NEW BRUNSWICK.

By Philip Cox, Ph. D.

The absence of a monograph on the Frogs, Toads, and Tree Toads from the natural history literature of the province is the only apology for the appearance of this paper. Beyond recording the occurrence of all the families and species known here, with brief notes on their distribution in the Maritime Provinces and Gaspe peninsula, P. Q., it will be found to contain little else, except observations on their color, size,and rugosity, together with some comparisons intended to illustrate the general influence of climatic conditions. The short summer, long and severe winter, and protracted period of hibernation are here associated with slight differences, such as a more extensive mottling of inferior surfaces, less regularity in size and form of spots deemed specific, and greater roughness of skin ;—variations from acknowledged type characters, so marked and general as to suggest a necessary connection between them and environment. However, this divergence is not confined to the Salientia alone, but is well marked among the Urodela, especially the increased mottling of the under parts.

As far as the writer's observation extends, the more aquatic species exhibit the greatest variation, due in a measure, perhaps, to the stock of river systems overlapping and commingling less freely than is the case with terrestrial forms, thus intensifying and rendering more constant any tendency to variation due to local causes.

Of the seven or eight families of the order found in North America, but three are here represented, of which the Ranidæ are the best known, as their size and habits render them easy and attractive objects of study ; yet it is by no means certain that all the species and subspecies of the family, actually occurring here, have been detected. Climatic and phylogenetic considerations would seem to render the occurrence of *R. cantabrigensis* Baird very probable ; and *R. silvatica* Le Conte presents such an array of constant variations as would justify the addition of another subspecies to the list of the batrachians of North America.

The Bufonidæ is likely limited to a single, but very variable.

species, which upon closer study may be found to consist of at least two subspecies.

Of the Hylidæ less is known. Small, shy, and assuming to a large extent the colour of their surroundings, they are difficult to collect, and our knowledge of them is not sufficiently extensive and definite to warrant any conclusion about the number of species actually occurring. Two are fairly well known; and probably a third and exceedingly rare species also occurs.

BUFONIDÆ.

(The Toads.)

Bufo (*lentiginosus*) *Americanus* Le Conte.

Common Toad.

This is the only representative of the family here, and is regarded by some herpetologists as a subspecies of *B. lentiginosus* proper, a more southern form. The latter varies greatly throughout its range, as many as four subspecies having been described and named, and even here the species exhibits much variation, not confined always to superficial characters such as colour, rugosity, and regularity of marking, but extending to deeper and more structural features, as proportion of parts and development of cranial crests and ridges. In many instances the superciliary ridges converge posteriorly and the approximations are marked by knobs, something after the manner of *B. l. woodhousei* Baird; but as a rule the inward projection of the postorbital ridges is well marked.

Coloration variable, running from almost black to yellowish grey, the former characteristic of specimens from damp localities or dark surfaces.

Reproduction similar to that of frogs, but eggs laid later and in strings instead of masses; tadpoles small and black, and larval period short. Indeed metamorphosis so hastened by lack of water as to point to possibility of development from ova in air alone.

Voice a prolonged sonorous thrill, during breeding season and warm nights all summer.

Uniformly distributed over New Brunswick and all the maritime provinces, as well as Gaspe peninsula, Quebec.

HYLIDÆ.

(THE TREE-TOADS.)

Hyla pickeringii Storer.

Tree-Toad. Pickering's Toad.

This is the first of the batrachians to announce itself in the spring, when its sharp whistling peep can be heard from every pond, swamp, and marsh in or near a wood. It is also among the last to disappear in autumn, for its note can be discerned late in October after the first heavy frosts. A wary, nimble little creature, hard to collect even during the breeding season, and in early summer found occasionally adhering to the bark of willows and red maples about ponds.

Average size less than one and a half inches in length. Gular sac brownish-purple.

Abundant in New Brunswick, and the other maritime provinces; occurs also in the Gaspe peninsula.

Hyla versicolor Le Conte.

Tree-Toad.

Though early lists of provincial batrachians include this species, and describe it as "common," the writer's experience leads him to believe it very rare. This is unaccountable, for it is very common in the Northern States, where its congener, the last species, is equally abundant, and should therefore be well represented in the zoological province of northern New England and New Brunswick, as far at least as the valley of the St. John. Its note—a thrill, not unlike that of *B.* (*lentiginosus*) *Americanus*, but briefer—has been heard in a few places, and always after night.

A specimen collected in Gloucester Co., by Dr. A. C. Smith, Inspector of Leprosy, Tracadie, is the only provincial representative examined by the writer, but, judging from a description, another was found near Fredericton a few years ago.

Larger than the last, with surface more warty and gular sac paler. As the specific name implies, it possesses much of the color-changing power of the chameleon.

Said to occur in Nova Scotia, but not reported from P.E.Island.

RANIDÆ.

(THE FROGS.)

Rana silvatica Le Conte.

Wood Frog.

This slender and graceful little frog, the smallest of the genus here, frequents forests and bushy covers, but is also found in fields, meadows, and grassy heaths where the type undergoes considerable variation. Body stouter with shorter legs; palmation greater, dorsal spots larger and lateral ones often fused into a line under the dorso-lateral fold as in *R. cantabrigensis* Baird; coloration dark purple instead of "dead leaf," with greater mottling of the inferior surfaces; an obscure spot above the eye, the two often fused into a transverse interorbital line. Characters so fixed and general as to entitle to subspecific recognition.

Generally distributed throughout the maritime provinces, and the Gaspe peninsula.

R. virescens Kalm.

Green Frog.

This frog varies greatly, but the variation tends in two more or less well marked directions to which subspecific and even specific rank has been assigned by some herpetologists; but, as numerous intermediate forms showing a blending of the characters of both and difficult of reference to either, always occur, it would seem as if the differentiation had not reached the degree of permanence involved in the idea of species. Indeed the characters exhibit such an absence of stability, and the general equilibrium is so easily disturbed, as to suggest the probability of a recent origin, a position which finds some support in the late Prof. E. D. Cope's view of the phylogeny of the frogs of North America. In this respect it is in strong contrast to *R. palustris* Le Conte, a very uniform species.

The Green Frog, then, presents in New Brunswick the following two varieties :

R. virescens virescens Kalm. Characters fairly constant. Muzzle acutish, head entering length of head and body three times ; bands on thighs and colour pattern of dorsal and lateral surfaces quite regular ; size small, averaging barely three inches. Back-ground of superior surfaces bright green.

Distribution coastwise, in the lower valleys of all rivers ; not abundant. Found also in the other two maritime provinces ; but is rare on the Gaspe peninsula.

R. virescens brachycephala Cope. A more aberrant form. Muzzle blunter and more truncate ; head short, entering length of head and body three and a half times ; size large, averaging over three and a half inches in length ; limbs and body stout, the latter less depressed. Ground colour of superior surfaces pale green. Pattern less regular, two adjacent spots being frequently fused into one, with an approximation to a third or median row of dorsal spots often present.

Abundant in the inland and western parts of New Brunswick. Roy McLean Vanwart and I did not observe it on P. E. Island, nor the Gaspe peninsula.

R. palustris Le Conte.

Marsh Frog.

Though the type differs from that of southern New England in some respects, none of the frogs exhibit within our range a stronger and more constant balance of specific characters. The type here has the muzzle less acute ; dorsal and lateral spots larger ; the bands on the femur fewer and broader ; finer and less extensive granulation of the buttocks ; and a general tendency to form a vertebral row of spots, thus making three dorsal series instead of two. P. E. Island specimens show more palmation with white line along edge of upper jaw extending forward to the nostril.

Generally distributed, but never abundant. Often met with on rocky and burnt areas. Roy McLean Vanwart and the writer found it very rare in P. E. Island. Occasional on the Gaspe peninsula. Not reported from Nova Scotia.

Rana septentronalis Baird.

Mink Frog.

Size small, seldom exceeding two and a half inches in length. Body rather deep and depressed ; tympanum large, sometimes equalling that of *R. clamata* ; teeth feeble, the two vomerine patches small, approximate, and often fused. Legs rather short, the heel just reaching the pupil ; feet well webbed ; dorso-lateral folds feebly represented, often wanting. Skin rough above, especially on the sides and posteriorly ; below rather smooth.

Coloration, above brownish olive, deepening behind and laterally to brownish purple, often with metallic lustre. Surface broken into large and irregular roundish spots by waving and coalescing lines of greenish yellow, of varying width. but showing no definite pattern. Below whitish with dusky spots and reticulations on the buttocks. Many exhibit the blotching of the throat peculiar to *clamata*, a feature not attributed to more southern specimens. The species, too, seems to average larger here.

This frog is new to maritime province lists. Some time ago the writer, regarding its near affinities and phylogenetic relations with *R. clamata* and *R. catesbiana*, suggested that it was likely to be found "in the western part of the province or the lake region near the Bay of Fundy." ("Batrachia of New Brunswick,"Bull. No. 16, Nat. Hist. Soc. of New Brunswick.) He has since collected it at some stations in the valleys of the St. John and Miramichi, and C. F. B. Rowe took specimens from the lake region referred to.

Next to the Bull-frog *R. catesbiana* Shaw, it is perhaps our most aquatic species, being met with in the shore waters of lakes and rivers, never in isolated spring holes like *R. calamata*. Wary, shy, and active, it is difficult to capture ; and, when first taken, emits an odor like that of the mink, whence the name. The writer has no knowledge of its breeding habits, nor of the life-history of the larvæ ; but as it shows a preference for large bodies of well oxygenated water abounding in food, its habits, in this respect, are likely similar to those of the Spring-frog and Bull-frog, whose tadpoles seldom mature in one season.

It will likely be found not uncommon in all suitable places in the province. Roy McLean Vanwart and the writer did not observe it on P. E. Island, but the latter found it abundant on the Gaspe peninsula in the summer of 1898, where it largely replaces *R. clamata.* A hardier form than the latter, more active, and possessing properties and instincts which tend to the better preservation of the species, the Mink Frog will likely be found supplanting the latter in the more northern Atlantic coast regions of Canada.

Rana fontinalis Le Conte.

The Spring Frog.

The Spring Frog is an aquatic species as suggested by the specific designation. As already stated it evinces a strong tendency to variation and exhibits many diverse types ; indeed scarcely two individuals can be found to agree in all respects. Consequently it is difficult to classify ; and herpetologists guided simply by a knowledge of local forms and not having access to extensive collections, have frequently mistaken varieties for new species, so that four or five were established and the nomenclature and description of the species greatly muddled. Indeed so different do its members appear that the fixing of a type would seem rather the result of an implied understanding or convention of naturalists than of fixity and predominance of certain specific characters.

The type most frequently met in the province shows a stout thick body with stout strong legs. The colour above varies from brownish olive to dark brown with a few black roundish spots on the back and sides ; throat citron yellow with dusky reticulations, and under parts yellowish white. The tympanum or ear drum is large, exceeded only by that of the Bull-frog, and the skin is rough and pustular.

This form predominates in the northern parts of the province, in forest spring, lakes, along streams and rivers, and generally wherever the conditions are suitable. It is no uncommon thing to find it popping up its head in some warm spring in January, with the snow covering the ground to the depth of two or three feet. Indeed the difference between the summer and winter temperature of such boiling springs must be quite insignificant.

Another type, frequently found in the neighbourhood of cool streams in the southern parts of the province, differ materially from this vigorous pustular form. The body is long and slender, the hind legs also longer and the feet less webbed. General color above olive green with small brown spots, throat and under parts white, sparingly spotted with brown ; tympanum smaller.

This variety is more terrestrial, being often found among grass and weeds at considerable distance from water ; and, owing to the unusual length of hind legs, is able to make long leaps equalling the Green Frog in this respect. On account, too, of the relatively greater length of the fore limbs its position on land is less prone than is generally the case among frogs. It constitutes the *R. clamitans* of some authors, and seems to have been the one so classed by Daudin in 1802.

Sometimes colonies of black specimens of medium size are met with having an unusual amount of blotching and mottling of the inferior surface of the body and limbs. This form was first described by Professor Agassiz, who collected it about Lake Superior, and named it *R. nigricans*, but later naturalists have, for what seems good reasons, relegated it to the position of a mere variety of *R. fontianlis.*

Again specimens are found almost similar to *R. clamitans* but with muzzle more sub-acute, the upper surface pale green with much dark marbling and dotted with yellow points after the pattern of some specimens of *R. sylvatica.* It has a dark band on the back of the humerus and covering the elbow much as in *R. v. brachycephala.* As far as my observation goes *R. clamitans* is alone entitled to the distinctive appellation "clamata" used by some instead of "fontinalis," for I have never noticed the habit among the other varieties.

The wisdom of uniting these apparently different types under one species cannot be expected to meet with general approval. It will likely be dissented from by such as are ready to establish species on minute and merely superficial characters which are so apt to vary according to local environment, and found always susceptible of a serial arrangement, linking the extremes to some more central specific form. When naturalists, as before observed, had not, for purposes of comparison, extensive collections from large areas, but were guided by a knowledge of local types, it was reasonable to regard these forms as entitled to specific recognition. The case is different at present. An immense amount of material has been collected from nearly the whole of North America, so that herpetologists are able not only to correct early mistakes but shed new light on the development of species. Hence it becomes an easy matter to trace the relation of local varieties and strongly marked species. The recognition of subspecies marks, too, a new departure in natural history, for within a certain range it opens up a wide and interesting field for the investigation of the nature of influences modifying animal life, a study deprived, heretofore, of its chief attraction by the custom of attributing specific fixity to every modification of type, even within narrow and superficial limits.

But it may be asked on what common and unvarying characters is the specific identity of all these forms of the Spring Frog to be based ? A few are here indicated. The large flat, and thickish head ; muzzle narrowed and rounded ; tympanum larger than the eye ; vomerine teeth in roundish and approximated patches between the choanæ, but projecting beyond the line joining their posterior borders ; the heel of the extended hind leg never reaching the tip of the snout ; the first and second joints of the fourth toe unwebbed; the peculiar bifurcation of the dorso-lateral fold at the tympanum;the dark line from the commissure to the humerus ; the yellow blotching of the under jaw; the reticulated yellow throat ; the general size, seldom exceeding three and a half inches ; the aquatic habit and uniform voice. Many of these characters are structural, fairly constant, and will be found to afford a good basis for the diagnosis and classification of the members of this apparently heterogeneous group. Yet exceptions are not wanting. The so-called *R. clamitans* has a lunt and truncated muzzle, whitish throat, and is somewhat terrestrial in habit ; while the vomerine teeth of *R. fontinalis* are, at least in large individuals, more posterior in position.

In the degree and permanence of those characters which serve to differentiate it from the rest, what is above designated *R. clamitans* seems to merit best the distinction of a species. *R. nigricans* appears to owe its dark colour and excessive mottling of the inferior surface to its habitat ; at least I have never collected it except in streams with bottoms of black mud or of equally black moss-grown rocks, where it herds with similarly colored specimens of the Bull-frog, *R. catesbiana* Shaw, whose sombre dress is likely attributable to the same influence. That they are inferior in size and less robust than specimens found in springs and spring brooks is probably the effect of a poorer diet and longer and severer periods of hibernation.

Generally distributed throughout the maritime provinces, including P. E. Island. Uncommon on the Gaspe peninsula, where its congener, *R. septenrionalis*, seems to replace it.

Rana catesbiana Shaw.

The Bull-frog.

The Bull-frog is the largest and most aquatic of the Ranidæ found in North America, and is very generally distributed in the province, attaining its greatest size and most vigorous development in the forest lakes of the interior. It was formerly well represented on the lakes and streams tributary to the lower St. John; but has grown quite scarce since the introduction of the Eastern Pickerel, *Esox reticulatus* Le Sueur, which devours it and the Spring Frog to such an extent as to render them even rare where they were a few years ago abundant. It is more gregarious than the Spring Frog. Indeed it is hardly ever found along the shores of large lacustrine areas except in colonies, which affect shallow marshy places where the necessary warmth and food can readily be obtained. Here they attain a large size. In the Little South West Miramichi Lake, in the Squattook Lakes drained by the Madawaska, and from other lacustrine waters, the writer has collected scores of specimens measuring seven inches in length of body and head, and from fifteen to sixteen from tip of muzzle to the toe of extended hind leg. Such examples are dark and pustular, approximating in this manner to *R. clamata*. The body is broad and stout; the limbs short and thick.

It is no uncommon thing to meet with individuals with dorsal parts of a rusty brown colour, or the whole upper surface pale green with small black spots. The latter are probably young.

Being entirely aquatic the Bull-frog necessarily varies much according to locality. Reference has already been made to small black individuals associated with *R. nigricans*, whereas on grassy shores or in shallow water with weedy bottom there is always more or less washing of green on the head and anterior dorsal parts.

The bellowing notes, whence it derives its name and which lumbermen imitate by the words "more rum," are seldom heard by day; but on warm nights it is very noisy and can be heard a distance of three miles. During cool nights it is silent and on chilly days is seldom seen, as it lies then under pond lily leaves or other floating vegetation.

When held up by the leg for examination, it will often scream most piteously.

The Bull-frog is rarely seen after the first frosts of early autumn, and has gone into winter quarters long before the Green Frog deserts its grassy haunts. But if it be the first to enter upon hibernation, it is also among the first to reappear whenever the conditions are favorable. As a general thing, however, the ice on our lakes breaks up late, so that it spends more than half the year in the dormant condition.

Distribution local. Occurs also in Nova Scotia, but was not found by Roy McL. Vanwart and the writer on P. E. Island; nor by the latter on the Gaspe peninsula.

TA EPIZOA.

By J. McGregor Baxter, M. D.

The term epizoa is derived from two Greek words *epi*, upon, and *zoon*, an animal, and is used to represent comparatively minute animals that prey on other larger animals, such as fish, beetles, insects of all kinds, birds, quadrupeds and even man himself, as almost every animal has its own particular parasitic enemy or enemies.

These animals are either true parasites, or are parasitic at certain stages of existence. I think it is generally believed that originally all of these animals led a separate and independent existence, and only by accident, or by stress of circumstances, were led to adopt a true parasitic life, for, if I recollect rightly, I have read somewhere that they all show diminutive and atrophied organs, such as wings,etc.,that show they really are degenerated offspring of animals that originally led an independent existence ; and indeed this transformation may be partial or almost complete, as the departure from the original natural mode of life is more or less complete.

We find this feature scattered throughout all nature, that organs that are not used nor needed dwindle away till at last they become merely rudimentary, as, for example, birds and insects that inhabit islands in the ocean gradually lose their wings, or at least they become so attenuated as to be useless for the purpose for which they were originally intended.

Let us take, for example, an independent living animal and suppose that by accident, or the dearth of food, it is induced first to attach itself to a larger animal wandering in its vicinity. It finds that by biting or scratching this animal it can derive ready-made and assimilated food at little expended effort on its own part,and you have the initial stage. Then, developed by use, natural selection and the survival of the fittest in the battle for life, you can easily suppose that the organs of such an animal during many generations would become more and more adapted to its selected habit, until you would get the parasite pure and simple, with all organs not absolutely necessary nor much used, diminished or entirely wanting. In fact, we can find animals in all the different stages from temporary parasitism to the pure parasite. Take, for example, the flea (*Pulex irritans*), the bedbug (*Cimex Lectularia*), and the leach (*Hirudo medicinalis*). These seek their nourishment alone on their hosts for the time being, but can, at least, and generally do, spend the rest of their existence in an independent life, and develop from the egg, and spend their youth and adolescence, independently of their host ; and indeed some of this same class of insects may lead an entirely independent existence. And if so, we should look for differences in the organic make-up gradually growing up between members of the same family, namely, between those that lived an entirely independent existence and those that were most attached to the parasitic mode of life.

I speak now only of those parasites that attach themselves temporarily to the surface of the animal upon which they live. Of course in the case of those that infest the internal economy of an animal the difference would evidently be much greater.

In those animals in which parasitism is a long continued heredity, many of the original traits and organs of independent existence have almost or entirely disappeared. I am not well posted in this branch of zoology, but I imagine it would be pretty difficult to make out the original habitat and mode of existence of such old-time sponges as *pediculus capitis*, *P. vestimenti*, *P. Tabescentum* and *Phthirius ingrinalis*, for these, as far as I know. have ceased entirely their independent existence, and utilize their host not only for their nourishment but (in contradistinction to the temporary parasite before mentioned) they spend their entire existence, lay their eggs, and bear their young on the surface of the body of their adopted hosts.

Now, what I wanted to speak of more particularly in this article is a family of parasites that are usually classed as temporary parasites, I believe—viz., the family of *Ixodiæ*, or Ticks.

There are many genera under this family, about twelve. I believe—*Ixodes bovis*, *I. ricinus*, *I. albipictus*, *I. Robisonii* and four or five others under the classification of *I. Americanus*, etc.

I received a number of specimens of the species *Dermacentor Americanus* L., taken from the body of a male caribou killed in the first week of February, 1898. I put them in a glass bottle, and what struck me particularly was their extreme tenacity of life, for they lived in a stoppered glass bottle, without a particle of nourishment, until the seventh of May, when the last specimen departed for the "happy hunting grounds." They were on the poor caribou in thousands, and must have made his life miserable. When the skin was hung over a clothes-line and beaten the snow was covered with them, and the hair was scratched off the skin in spots by the animal's horns in his efforts to get rid of them.

Regarding another variety, the American wood tick, Meinherr Kalm states they were found in the woods the whole summer through, on bushes and plants growing among the bushes, but more particularly on the fallen leaves of the preceding year; they are so abundant everywhere that if one sits down his clothes and even his body soon get covered with them; for though of slow pace they immediately climb upon his clothing, seeking some naked place on the body on which they instantly fasten themselves by introducing their trunk into the skin. Those who go into the woods barefooted soon get their feet and legs covered with them. They fasten themselves not only on man but also on animals, such as horses and horned cattle, which they frequently kill. They never inhabit meadows or cultivated fields, or cleared land. They pierce the skin in such a subtile manner that the victim does not feel any pain until half their body is sunk in the flesh ; it is then that he first feels a strong itching, and afterwards a very severe pain. A hard swelling occurs the size of a pea or larger. It is then very difficult to get rid of the tick, for in endeavouring to draw it out it breaks asunder rather than let go its hold, so that the head and trunk remain in the sore, soon producing inflammation, followed by suppuration, whereby the sore is frequently made deep and dangerous. It is, therefore, by cutting the flesh all around it that we must try to withdraw the tick entire from the spot where it is lodged. Or it is well to make use of a pair of tweezers to draw it out, as M. Kalm states he has done with success. He relates that he has seen horses which had the under side of their bodies and other parts so covered with these ticks, that the point of a knife could scarcely be introduced between them, and from being continually sucked by these parasites, deeply sunk into the flesh, the animals became so enfeebled, and were tormented so grievously, that they eventually succumbed and died in great misery.

Both sexes were represented on this caribou's body, the one of a coffee brown colour both above and below except a species of shield on the back, about the extent of the thorax, but, the latter and body not being segmented, this estimate is only an approximation. Within the shield and immediately back of the head was a ring coloured brown (the shield was tallow colour) with three fringes of the same colour extending backwards from it nearly to the back of the shield.

These ticks have four legs on each side of the body, each five-jointed, and a sort of four lobed head. The legs end in an attenuated segment terminated with a bulbous extremity covered with a few hairs below and a pear-shaped sharp-pointed nail on the outer or upper side, which is slightly hooked—evidently for prehension. Whole length of the body one fourth of an inch. The other sex same length, slightly broader, underside same uniform coffee colour, back drab with four or six lines of interrupted coffee coloured and slightly linear spots, extending from head to rear of body; other characteristics the same as the last.

Now here is an animal which the books describe as an independently living animal feeding on moss and dry foliage on sunny hillsides, and only occasionally attaching itself to cattle, and gorging itself with blood, then falling off to resume its natural habitat, and is therefore what one would call a temporary parasite. If this be true, it is now assuming the transition stage, and will soon become a bona fide parasite, for there were great numbers of eggs attached to the hairs of the caribou's hide, which showed conclusively that it was about to have a numerous family, which were intended to be educated from the start in the parasitic proclivity. The question arises, are the writers mistaken regarding its habits, or is it in the transition state and about to degenerate into a true parasite?

DUST.

By R. P. Joyce.

Dust, like dirt, has been described as matter in the wrong place. Yet when on the threshold of the 20th century the scientific record of the 19th comes to be written, not the least of its achievements will appear to be the discovery of the essential part that this derided form, or deformity, of matter plays in the economy of the universe. Not our atmosphere only but interstellar space also seems to be traversed by masses of dust of more or less impalpable fineness, which, like light, may be called an article of commerce among the spheres. Science is finding out more and more that all systems with their members are not isolated and independent, but related and interdependent, reaching out into the infinite. The earth in its course round the sun and in the course in which the sun moves round some vaster circumference, gathers daily tons of meteoric matter mostly in the form of dust. This dust is found on the perpetual snow of mountains, in the ocean ooze and in the motes of the sunbeam. Even vegetation owes something to this insensible rain of meteoric particles, so that the bread we eat contains within it matter which may have voyaged for countless centuries of time through illimitable space. Thus to nourish our bodies the remotest realms of the universe may have been laid under contribution, and everyone here assimilated particles of matter borne to our earth by shooting stars and meteoric dust. Again and again we are reminded that one touch of nature not only makes the whole world kin but binds the universe in intimate association. In this fact Wordsworth's spiritual idea finds its materialistic complement—

> "The soul that rises with us, our life star,
> Hath had elsewhere its setting, and cometh from afar."

The uses and abuses of dust have been treated from a variety of points of view, so that the literature has grown to be quite considerable. That venerable art philosopher, Ruskin, has given us the "Ethics of the Dust" in a course of inimitable lectures. Who can forget his analysis and parable of an ounce of mud (dust paste) taken from the footpath of an English manufacturing town in which the clay, sand, soot and water, that are its chief constituents, resolve themselves under the power of crystallizing affinity into a sapphire, an opal, a diamond, set in a star of snow.

Tyndall and others have taught us the hygiene of dust, which includes the germ theory of disease that has revolutionized the sciences of surgery and medicine. This paper, however, is concerned with the physics of terrestrial dust and its influence as an essential factor in meteorology, and in making the earth what it is as a place fit for the existence of animal and vegetable life.

The discovery of the undulatory movement of light in straight lines, modified only by the law of reflection and refraction, wiped the slate of previous notions on this subject. The cause of its difiusion required explanation and has been found to be, in the first instance, owing to the presence in the atmosphere of infinite dust particles, the more finely divided in the upper strata and the coarser in the lower. Hence the clear blue of the sky, which would otherwise be a black back-ground on which would appear the sun, like the blinding projected search-light of a warship, the other heavenly bodies in less degree and all visible in day time. Thus we would receive streams of light with black bewildering shadows between. The face of the earth would stand out stark like a lunar landscape. Where there is no atmosphere, there is no dust, and therefore no diffusion of light.

But the light of the sun coming to us and passing into our dust-pervaded air is caught and reflected by each particle, and as the finer particles float higher and are large enough to reflect only the short blue wakes of the spectrum, hence the color of the sky. As the light passes down its rays are caught in turn by coarser particles, just as they may be large enough to reflect the longer waves of the other colors of the spectrum, and diffuse them.

To this vast and vital office of insignificant and hated dust do we owe all the beauties of the morn, the splendor of noon and the glories of sunset; also the ever varying tints of mountain, sea, and landscape. The eye would cease to derive pleasure in its use, were there no dust, for then art would be impossible. More important still, were it not for dust and its effects, vegetable life would be impossible except perhaps in the form of fungi; animal life a query, and common life as we live it intolerable.

Eminent as are the services of dust in the diffusion of light, they are no less important as the only means of diffusion or distribution of rain and all that this involves for a habitable world.

It is known that water in the form of vapor requires to come in contact with a body as a medium of condensation, when it reaches the necessary coolness. In the cooler upper region of the atmosphere water vapor seeks and finds such medium in the ever present dust. The particles become the primary nuclei of minute water globules of small specific gravity that float in masses in the form of clouds carried hither and thither by air currents. Condensation being initiated, the process goes on until final precipitation takes place in the form of showers of rain with all its attendant blessings. Without the nuclei which the dust particles afford for the purpose, the atmosphere would be in a constant state of excessive saturation, and the surface of the earth the only condensing medium; so it is easy to imagine what the disastrous consequences would involve. There would be no fog, no clouds, no rain, no showers, no snow, but copious dews. There would simply be an extremely saturated atmosphere, seeking, when cooling began, something to wet or ice over. Vegetation, the walls of our houses, ourselves, everything, acting as media of condensation, would be dripping spectacles in summer and clad in sheets of ice in winter. The now indispensable umbrella would afford no protection. Our houses might be roofless so far as any shelter they could give from the soaking atmosphere, and it is doubtful whether fire could be discovered and continued under such physical conditions. It is difficult to conceive the type of animal and vegetable life that could exist in an environment so uninviting. Perhaps fish, water-lilies, and Kingsley's water babies may give us some clue. In mountain regions the effects of a pure atmosphere as regards dust would be more disastrous still. Their greater attracting influence as condensing media for the semi-liquid atmosphere would create devastating deluges of water compared with which tropical rains would seem April showers. The mountain sides would be swept of all vegetation and soil into the valleys and thence by tremendous floods and inundations to the sea, and these forever recurring. The present slow, almost insensible, process of denudation would be accelerated a thousand fold and the earth long since have become a flat planet like Mars, where, it is said, the mountains were worn down ages ago, until now the highest elevations are only a few hundred feet above the general plain and throw no shadows.

Such, in brief, are some of the ends that dust serves in the economy of nature and the fearful consequences to all forms of life were it banished from space. We may learn from this that no fact in nature is insignificant, but has its relative value like a cypher in a number, which is essential to the same. In the action and reaction of things an equilibrium is maintained and a marvellous system of equity or compensation upheld, that must strike the most superficial observer with wonder, and the thoughtful with the reality of the conclusion that, in the last analysis, mind moves matter for present and remote purposes, and that blind chance, or the fortuitous clashing of atoms, has not the potency and power to evolve anything upon which we may reckon without being put into a state of intellectual confusion, against which we are taught to pray least we be finally worse confounded.

OUR WINTER BIRDS.

By J. McGregor Baxter, M. D.

There is considerable difference, in different localities, even although these may be in close proximity, in the birds that are to be found there, and for that reason I thought it might not be amiss to give a short account of some of the most common ones to be found in this immediate locality during the winter.

When one comes to consider the length and extreme severity of our winters it surprises one to find that any birds can be found sufficiently hardy to survive the paucity of food, the terrible storms, the depths of snow, and the severe frosts which they are every winter so sure of encountering. Still, if our winters were just a little shorter and a little less severe perhaps we might have a few more of them give up their migratory habits and stay over with us. I remember that, in the winter of 1890, one solitary robin remained in the trees about the garden of the Bowser House, and I watched him carefully every day to see how he would weather it. On the 20th of January we had a terrible snowstorm and I concluded that I would see him no more. But I had mistaken his staying powers, for he came out the next day, looking rather thoughtful, melancholy, and a little bedraggled, but still he seemed determined that, if he had made a miscalculation in staying over, it was too late to rectify it, and that he would see it out "on that line if it took him all winter." Well, he did his best, the brave little fellow, but we had another terrible snowstorm on Feb. 20th, and I saw him no more.

Our aquatic birds, as a rule, move further south, or out towards the open ocean, so that we rarely see any during the winter in this locality, as the river is frozen from two to four feet deep for forty miles down. But some winters, when smelts are plentiful, you may see numbers of herring gulls flying about or collected around the holes cut in the ice, feeding upon refuse fish left there, and I once found a dovekie (*Mergulus alle*) frozen into a thin sheet of ice that had formed over a little pool of water that had collected in a hollow in the main river ice.

The Cursores almost all betake themselves also to milder regions, but we have the Canada grouse or spruce partridge

(*Tetrao Canadensis*) and the ruffed grouse (*Bonasa umbellus*), which remain with us all winter. These birds are well protected by a dense coat of feathers, and frequent dense forests, and they also have a habit of darting down from a tree and dashing themselves into the snow for a considerable distance and remaining there during extremely cold weather for the sake of the warmth, as the snow falls lightly down after them, closing the aperture of entrance, and the warmth of their bodies thaws a little chamber around them and the heat generated does not escape. I have been told by lumbermen that when they take out a lunch which they do not wish to get frozen they dash it into the snow in the same manner and it will not freeze ; but if they take extra pains to pat the snow down around it, it will freeze solid. The partridge probably made this discovery before them. If, however, it comes on to rain a little and then freezes suddenly after, so as to form a crust, sometimes the partridges are unable to get out again.

The most of our winter birds belong to the sub-class Aves Aereæ, or insessores, and are mostly to be found as denizens of the deep woods or forests.

Among the Falcondæ we have the goshawk (*Astur atricapillus*), and the sharpshinned hawk (*Accipitur fuscus*). The goshawk is a large, powerful and handsome hawk of a dark slate colour, with a black crown. It is not very common but is a venturesome hunter, and a story is told of a farmer who was going to have a chicken pie, who, having cut off the head of a chicken, saw a goshawk fly down and take the struggling chicken and fly up into a tree and proceed to take his dinner off it, but as the farmer had a loaded gun in the house that dinner was never finished. Another goshawk chased a hen right into a house, where an old man and a girl were sitting, and seized it ; but he bade "farewell to hope when he entered there," for he never came out.

Their principal food consists of poultry, ducks, grouse, hares, squirrels and other rodents. The sharpshinned hawk we have also here during the winter, and last winter one domesticated himself in a barn in town where a lot of English sparrows had also taken shelter, and, killing a few each day, he had converted them all except two into hawk when he was killed himself by an incipient Nimrod in the shape of a boy armed with a pitchfork.

It is quite common. Its food consists of young poultry and wild birds, and among these of course some of our most useful ones, but, to his credit be it said, he is particularly fond of that nuisance, the English sparrow, and it is to him particularly that we must look to rid us of the pest, and so in the mean time it would be wise to refrain from killing him till that work is accomplished. He destroys also quite a number of insects of various kinds, but he will come right into town to enquire if any one has seen any sparrows about.

Of the Strigidæ we have during the winter the snowy owl (*Nyctea nivea*), the great horned owl (*Bubo Virginianus*), the barred owl (*syrnium nebulosum*), the hawk owl (*Surnia Hudsonii*), the screech owl (*Scops Asio*), the short eared owl (*Brachyotus palustris*), and the saw whet owl (*Nyctate Acadica*). These,of course, being birds of prey, live upon whatever animals they can find and overcome—partridges, other small birds, rabbits, mice, etc.

The snowy owl is only an occasional visitor, but is not very infrequently shot down about the mouth of the river and at Bay du Vin. It seems to be driven down this way only by lack of food, and will take grouse, hares, mice and even offal sometimes when hard pressed. I believe its flesh is eaten by the Esquimaux. The great horned owl is comparatively common. It is a great enemy to poultry, and feeds on ducks, grouse, hares, mice, hawks, crows and other owls. It is strong and rapacious, and will make no mean adversary to man himself.

The barred owl is also common but is duller and slower in its motions, and is not so bold and rapacious. He is not quite so aspiring in his choice, but otherwise his food is about the same.

The hawk owl is fairly common, and its food is grouse, hares, mice, grasshoppers and other insects. It is diurnal in its habits, and breeds, I believe, further north.

The screech owl is not very common here, but is to be found. It is nocturnal in its habits, and its food consists of birds, reptiles, batrachians, fish, crustacea and insects.

The short eared owl is fairly common,and is both diurnal and nocturnal in its habits. Its food consists of birds,mice and insects.

The saw whet is common. Its habits are nocturnal, and its principal food mice and insects, and it is therefore a very useful bird. I believe it breeds here, although I have never found a nest, but it seems to be here all the year round.

Among the Picidæ, or woodpeckers, we have the log cock or military woodpecker (*Hylotomus pileatus*), the black backed woodpecker (*Picoides Arcticus*),the banded back woodpecker (*P. Americanus*), the hairy woodpecker (*Picus villosus*), and the downy (*P. pubescens*).

The log cock is an artist in his way. With his strong bill and muscular neck and body he deals such powerful blows that he can be heard long before he is seen, and it seems to me that I walked half a mile on one occasion after hearing one before I saw him. I found him slicing off bark as you would take it off with a drawshave. He would pound, then listen, then pound again, then listen, and many a time I have wished for his skill and acuteness in ansculation and percussion in a doubtful chest affection. One can understand how he operates when all insect life is in vigorous activity, but in winter when it is dormant or inactive, how is it ? Is he clairvoyant ? To be sure he is not entirely dependent upon insects for food, for he does not disdain berries, fruit, beech nuts, and even, they say, acorns.

The black-backed woodpecker has the peculiarity of having only three toes. It is rather rare here, or else it retreats into the dense forest, remote from human habitations, and is therefore less often seen than the hairy and downy woodpeckers. Its food consists of wood worms, and larvæ and eggs of insects, dug from crevices in the bark of small sized trees. It nests here, and generally for that purpose selects an easily worked, soft-wooded tree, such as poplar, leaning over if possible, and it drills for its nest on the under side, making the entrance just large enough to admit its body, but enlarging afterwards, and going down ten or twelve inches, lining its nest with fine chips, and laying from three to five white eggs.

The banded backed woodpecker is even rarer here than the last mentioned and slightly smaller. It is also a three-toed variety. It is an arctic species, comes here in November, and leaves in early spring generally, although it has been found nesting in this Province. Its food seems to be about the same as the black back.

The hairy and downy woodpeckers are so much alike in their appearance, habits, food, etc., that they may be considered together. They differ very little in any of these respects, and are also, perhaps, equally numerous. Their food, as per examination of a large number of stomachs in Nova Scotia, New Brunswick and the North Eastern States, consists of from 68 to 70 per cent animal food, 20 to 25 vegetable, 1 mineral, in both cases. The animal food consisted of ants, beetles, bugs, flies, caterpillars, grasshoppers, spiders, myriopods, etc. There is one peculiarity that appears common to all the woodpeckers here, and that is that if there come one or two sharp, cold, very frosty days you will never see a woodpecker at all. They appear to remain in their nests. But if there comes a change, and a warm day or two, they are out again ready for business.

Among the Corvidæ we may mention the crow (*Corvus Americanus*), the bluejay (*Cyanurus Cristatus*) and the ubiquitous Canadian jay, whisky jack, moose bird, etc. (*Perisoreus Canadensis*). The crow may, or may not, be considered as one of our winter birds, for although I myself have never seen a specimen here from the final setting in of winter until the middle of March, except in the winter of 1896, it is contended by the lumbermen in general that they stay in the deep woods all winter. (Since writing the above the writer has seen a crow on the ice in front of Chatham, on the river, January 6th, 1899, and he seemed quite lively and happy.) This bird, although it destroys the eggs and young of many of our insect-destroying birds, does not do nearly as much damage to the farmers' crops and chickens as he gets the credit of. It is also charged with pulling sprouting corn, and even destroying corn in the milk stage. It really does all of these things, but in comparatively small amounts, while the good it does in destroying noxious insects and vermin far more than counterbalances the evil. In fact, its injurious propensities need hardly be mentioned, supplying only three per cent of its food, even in the United States, according to a report of the Department of Agriculture, and the destruction of birds and eggs formed one per cent of its annual food, whereas grasshoppers, May beetles, cut worms, mice, moles, shrews, rabbits, molluscs, etc., constituted the balance.

The bluejay is one of our most brilliant birds as regards plumage. In the winter he loves to be on the border of clearings, near dense woods, apparently wishing to vary his surroundings, according to the weather, for on fine days he can take to the open, and even come about the houses of the settlers to see what he can pick up, and if the weather is unpropitious he can "seek the seclusion which the forest grants." He is a greater depredator than the crow in regard to the eggs and young of other birds, and coolly goes about his murderous work even in the very presence of the grief-stricken parents. According to U. S. Agricultural Reports twenty-five per cent of its food is animal and seventy-five vegetable. The animal food consists of the young of birds, eggs, noxious insects, and useful insects, as far as agriculture is concerned. The animal food naturally rises to its highest point in August, when insect life is most abundant.

The Canada jay. This eccentric little bunch of feathers (for it is little more) is abundant everywhere in our forests, and you have only to kindle a fire any time to tell how many of them are within a mile's radius. It is very fond of animal food, which it carries off and stores up for future use, and thus if not watched it will cause an immense amount of that kind of food to mysteriously disappear. He is an amusing little thief, and many are the traps that are laid for him around the lumber camps, where he is a constant winter resident.

Of the Fringillidæ we have the pine grosbeak (*Pinicola enucleator*), the red crossbill (*Curvirostra Americana*), the white-winged crossbill (*C. Leacoptera*), the redpolled linnet (*Ægiothus Linarius*), the mealy redpoll (*A. exilipes*), the pine linnet (*Chrysomitris pinus*), the snow-bunting (*Plectrophanes nivalis*), and the Lapland longspur (*Plectrophanes Lapponicus*).

These, with the exception of the snow bunting and Lapland longspur, live in the depths of the forest, and they all go further north in summer as a rule, but the grosbeak nests here occasionally, and the red crossbill and the pine linnet often.

The pine grosbeak is sometimes called the "winter robin," but of course is no robin at all. He is quite a brilliant looking bird, and not at all timid. Its favorite food is the seed of the mountain oak berry (*Pyrus Americanus*). They disappear about the first week of April from this locality, but are said to sometimes breed in the valley of the Restigouche. The red crossbill is abundant in our deep forests during the winter, and he comes out to civilization during the summer, for he often nests here. Its principal food is seeds of plants and trees, cones of spruce and fir, buds, with occasional insect cocoons. They are lively, chatty little fellows, and do not appear to mind the cold in the least. The peculiarly constructed bill acts on the principle of a double wedge, and is admirably adapted for stripping the cones of their leaves. They generally go in flocks and frequent forests of scrub pines.

The white-winged crossbill is of a more brilliant plumage, but is rarer than its cousin, the red crossbill. Its food and habitat are about the same, but it does not breed here as a rule, as it seems to be a bird of more northern range.

The redpoll is about the size of the sparrow. They arrive here from the north in October, in flocks of several hundreds, at which time they frequent the low woods skirting pastures, streams and lakes. They live then on the seeds of alder, low birch and cedar. They are quiet generally while feeding, and rather timid in the autumn, but less so in the spring. They retire further into the woods as winter comes on, and break up into smaller flocks, but collect again in March and leave in April.

The mealy redpoll resembles the other very much in its habits, and is regarded by some as a mere variety of that bird.

The pine linnet is frequently found in company with the redpolls, and shares many of their habits. It often comes into villages in August and September, and feeds on the seeds of dandelions and thistles. They often gather about lumber camps during the winter. They often summer here. Their song is melodious and resembles that of the goldfinch.

The snow-bunting affects more the open country and the shores of rivers and lakes. They are erratic in their habits, and you may see great numbers of them for a few days, and then none at all for some time. They come about the last of October, and leave in April. They are of a brown colour, when they first arrive, but change to their beautiful winter plumage as the season advances. They appear to love the stormy and tempestuous weather. They live on the seeds of weeds and grasses and pass the night under the shelter of cliffs or banks, perched on dead branches or projecting sticks. They always appear to be fat, and a snowbird pie is considered a great dainty. They have been found as late as the 28th of May (that is, a straggling bird) near Newcastle.

The Lapland longspur associates with the snow-bunting,and its habits and food are about the same. An odd snowbird (*Junco Hyemalis*) winters here, but I do not think it is a common bird in this locality.

Of the Laniidæ we have the great northern shrike or butcher bird (*Collurio Borealis*), as an occasional visitor, or rather they are rare. He comes here in October, and goes north in April. His colour is blueish ash, whitish below. with a black bar running through the eye. It has a bill midway between the seed-eater and the hawk, and its food corresponds, for it consists of insects, crickets, mice and birds. It carries consternation among those little imported nuisances, the English sparrows. It has a habit of impaling its victims on thorns on a tree, and leaving them there, hence its name. By the way, the English sparrow (*Passer domesticus*), one of the Fringillidæ, is also a winter resident, a quarrelsome, noisy, dirty little rascal, that eats everything except what he was brought over here to eat (viz., insects), fights with all the "old families," just as if he belonged here,and, when he can find no other mischief to do, tears the leaves off the apple and other trees just for pure deviltry. The butcher bird and the sharpshinned hawk, however, have caught on to him.

The brown creeper (*Certhia familiaris*),was seen at Bartibogue as late as December 20th, in 1891. but the fall and early winter were mild and open.

Of the Sittidæ we have the red-billed nut hatch (*Sitta Canadensis*). It is a restless, lively, chatty little fellow, and is found in twos and threes among the chickadees very often. They are insectivorous and examine the trees, commencing below and working spirally upwards, and seem to confine their attention to the main trunk and large branches, while the chickadees examine the smaller branches.

The chickadee is also a winter resident as well as a summer bird here. We have two varieties of them,viz., the black-capped chickadee or titmouse (*Parus atricappillus*), and the brown-capped (*P. Hudsonius*). They are tireless insect hunters, and therefore among our most useful birds. It has been said that one pair will eat 500,000 caterpillars in a year. The brown-cap appears to keep more to the deep woods. The golden-crowned kinglet (*Regulus Satrapa*) is another of our winter birds, and is often found in company with the chickadees.

This list of our winter birds is by no means exhaustive, but may be interesting to some of our amateur ornithologists. Much more might have been said in regard to their habits, etc., but it would have made the article too lengthy for this bulletin.

A PRELIMINARY LIST OF THE MOTHS OF MIRAMICHI WITH NOTES THEREON.

By J. D. B. F. Mackenzie.

As the climate is largely insular, owing to the influence of the bay waters, and the nights cooler than further inland, the moths like the butterflies are not numerously represented here. They appear, too, as a rule, later in the spring and early summer, and very few species can ever be said to be abundant.

Occasionally, and for unknown reasons, a new, or very rare, form arrives in swarms, as if carried beyond the limit of its usual habitat. Its rarity or entire absence the following year shows a lack of ability to withstand the effects of our climate, and the accidental character of its occurrence the previous season.

This list is not complete even for the limited area collected over, and is published rather as a beginning in one of the most interesting and practically useful departments of natural history, with the hope that it may stimulate students and local collectors.

BOMBYCIDÆ.

Spilosoma virginica,
Actias luna,
Leucarctia Acræa.
Datana ministra,
Telea polyphemus,

NOCTUÆ.

Apatella morula,
Agrotis haruspica,
Agrotis pitychrous,
Mamestra nimbosa,
Mamestra olivacea,
Hadena davastatrix,
Hyppa xylinoides,
Eucirrœdia pampina,
Cucullia intermedia,
Apatella Americana,
Agrotis subgothica,
Agrotis venerabilis.
Mamestra latex,
Mamestra renigera,
Hadena arctica,
Heliophila commoides,
Scoliopteryx libatrix,
Plusia bimaculata.

Plusia ampla, *Catocala antinympha*.
Catocala ultronia, *Hypena scabra*.

GEOMETRIDÆ.

Ennomos alniaria, *Metrocampa margaritata*,
Angerona crocataria, *Cleora pelucidaria*.

A swarm of the very pretty moth, *Cleora pelucidaria* Packard, appeared here on the evening of Sept. 29th, thousands of them covering windows, sides of houses and fences. It has never been reported from this section before—at least I can find no account of its being so, and as I was in doubt whether it was *C. pulchraria* or *C. pelucidaria*, I submitted it to excellent authority, who pronounced it the latter. Careful comparison afterward confirms it. Although put down by some authorities as a form or variety of *C. pulchraria*, it differs from the latter in many respects. Packard, contrasting it with *C. pulchraria*, describes it as follows: "Rather larger and more dusky, smoky-pellucid, palpi dark, thorax and body pale, mouse-coloured. Wings of the same hue. Inner line not so much curved, and outer line much as usual, but with the three teeth a little larger and less even. The lines are duller, and do not contrast so much with the rest of the wings as in the ordinary form. Fringes mouse-coloured, with faint dark checks. Beneath as above, but more uniformly mouse-coloured, with outer line as on the fore wings very faint and no markings on the hind wings, or with the outer line indistinct, but common to both wings."

Is *Adimonia rufosanguinia* Say migratory? On May 27th I found my choke-cherry trees (*Prunus virginiana*) swarming with *Adimonia rufosaguinia* in the adult state, hundreds of them rapidly devouring the leaves. Two days previously I went carefully over all my trees, hunting for anything in the entomological line, and there was an entire absence of the larvæ of this insect. I made enquiries among my acquaintances and found several whose choke-cherry trees were infected with them, but could not find anyone who had ever seen the insect in this locality before. The question arises, Whence came they? It confined its ravages to the choke-cherry trees with one exception—I once found it on the

Sweet Pea. Although a large patch of the latter was within three feet of some of my trees, I failed to find a single specimen on them. I can find only a very meagre description of the insect in any of the books I have at hand, and fail to find any account of its life history. Packard describes the larva of the *Galeruca*, as follows : "When about to transform it fastens itself by its tail to the surface of the leaf." Two days before the insect appeared on my trees there were certainly no larvæ on the leaves, and to all appearances it appeared in a swarm in one night. Paris green or hellebore appeared to have little or no effect on them. A number put under glasses seemed to thrive in the dry Paris green, and at the end of three days were as lively as ever. Picking them off by hand was the only remedy. Two or three days sufficed to rid the trees of them, and no more appearing gives one the impression that they must have flown from a distance.

I am indebted to J. Alston Moffatt, Esq., Curator of the Entomological Society of Ontario, for valuable information in reference to the above.

SOME MODERN ROCK-BUILDING.

By F. A. Dixon, M. A., Principal Sackville High School.

When one takes a survey of the rock foundations of the earth's crust, he is so impressed with their structure,—a process so slow in its operation that time as measured by years or by the life of man is too short to mark any perceptible progress in the work,—that he is at first rather apt to assume the work as complete than to look for evidence of present rock-building.

But rocks are being constructed now just as truly as at any previous time in the earth's history. Streams overflowing their banks in time of freshet leave a thin layer of sediment behind to add to the depth of the intervale. Rivers carry down to their lower courses and into bays and seas material washed from the land, which material, down in the calm depths remote from our observation, is deposited to become compressed in the course of ages into solid rock.

But the marshes at the head of the Bay of Fundy afford an instance of rock-building of the present, at once unique in its character and affording unexampled opportunity for observation. Here the material is carried from the bay inland up the rivers, and is deposited on banks and other areas overflowed at high water. The retreat of the tide permits examination of each layer of deposit before the next is made, while at any time, except that of high water, numbers of layers can be cut through with the spade and an outcrop is then exposed.

Nature's apparent eccentricity in thus carrying material from lower to higher levels is the result of the excessive rise of tide that here occurs, and which in turn is the result of the shape and position of the Bay of Fundy.

The extreme difference between low and high water levels differs in different parts of the bay. It has been much exaggerated, and a rise of 60 feet of tide is commonly believed. This height is greater by several feet than that actually occurring. At the head of Cumberland Basin, the greatest difference of level is about 46 feet. In the Tantramar River, at the I. C. R., only a few miles from the basin, the rise of tide is 35 feet, and a few miles further up the same river, at the highway bridge at Upper Sackville, the rise is 24 feet.

The familiar explanation of the phenomenal tides of the bay being correct, viz., that, during the rise of the tide, as the Nova Scotia and New Brunswick shores approach each other, the waters become crowded and therefore increase in vertical height, the surface of the water at high tide is not a level but a slope from the head to the mouth of the bay; and, as the same conditions apply up the tidal streams, a continuous high water slope then exists from the highest tidal point in the rivers to the mouth of the bay.

The existence of this high water slope is proved and illustrated at a point in the Tantramar River known as Rampasture Neck. Here the river makes a beautiful serpentine, doubling back on itself so as to form a peninsula with a narrow isthmus. The isthmus is overflowed at spring tides. When it is being overflowed by the rising tide the water comes on from the up stream side, where it is from one to two feet higher than on the down stream side. The distance around the peninsula being about three miles, the high water surface shows here a slope of about 4 inches to the mile, or 4 feet in 12 miles. Hence it is plain that the higher we ascend the tidal streams the greater is the height of the tid , or, in other words, the further from the earth's centre is the high water surface. At the same time, as we leave the bay and ascend the rivers, the less is the difference between the high and low water surfaces, owing to the upward slope of the bottom of the streams being greater than that of the high water slope.

The tides of the Bay of Fundy are not only phenomenal in height but also in the difference of height between spring and neap tides. The spring tides occur of course at the periods of new and full moon. But new moon tides are not the same in height as those occurring at the previous or next full moon. Whichever of these phases occurs more nearly at the time of the moon's perigee brings the highest tides of the month. And the more nearly the phase and perigee approach each other the higher will be that set of tides. It is then that for several successive tides the water is from one to six feet higher than the marsh level, and would overflow the marsh except for the protecting dykes. At the alternate period of spring tides the water barely rises as high as the marsh level. At all other tides, the least rise of which occurs at the moon's quarters, known as neap tides, the water begins its retreat while still several feet below the marsh level.

As a result of the great rise of tide the currents in the rivers and half-emptied bay are of great swiftness. Here, too, is a large quantity of quicksand,—sands which the waters have gained possession of as a result of the pulverizing power of the waves and other agencies on the rocks of the bay shore. These sands are continually being carried to and fro by the flowing and ebbing tide. By the resulting attrition the sands are still further pulverized into an almost impalpable detritus. With this detritus the water becomes charged and gains its chocolate colour, and the further we ascend the tidal streams the more heavily is the water charged.

At high water during the period of spring tides large areas are overflowed by the muddy waters, and during the short interval, while the water is at rest, a large part of the detritus settles and is deposited, forming one layer of alluvium. It is in this way that the whole of these alluvial marshes have been made. One layer of alluvium is in thickness from an inch down. The total depth of alluvium varies from the thinnest layer at the head of the tide to 40 feet at the mouths of some of the rivers.

There are reasons to believe that the lower layers of the deeper alluvium were deposited on subsiding upland soil. In one locality near a channel were found stumps of beech, pine and other upland trees many feet below the marsh and tidal levels. In many places are found roots of trees which could not live subject to overflow by salt water.

The marsh deposits began then as soon as the areas now covered with alluvium were low enough to be overflowed. As the subsidence continued the depth of deposit increased. These deposits in some cases have been sufficient to check the upward flow of tidal waters in river valleys and allow the subsiding areas above to receive a fresh water or lake deposit. An interesting instance of this is the area in the basin of the River Missiquash, now under the control of the Missiquash Marsh Improvement Company. Most of this area until very lately has been, as far back as popular records go, covered with fresh water, forming a series of lakes joined into one large one in times of freshet. When the fresh water is drained off a thickness of from one to two feet of lake deposit is found, but under this several feet of pure "quick-sand mud." The tide had once flowed freely over this area, but was checked by its own deposits; leaving a basin above to become lake.

Occasionally on the banks of streams, in the deeper deposits, are to be seen layers of "blue" mud alternating with "red." The blue mud owes its colour and chemical change to the iron compounds of the red alluvium, brought about by the decay of vegetable material in the presence of much moisture. This process still goes on in places. The commonest vegetation so decaying are the roots and leaves of a species of sedge which does not flourish on the highest marsh levels. These levels, before being dyked, are usually bald, or covered meagrely with samphire, rosemary, or other scanty vegetation. Sedge makes a more luxuriant growth on areas more frequently overflowed, or in levels slightly basin-like, where the alluvium is always completely saturated with tidal waters. It is in such conditions that red alluvium becomes blue.

From the alternate red and blue layers outcropping on river banks we are enabled to read the character that each layer bore when it occupied the surface. Thus then during a continuing subsidence have the deeper deposits of alluvium on the lower courses of rivers been made.

Besides these there are areas, many thousands of acres, about the upper course of the Tantramar, where rock-building,—or more properly, as the agriculturist would think, soil-building,—has been and is now going on. Here nature is aided in her efforts and directed by the hand of man. These areas were originally shallow lake where the Indian and the pioneer hunted the goose and brant, and where later the sportsman sought the haunts of the mallard.

Early in the present century lived a farmer in the neighborhood, Toler Thompson by name, who studied the tides of the Tantramar. As a result of his observations he began to connect these lake areas with the tidal waters. The fresh water flowed out, and the tidal water flowed in at high water, laden with its riches of salt alluvium. The lake vegetation,—moss, etc.,—was killed by the salt and soon settled and became buried under successive layers of marsh mud, which, in the course of time, enriched the lake areas with a firm and fruitful soil. The work involved much expense because of the extensive trenches to be dug by hand, but it has been exceedingly profitable.

The Missiquash Marsh Improvement Co. is engaged in a work of this character in the valley of the Missiquash, having got possession of several thousand acres of lake area. This company is applying modern methods, using a steam excavator for the larger ditches.

Interesting as this process principally is from an economic standpoint, yet interesting it must be to the scientist, affording an example, and perhaps the only one of its kind, of modern rock-building in which man and nature cooperate.

NOTES BIOLOGICAL AND ARCHÆOLOGICAL.

HYPERGENESIS.

A gentleman living near Chatham has a very prolific cow, as the following birth record shows:

1892, 1, her first; '94, 3, still-born; '95, 1, still-born; '96, 5, still-born; '97, 4, all alive but dying within a week. There was nothing unusual in her family history. J. McG. B.

ACAUDATE FOWLS.

There is in Chatham a breed of such. They were brought from Halifax, Nova Scotia, fifty years ago, and differ in no other respect from ordinary barn-yard fowls. The spinal column ends at the sacrum, the last vertebra of which is opisthocoelous, and the uropygial gland and rectrices are wanting. The characteristic seems to persist strongly, and assert itself among crosses, some of which may show two rectrices, the outer on each side. J. McG. B.

RARE WINTER VISITORS.

Several Juncos or Snow-birds, *Junco hiernalis* L., were seen from time to time at Bushville, near Chatham, during the winter of 1896-7. The season had not been a severe one. It is the only occurrence of the kind known to the writer.

Feb. 11th, 1899, Mr. James Pallen saw Wilson's Snipe, *Gallinago delicata*, by the side of White's Brook, a few miles from Chatham. The bird seemed active and strong, and was feeding over a muddy spot from which the snow had melted. The winter had been severe, and snow was covering the ground to the depth of two feet or more.

AN INTERESTING RELIC.

Among ruins of an old French post on Miscou Island, Glou. Co., which tradition ascribes to Nicolas Denys, was found, some years ago, a bronze vase, date 1601. Though somewhat injured by fire, the relic is well preserved. It is now among the curios of the family of the late Alex. McDougall, Esq., of Oak Point, Miramichi.

SECOND REPORT OF THE COUNCIL OF THE NATURAL HISTORY ASSOCIATION OF MIRAMICHI.

In presenting the Biennial Report of the Association your Council wish to refer to the loss it suffered in the death of its patron, Honorable Peter Mitchell. A native of Northumberland, personally known to so many members, distinguished for his brilliant abilities and long public services, his death was not only a blow to the Association, but a general loss to the whole province. As an expression of respect and regret, the Association provided a funeral wreath, and our president attended the obsequies on behalf of the Association.

It is, however, gratifying to be able to refer to the election as patron of Dr. G. W. Dawson, Director of the Geological Survey of Canada, a scientist of great ability and promise, occupying a very prominent position in the scientific world. Indeed, your Council feel that the Association was not only very happy in the choice but highly honored by his acceptance of the position.

We are pleased to be able to state that the Association was represented and its report presented by Dr. J. V. Ellis, M. P., at the meeting of The Royal Society of Canada, held in Ottawa, May, 1899; and at the meeting in May, 1900, by our patron, Dr. G. W. Dawson. Both reports were favorably commented upon.

Membership.

We are happy to say that no death or resignation occurred since the last report. While a number ceased to be members, owing to removal from Chatham, an increased number was added to the list. The following represents the membership at present:

Honorary members,	2
Members,	40
Associate members,	41
Corresponding members,	11
Total,	94

Financial Standing.

Balance on hand in February, 1899,	$ 24.38		
Receipts for two years ending February, 1901,	295.10		
		$319.48	
Expenditure,		215.15	
Balance on hand			$104.33
Estimated cost of printing Bulletin,			50.00
			$54.33

Cabinets ordered, to be paid out of this balance.

Museum.

Owing to the lack of space for the reception and arrangement of materials, especially large objects, the Association was unable to add as generously to its collection as it would have done. Now, however, as the old custom house, a large stone building, has been secured for a museum, the future will, we trust, be marked by a satisfactory increase of specimens of all kinds. As the reports of the various committees and curators show, there was considerable material added since the last report.

Botany.

The growth of the herbarium has been steady and gratifying. A cabinet was procured, a large number of plants mounted and labelled, and many collected during the summer will be placed in the cabinet in due time. Little, however, was done with the cryptogamous flora of the district, and we beg to express the hope that the ensuing year will be marked by some special work in this direction. The mosses and ferns deserve early attention.

A few fine specimens of fossil carboniferous plants were received as donations.

Ornithology.

There has been a gradual increase in the material under this head, but the lack of cabinet space was felt here as elsewhere: still a large number of the birds of New Brunswick were added

Invertebrate Zoology.

In this section excellent work has been done. The entomological cabinet shows over 1500 specimens, and many molluscs and marine articulates have been collected, but owing to lack of room no systematic arrangement of the material has yet been made.

Archæology.

A fair beginning has been made in this department. About twenty-five prehistoric stone implements, a number of interesting relics of early French occupation, and a few old curiosities have been brought together; but as this part of the province is rich in remains of the Stone Age, this section of the museum is expected to grow rapidly.

LECTURES AND ESSAYS.

Since organization Feb. 2nd, 1897, to the present, the following meetings were held, and discourses delivered:

1897.

Feb. 9. The Skeleton of the Bird. J. McG. Baxter, M. D.

Feb. 16. Digestion of Birds. J. McG. Baxter, M. D.

Feb. 23. Nature and Economy of Cryptogams. J. McG. Baxter, M. D.

Mar. 2. Fossil and Wingless Birds. Dr. Cox.

Mar. 9. Feathers. J. McG. Baxter, M. D.

Mar. 16. Devonian Fishes. Dr. Cox.

Mar. 23. Modern Cartilaginous Fishes. Dr. Cox.

Mar. 30. Embryonic Development and Growth of Bony Fishes. Dr. Cox.

April 6. Importance of Study of Insect Life. J. D. B. F. Mackenzie.

April 13. Moths. J. D. B. F. Mackenzie.

April 27. Animal Intelligence, Instinct or Reason, Which? J. McG. Baxter.

May 4. Classification of Fishes. Dr. Cox.

May 11. Insects Beneficial and Injurious to Vegetation. J. D. B. F. Mackenzie.
Nov. 9. The Ice Age in Miramichi. Dr. Cox.
Dec. 13. Dependence of Man on the Lower Animals. J. McG. Baxter, M. D.

1898.
Jan. 18. The Earth's Crust. Rev'd Dr. McKay.
Jan. 25. Courtship and Marriage of Birds. J.McG.Baxter,M.D.
Feb. 8. Evolution of the Bird. J. McG. Baxter, M. D.
Feb. 22. Portage Island, its Formation and Flora. Dr. Cox.
Mar. 1. Is Man Indigenous? R. P. B. Joyce.
Mar. 8. Interesting Freaks and Habits of the Bull-frog. Dr. Cox.
Mar. 15. The Mammal, its Place in Nature. Dr. Cox.
Mar. 22. Classification of Birds. J. McG. Baxter, M. D.
April 5. The Carnivora of N. B. Dr. Cox.
April 19. Ants and Spiders. J. D. B. F. Mackenzie.
April 26. Insect Pests and the Remedies. J. D. B. F. Mackenzie.
May 3. The Deer Family in N. B. Dr. Cox.
May 10. The Rodentia of N. B. Dr. Cox.
May 17. Flora of the Restigouche. G. U. Hay, Ph. B.
June 3. Formation of the Bay of Fundy Marshes. F.A.Dixon,A.B.

Two outings were made by the Association, one to the valley of the Bartholomew, the other to French Fort Cove, where interesting researches were carried on, and collections made. The anniversary of the organization of the Association was duly celebrated in a special manner, followed by a conversazione, that of Feb., 1899, being a grand success. Too much credit cannot be given the committtees and associate members for the ability and untiring energy they displayed in arranging and carrying out so successfully all details of the programme. The Council also desire to acknowledge the many obligations they are under to the press for the free insertion of notices and reports of the transactions of the Association.

PHILIP COX, Secretary.

DONATIONS TO THE MUSEUM AND LIBRARY.

1500 North American Insects, classified and labelled. J. D. B. F. Mackenzie.

100 Miramichi plants, mounted. Dr. Cox.

Petrified Tree-fern, Bordeaux Quarries, Restigouche. D. Ferguson.

2 specimens of Branching Coral. J. D. B. F. Mackenzie.

75 mounted birds. Dr. Cox.

Harlequin Duck, *Histrionicus histrionicus* L.; American Merganser, *Merganser Americanus* Cass.; Red-breasted Merganser, *M. serrator* L.; American Scoter, *Oidemia Americana* Sev.; Scurf Scoter, *O. perspicillata* Linn. Mr. and Mrs. Geo. Watt.

Eider, *Somateria molissima* Linn; Great Horned Owl, *Bubo virginianus* Gmel. George Dean.

A collection of shells from Portage Island, Miramichi Bay. Dr. Cox.

Some American silk-producing moths and their cocoons. Prof. Brahm, Bangor, Maine.

Bald Eagle, *Haliaetus leucocephalus* L., Joseph Simpson.

American Osprey, *Pandion haliaetus* L., Dr. Baxter.

2 Fossil Fishes, specimens cannel coal, Albert Co. A. Rowan, St. John.

A number of plants from Restigouche valley. G. U. Hay, A. M.

Purple Grackle, *Quiscalus æneus* Ridg. Joseph Tweedie.

Salamanders and the Tailless Batracians of New Brunswick (alcoholic specimens). Dr. Cox.

Monster lobster claw from Neguac. A. Cassidy.

Algæ and shells from the Gulf Shore. Capt. Asa Walls.

Tooth of Sperm Whale. John Sinclair.

Red-throated Loon, *Urinator lumme* Gunn. J. Morgan Ruddock.

Pine Grosbeak, *Pinicola enucleator* Linn. Inspector G. W. Mersereau.

Black-backed Gull, *Larus marinus* Linn. F. Jenkins.

Foolish Guillemot, *Uria troile* Linn. W. C. Stothart.

Shrew-mole, *Blarina talpoides*, E. J. Cox, Maugerville.

A number of plants from Derby, Miramichi. J. J. Clark.

Bald Eagle (young), *H. leucocephalus* Linn, Domestic Duck. Douglas Haviland.

A tailless fowl (Vide notes biological and archæological). W. Salter.

120 specimens of the Fresh-water Fishes of N. B. (alcoholic). Dr. Cox.

A mounted Sturgeon, *Acipenser oxyrrhynchus* Mitch. W.S.Loggie.

Ghost Fish, *Cryptacanthodes maculatus* Storer. A. G. Williston.

Pike Fish, *Siphostoma fuscum* Storer. Frank Loggie.

Greenland Sculpin, *Cottus grœnlandicus* Cuv. A. G. Williston.

Alligator Fish, *Aspidophorides monopterygius* Bloch. F. Loggie.

Fresh-water Fishes of Gaspe, P. Q. (alcoholic). Dr. Cox.

Horseshoe Crab, *Limulus*. Charles Whitehead.

3 specimens ditto. Andrew Brown.

2 mounted heads of Albatross. Harry Haviland.

A specimen of Idleweiss (Alps). Miss I. Haviland.

A number of Miramichi plants. Jas. McIntosh.

Under jaw of Walrus from Miscou Island, N. B., and tusk from Alaska. A. C. Smith, M. D.

Polished agate. Frank Pallen.

Fiji Island war spear, bows, and arrows. J. D. B. F. Mackenzie.

Back-bone of Shark. F. E. Danville.

7 mounted mammals of N. B., 25 skins and crania of mice, shrews, moles, ermine, etc., and 25 bird skins. Dr. Cox.

Barred Owl, *Strix nebulosa* Forst. J. L. Stewart.

Rana cantabrigensis Baird, James Bay, Canada, through exchange with National Museum, Washington. Dr. Cox.

Horned Toad, *Phrynosoma cornutum* Wym., Scorpion, and Mason Spider. McD. Snowball, Cal.

Amblystoma punctatum L., Great Spotted Salamander. Byron Keating.

Back-bone of Harbour Seal. Miss Laura Morrison.

Stone chisel, Porto Bello, Sunbury Co. Ed. J. Cox, Maugerville.

Lump-fish, *Cyclopterus lumpus* L. J. D. B. F. Mackenzie.

A collection of stone implements from the rivers St. John, Miramichi, and Restigouche. Dr. Cox.

Canadian Plants by Prof. Macoun (5 vols.). Dr. Dawson.

Wild Flowers of Miramichi by Roderick McKenzie. The Author.

Bull. No. XIV of the Nat. Hist. Soc. of N. B., and Economic Mollusca of Acadia by Dr. Ganong. Dr. Cox.

REPORT OF THE BOTANICAL COMMITTEE.

A good deal of activity has been shown since the organization of the Association in investigating the flora of the "North Shore," which has resulted not only in adding several hundred specimens to the herbarium, but bringing to the notice of botanists several plants new to the province, as well as extending the known range of a great many others.

These will be found arranged under their respective heads in the following catalogue:

PLANTS NEW TO THE PROVINCE.

Lepidium intermedium Gray, Wild Peppergrass. Chatham and Bay du Vin. Dr. Cox.

Spergularia borealis Robinson. Portage Island, July, '97. Cox.

Spergularia salina, var. *macrocarpa*. Portage Island. Has a marked range. Cox.

Comandra umbellata, Nutt. Islands Miramichi Bay. Cox.

Hieracium pilosella. Loch Lomond Road, St. John, and Charlo, Restigouche. Cox.

H. pilosella, var. *peletorianum*. Charlo, Rest. Cox.

H. cladanthum. Campbellton and along I. C. R. through Rest. Co. Cox.

Artemisia annua. Roadside, Chatham. Cox.

Matricaria discoidea. D.C. Wild Chamomile. Grammar School grounds, Chatham. An immigrant from Oregon. Cox.

Chenopodium Bonus Henricus L. Good King Henry. Streets, Chatham. Cox.

PLANTS WHOSE RANGE HAS BEEN EXTENDED.

Viola canina L. Red Bank, L. S. W. Miramichi. Cox.

Erodium cicutarium L'Her. N. W. Miramichi. Cox.

Trifolium arvense L. Neighbourhood of Chatham and Nelson. J. J. Clarke.

Draba incana L var. *arabisans*. Wharves, Chatham. Cox.

Apios tuberosa Moench. L. S. W. Miramichi. Clarke.

Lobelia Dortmanni L. L. S. W. Miramichi Lake. Cox.

Euphorleia Cyparissias L. Bartholomew River. James McIntosh. Beaubair's Island, Clarke.

Liparis Loeselii Richardson. Dalhousie Junction, Rest. Cox.

Polygonatum biflorum Ell. Indiantown, Mir. Barnaby River. Renous River. McIntosh. Clarke.

Ambrosia artemisifolia L. Hogweed. Chatham. Cox.

Trillium erectum L. Doaktown, fide. Miss Ethel Mersereau.

Cypripedium spectabile Swartz. Mill Cove. Cox. Renous River. Clarke.

Ranunculus multifidus Pursh. Eel River, Rest. Cox.

Amphicarpæa monoica Nutt. Barnaby River. Burton Flett. L. S. W. Mir. Clarke.

Arnica mollis Hook. L. S. W. Mir. Clarke.

Vaccinium caespitosum Michx. Mouth of Sevogle River. Cox.

Veronica Buxbaumii Tenore. Eel River, Rest. Cox.

Nepeta Glechoma Benth. Common in villages and towns, Miramichi.

Lysimachia thyrsiflora L. Restigouche and Portage Island, Miramichi Bay. Cox.

Listera cordata R. Brown. L. S. W. Mir. Cox.

Solanum nigrum L. River bank, Chatham. Flett.

Epilobium Hornemanni Reichenb. North West Miramichi. Cox.

Empetrum nigrum L. Bay du Vin. Cox.

Senebiera coronopus D. C. Ballast wharves, Chatham. Cox.

Erysimum cheiranthoides L. Wharves, Chatham. Cox.

Brassica alba Gray. Wharves, Chatham. Cox.

Stellaria graminea L. Along Canada Eastern Railway near Chatham. Cox.

Echinospermum lappula L. Chatham. Cox.

Ligusticum scoticum L. Shores of Miramichi Bay. Cox.

Drosera longifolia. Derby Lake. Clarke. Barrens about Napan Lake and L. S. W. Mir. Jas. McIntosh.

Chenopodium capitatum L. Chatham. Eel River, Rest. Cox.

Mercurialis annua L. Newcastle ballast wharf, Cox.

Aspidium fragrans Swartz. Rockheads, Mir. Cox.

Dentaria diphylla L. Blackville. McIntosh.

Spergularia rubra Presl. Derby. Clarke.

Rhus toxicodendron L. Blackville. McIntosh. L. S. W. Miramichi. Clarke.

Desmodium Canadense D. C. Hero's Falls, Rest. Cox.
Medicago lupulina L. Common in Miramichi towns and villages.
Melilotus officinalis Wlld. Wharves, Chatham. Cox.
Parnassia Caroliniana Michx. L. S. W. Miramichi. Clarke.
Sanicula Marylandica L. Derby. Clarke.
Osmorrhiza longistylis D. C. Derby. Clarke.
Cryptotænia Canadensis D. C. Derby. Clarke.
Aralia trifolia Decsne and Planch. Derby. Clarke. L. S. W. Miramichi. Cox.
Cichorium intybus L. Found in hay-fields along Miramichi River. Clarke.
Campanula aparinoides Pursh. Nelson. Clarke.
Andromeda polifolia L. L. S. W. Mir. Cox. Derby. Clarke.
Gentiana Andrewsii Griseb. Blackville. McIntosh. L. S. W. Mir. Clarke.
Cuscuta gronovii Willd. Blackville. McIntosh.
Epiphegus Virginiana. Bart. Moorfields. McIntosh.
Utricularia cornuta Michx. L. S. W. Mir. Cox.
U. intermedia Hayne. Derby. Clarke.
Phryma Leptostachya L. Derby. Clarke.
Humulus lupula L. Naturalized on L. S. W. Mir. Clarke.
Juglans cinerea L. L. S. W. Mir. Clarke.
Arethusa bulbosa L. Derby and Blackville. McIntosh. Chatham. Cox.
Allium schœnoprasum L. Nelson. Clarke. Blissfield. G. W. Mersereau.

JAMES MCINTOSH,
Chairman of Botanical Committee.

OFFICERS OF THE ASSOCIATION.

1899.

Patron—Hon. Peter Mitchell.
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The Geology and Metalliferous Rocks and Deposits of Northern New Brunswick.

BY ROBERT CHALMERS, F. G. S. A.

Part I. Geology and Economic Minerals of Northern New Brunswick, read Oct. 10th, 1899.

Part II. Occurrence of Gold in New Brunswick, read June 12th, 1900.

PART I.

GEOLOGY AND ECONOMIC MINERALS OF NORTHERN NEW BRUNSWICK.

By Robt. Chalmers, F. G. S. A.,

of the Geological Survey of Canada.

1.

HISTORICAL RESUME.

The rock-formations of Northern New Brunswick have been studied by a number of leading geologists at different times during the last sixty years. The first investigation known to the writer was in 1841 by W. J. Henwood, an English geologist, who examined the country to the south of the Baie des Chaleurs in some detail and crossed the great sandstone or Carboniferous area between Fredericton and Bathurst, defining its limits. The thin seams of coal which occur in these sandstones at Clifton, Gloucester County, were noted by him, and a collection of plant remains from the rocks of that locality was also made. The granite at Bathurst was examined and considered by Mr. Henwood to be the lowest or basal rock of the region, according to the views then held, having been found overlaid on the south by the sandstone and conglomerates of the coal measures, and on the north by slates, with numerous quartz veins and irregular masses of greenstone. Along the coast between Bathurst and the Restigouche River he likewise made a survey of the rocks and spent some time at Dalhousie studying the Cape Bon Ami beds, from which he obtained a large collection of fossils. But although describing the rocks and grouping them according to their lithological character and contained fossils, he made no attempt to fix their geological age. On his return to England he read a paper on the geology and fossil remains of the northern part of the province before the Geological Society of London.*

In 1842, Dr. Abraham Gesner, then provincial geologist of New Brunswick, carried out an exploration of the northern

* Proc. Geol. Soc. of London, Vol. III, 1838-42, pp. 454-456.

counties, particularly Gloucester and Restigouche, and examined the whole coast of the Baie des Chaleurs from the boundary of the Carboniferous at Bathurst to the Restigouche River, afterwards traversing the interior of the province to the upper St. John. Although his survey was almost entirely of a preliminary character, he nevertheless made the first classification of the rocks of the region according to their stratigraphical relations and the few fossils they contained, subdividing them into (1) Coal measures, (2) Silurian, (3) Cambrian, and (4) Granite and trap,—a classification which, considering that the study of geology was then in its infancy, has proved to be very nearly correct for the northern section of the province. The geological map which Dr. Gesner had in preparation about this time, the first geological map of New Brunswick, though never completed, is still in existence; but I am not aware that the formations of the northern counties are represented on it.

The next exploration of northern New Brunswick of which we have any account was that made in 1843 by Sir J. W. Logan, then Director of the Geological Survey of Canada. Sir William, after completing his section of the Joggins coal measures in Cumberland Co., N. S., is said to have walked along the whole New Brunswick coast from Baie Verte to Bathurst for the purpose of examining the great Carboniferous basin of this province. He was especially interested in tracing out its northern and western boundaries and ascertaining whether the Carboniferous rocks extended around the southern coast of the Gulf of St. Lawrence into the Province of Quebec. From Bathurst he seems to have travelled around the west shore of the Baie des Chaleurs in a canoe. "I have with me," he says, "at my own charges, a young man of the name of Stevens from Bathurst, a son of Mr. Stevens who established the Gloucester Mining Company in New Brunswick. Knowing something of mineral exploration, having a dash of the necessary enthusiasm, and being accustomed to rough it in the woods, able to handle an axe, manage a canoe and fit up a *camp*, as they call it, I anticipate, with his assistance, getting along with economy and despatch." In thus tracing the Carboniferous rocks he wished to ascertain whether the true coal measures existed in the Gaspe peninsula, as reports had got abroad that coal was found there. This did not prove to be the case, however, the rocks of this age in Gaspe belonging to the lower part of the series, which he named the Bonaventure formation from their great development at Bonaventure Island.

In 1849 Prof. J. W. F. Johnston was employed by the Government of New Brunswick to investigate and report on the agricultural capabilities of the province. Accompanying his report, issued in 1850, was a letter from Prof. James Robb of Kings College (now the University of New Brunswick), on the geological structure of the province, accompanied by a geological map. This map, the first published showing the geology of New Brunswick, was largely based on Dr. Gesner's, but contained a number of corrections. The geology of the northern counties was, however, delineated only in its broadest features, as Dr. Robb, so far as known, made no exploration in this part of the province.

The next publication which has any reference to the geology of the northern counties is Prof L. W. Bailey's *Notes on the Geology and Botany of New Brunswick*, published in 1865. In this brochure the author gives the results of his observations during a canoe trip across the country, going up the Tobique and down the Nepisiguit River at Bathurst. About this time also his *Report on the Mineral Resources of New Brunswick* appeared. In it he gives a detailed account of the mineral resources, with notes on mining development, localities, etc.

In 1864 the survey of the province by Prof. H. Y. Hind was undertaken, and a report of this work was published by the Provincial Government in 1865.* Prof. Hind in this report outlines the physiographic features of the Baie des Chaleurs district and defines the great Carboniferous basin. The character of the rock-formations, and the fossils found in the region, were also described and a catalogue of the plants of Middle Carboniferous age, embracing such as were met with at Salmon Beach, Gloucester County, is given. The limits of the geological formations were more clearly and accurately defined. Sections of the beds on the Nepisiguit River and at Cape Bon Ami were

* A preliminary Report of the Geology of New Brunswick, by Henry Youle Hind, M. A., 1865.

These are the principal forms that have been found here as yet, but the ground has just been broken.

There is an excellent field here for the study, as we have fresh, brackish and salt water all within easy distance.

Not only can a great many varieties be found, but we have commenced by establishing several small aquaria, in connection with the Association, where opportunity will be had to study the life habits of these minute forms. A journal is being kept, stating where the specimens were found, the appearance, number of species found, and other notes. This is a very necessary proceeding, and marginal notes are made so one can see at a glance what you have and where it was found.

It does not do always to stick too closely to the books, as, for instance, you will always find it said that there is no use looking for desmids in a swift-flowing stream, and this is in general true; but yet, passing one day by the bank of a swift-running brook, during a spring freshet, a bunch of algæ was noticed sticking to a stone in the middle of the swift current, which, being taken gently off and placed in a bottle, yielded, when brought home and placed under the microscope, the first and finest clusters of closterium Venus ever met with so far, and the brook was followed up and explored and proved a perfect bonanza for desmids of very many varieties. So, also, from a horse trough on one of the principal streets were obtained most elegant festoons of Diatom vulgare in endless numbers.

Look for yourself, don't take anybody's word, and don't despise the humblest sources as you may and probably will find in some horse track specimens which you may look in vain for elsewhere.

You will find also matter for thought and speculation, in your own experience, that you may never see mentioned in books. For instance, two specimens of the cyclops have been found here that were covered with a species of parasite that looked like the epistylus infusoria, as they drew in and expelled each a current of water. In both cases the animal appeared to be sick or suffering, or at least annoyed, as they were trying vigorously to shake them off, and seemed also sluggish. They were both large specimens of the cyclops. Was it because they were large and consequently sluggish that they became infested? And what was the parasite anyway? We have no book here that mentions it at all.

There seems also to be a remarkable dearth of books that give anything like a connected account of the life history of these small forms of life. This leaves, of course, much to be desired, but it also leaves a hiatus to be filled up by any energetic, ambitious, painstaking student.

The manner in which these forms pass over our severe winters is another subject for study, but if all is true that some authors assert, the tenacity of life in some of them is remarkable, and I would like here to quote from a German author a striking passage in that respect. After speaking of the vitality of seeds he says: "If then seeds that have been deprived entirely of air for 16 years, through their own inherent vitality are enabled to revive and flourish, so we shall also see that thoroughly dried bodies of the simpler formed animals can also undergo such an interruption of all visible vitality without injury. It seems to be simply this, that thorough drying or cold holds in check chemical affinities that in the breathing animal tend to bodily disintegration.

"This seems to be exemplified by experiments lately tried by the distinguished scientist, Raoul Pictet of Genf., who caused animals of different species to be frozen in blocks of ice, and reduced the temperature far below that of Siberia, and yet when they were thawed out they came to life again. Fish bore without injury a temperature –8 to 15 deg. (Centigrade), snakes –25 to 28 deg., snails endured for a number of days a temperature of –110 to 120 deg. Frog's spawn, infusoria rotifers, etc., resisted for hours –60 deg. Microbes, baccilli and their spores were apparently unchanged even for a length of time in a temperature of –200 deg. or even more when placed in liquid air.

"As all chemical change without exception ceases at –100 deg. (Centigrade), so must, in an animal or spawn that resists for a length of time this tremendous reduction of temperature found in certain districts, and the whole series is intersected by dykes of intrusive rocks. Where the latter are not predominant, the slates and calcareous rocks decompose into a fertile soil. On the table lands 800 to 1,000 feet high. which constitute the larger part of the area outside of the river valleys, the superficial deposits are deep, often loamy and highly productive from an agricultural point of view. Thousands of acres of the uplands of northern New Brunswick, containing soils of this description, are still in a wilderness condition and await settlement.

5.

DEVONIAN.

The only rocks of this age in the north of the province occur in the Restigouche valley, and in a belt crossing the upper waters of the Upsalquitch, the precise limits of which have not yet been defined. Interesting suites of fossil fishes and ferns have been obtained from these rocks in the first mentioned locality.

6.

CARBONIFEROUS.

The sediments of this formation cover a large area in the central and eastern part of New Brunswick and consist for the most part of flat-lying gray sandstones and grits, fringed by a belt of red sandstones and conglomerates. Their northern boundary has already been defined. Portions of the series are massive and well adapted for building stone. Thin seams of coal occur in a number of places, and fossil plants and trunks of trees are not uncommon.

7.

IGNEOUS ROCKS.

The granite of the Baie des Chaleurs district is confined to the areas of pre-Cambrian and Cambro-Silurian rocks, and is regarded as older than the Carboniferous. The diorites or diabases, felsites, etc., come up through all the rocks, though rarely met with in the millstone grit area. The south shore of the Baie des Chaleurs and the estuary of the Restigouche have been largely invaded by intrusive masses which have had a marked influence on the topography and agricultural character of the region.

8.

SURFACE GEOLOGY.

Dr. Gesner, who first made a cursory examination of the surface deposits of the province, collected a number of fossils from the clays and sands of the Baie des Chaleurs district. At that time they were classified as Tertiary deposits. He also came to the conclusion that during the existence of the testacea, whose shells are entombed in the clay beds, the coast border stood lower than at present, and that an upheaval followed. Little was known of the fauna of the Pleistocene, however, until the construction of the Intercolonial railway was undertaken, when a great number of clay banks and terraces were opened by cuttings, disclosing an abundant series of fossils. Rev. C. H. Paisley, then a resident of Bathurst, made large collections from the Leda clay of that vicinity, lists of which he published in the *Canadian Naturalist* of Montreal in 1873. Rev. Dr. Honeyman also collected a number of shells at various localities along the south side of the Baie des Chaleurs, and secured from one of the railway contractors the skeleton of a white whale or porpoise nearly complete which had been unearthed in a railway cutting on the north side of Jacquet River, Restigouche County. This skeleton is now mounted and set up at the Provincial Museum, Halifax, N. S. In 1872-73 the writer obtained a large number of Pleistocene shells from different localities along the Baie des Chaleurs coast between Bathurst and Dalhousie, duplicates of which were given Dr. G. F. Matthew of St. John, who catalogued them with others from the Bay of Fundy district.* The writer also published a partial list in 1885.†

Pleistocene fossils have not yet been detected in the Miram-

*Report Progress Geol. Survey, Can., 1877-78, pp. 29-30, EE.
†Annual Report Geol. Survey Can., Vol. 1, 1885, pp. 42-43, GG.

ichi area, nor, indeed, anywhere in the deposits overlying Carboniferous rocks. A molluscan fauna must have existed in the coast waters of the southern part of the Gulf in Pleistocene time, however, as well as in those of the Baie des Chaleurs basin.

The general succession of the superficial deposits of northern New Brunswick has been given in the table on classification, and their origin is explained by supposing that the region was dry land for a very long time, even geologically considered, previous to the ice age, during which the rocks became decomposed to great depths. When glacial conditions supervened the material thus produced was greatly denuded, some portions forming boulder clay. The stratified beds resulted from the modification of this boulder clay and of the decomposed rock beneath, at a later stage. In the period of maximum ice extension the region stood higher, and much scoring and erosion of the rocks took place from ice-action. This was followed by a subsidence, when the land reached a level of about 200 feet lower than it is at the present day. Succeeding this was an upheaval, when it rose slightly higher than it is now. Since then a slight downward movement has again taken place along the coast border as evidenced by the peat bogs settling down below the sea-level, and the land does not yet seem to have reached a position of stable equilibrium.

9.

MINERALS AND MATERIALS OF ECONOMIC IMPORTANCE.

Although northern New Brunswick has hitherto produced little of importance from the mine or quarry, except building stone, lime and bricks, nevertheless, a large number of minerals are known to exist here. The gray Carboniferous sandstone and granite furnish excellent building stone, and the former has also for many years been quarried for grindstones in eastern Gloucester. Limestone is abundant throughout the whole Silurian area, but has, so far, been manufactured into lime only for local use. Clay suitable for brick making is common and brick-kilns are in operation in several places in the Miramichi and Baie des Chaleurs districts. Peat bogs are numerous, and peat exists here in unlimited quantities, especially in the counties of Gloucester, Northumberland and Kent. No attempt has yet been made to utilize it, but it must some day become a valuable asset among the natural resources of the country. Shell-marl has been found at Charlo and Belledune and is occasionally used as a fertilizer, though in limited quantities.

Argentiferous galena, magnetite and bog iron, also manganese associated with copper and iron pyrites, occur in various parts of the region, but, so far, they have not been discovered in sufficient quantities to be profitably wrought. At Millstream, Nigadoo and Elmtree rivers, the argentiferous galena yielded traces of gold and appreciable quantities of silver.

PART II.

THE OCCURRENCE OF GOLD IN NEW BRUNSWICK.

(Communicated by permission of the Director of the Geological Survey of Canada.)

1.

HISTORICAL NOTES.

Alluvial gold was discovered in 1864 by Prof. Henry Y. Hind in some of the river valleys of the interior of New Brunswick, especially the Nepisiguit, Upsalquitch, Little South-west Miramichi, Long Lake, Campbell River, etc. In referring to this in the report of his explorations to the Government, Prof. Hind states that "in this province there is a large area occupied by auriferous drift, but in consequence of its shallowness it appears probable that it will not be found as rich as in Canada [Quebec], in those localities which are supposed to lie nearest the source of the gold"; and further, "the origin of the drift establishes the fact that gold-bearing rocks exist within the limits of the province over wide areas to the north of the localities where the fine gold in the superficial deposits has been discovered.*

About the same time Prof. L. W. Bailey, of the University of New Brunswick, found gold in Albert County in the vicinity of Elgin Corner. He says, "The precious metal has also been said to occur in some of the streams near Bathurst and on the Serpentine. * * * I have also seen an excellent specimen, said to have been found in Wapskehegan, a tributary to the Tobique."†

Dr. R. W. Ells refers to these occurrences in one of his reports and notes the character and abundance of the quartz veins, stating that "gold was found on the Little South-west Miramichi, about three miles above the North Branch and not far below a heavy rapid known as Main's Ledge, while on the main South-west several small pieces were obtained not far above Boiestown."‡

Subsequently, in the investigation made respecting some galena and iron ores in the vicinity of Bathurst, traces of gold were found. A specimen of one from Millstream, Gloucester County, assayed in the Laboratory of the Geological Survey, yielded :

Gold......0.175 of an ounce to the ton of 2000 lbs.
Silver....9.450 ounces to the ton of 2000 lbs.§

2.

ALLUVIAL GOLD IN THE SERPENTINE VALLEY.

Alluvial gold has, it seems, been known to exist in the valley of the Serpentine for thirty years or more. Some time between 1865 and 1870 Sperry Shea, of Woodstock, an old Californian miner, found it between the mouth of the river and the granite belt at the big falls, and secured a mining lease from the Provincial Government, covering this part of the valley. At the

*A Preliminary Report on the Geology of New Brunswick. By H.Y. Hind, M. A., 1865, pp. 218-227.

†Report on Mines and Minerals of New Brunswick, 1864.

‡Report of Progress Geol. Survey Canada, 1879.80, pp. 43-44D.

§Ann. Report Geol. Survey Canada, Vo. V. (N. S.), 1890-91, p. 49L.

time of his death, soon afterwards, it is said that he was negotiating with a company to work these alluviums. In 1889 several Woodstock gentlemen incorporated themselves under the title of The Northern New Brunswick Mining Company, with the object of systematically prospecting and working the gold-bearing gravels and quartz veins of this river valley. In 1893 this company, of which Mr. Solomon Perley is President, and Mr. J. C. Hartley, Barrister, Secretary-Treasurer, employed Mr. W. N. Gould of Sussex to examine the geology and character of the district referred to as regards the economic minerals and report thereon. The result was that in the following year a three-stamp prospecting mill was set up in a building erected for that purpose about six miles from the mouth of the river. Heavy quartz veins traverse the rocks here,and tests of a number of these were made, but I believe without any satisfactory results. More or less prospecting for alluvial gold has been carried on every season since, not only in the Serpentine valley, but also in the upper part of the Nepisiguit. Colours and small nuggets have been obtained in a number of places.

In the year 1897 Prof. L. W. Bailey was instructed by the Director of the Geological Survey to make an examination of this river valley with reference to the occurrence of gold in workable quantities in it, and to collect samples from the quartz veins for assay. In his report he states that "no work was in progress at the time of our visit nor were we subsequently able to obtain any definite information as to the reason for the erection of the mill or the returns therefrom. We were ourselves unable to find any gold and heard that the parties operating the mill had also failed to obtain any, except washing in a neighboring brook, but of this we were unable to speak with certainty. * * * Samples from various veins found at and near the mill and aggregating twelve pounds and a half in weight, were submitted to assay in the Laboratory of the Geological Survey, but were found to contain neither gold nor silver."*

Prof. Bailey says, however, "the results, though negative as

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*Ann. Report Geol. Survey, Can., Vo. X, 1897, pp. 39-42M.

regards the actual finding of gold, nevertheless, go far, in my opinion, to confirm the views previously expressed as to its probable future discovery."

In the summer of 1899, while at Woodstock, I was shown specimens of alluvial gold from the Serpentine River, some of them weighing from two to six grains. These specimens, with the reports concerning their mode of occurrence, seemed so encouraging that the Director of the Geological Survey instructed me when in the vicinity to examine that valley and investigate anew the character and mode of occurrence of the alluvial deposits therein, and especially to ascertain whether gold existed in sufficient quantities in these to be profitably wrought. Accordingly in the month of September when the river was supposed to be at its lowest summer level, I engaged Mr. Manzer Giberson of Arthuret, with a log canoe, and ascended the Right Hand Branch and its tributary (the Serpentine), spending a week on this exploration Very fortunately Mr. Solomon Perley, whose name has already been mentioned, was there with two men engaged in prospecting the river bottom, and to him I am indebted for much valuable information relative to the distribution of the gold and the precise localities where it occurred. He pointed out to me a number of the places where he had obtained it by panning and washing the gravels, some of which we tested over again. Several other new localities were, however, examined, and a series of trials made which proved the existence of the precious metal in the alluviums for a distance of eight or ten miles along the river bottom. Although no rich diggings were discovered yet a fair showing of gold was obtained.

The Serpentine flows in a westerly course into the Right Hand Branch, a tributary of the Tobique, the distance from where the latter joins the St. John River to where gold occurs being from 80 to 85 miles, following the river valleys. This river traverses a rugged and broken country from 1800 to 2000 feet high, and has trenched a valley from 800 to 1000 feet deep throughout the principal part of its course. It is in the narrowest and deepest part of this valley that the alluvial gold was found.

The surface of this part of the province is entirely covered with drift and heavily wooded, but neither rock nor drift exposures can be seen, except along the streams. The geological formations have been described in the reports of the Geological Survey. The strata are cut across nearly at right angles by the river, and sections of the rock are thus exposed to view in many places.

3.

CHARACTER AND DISTRIBUTION OF THE GOLD-BEARING ALLUVIUMS.

The character of the alluviums in the Serpentine valley is similar to that of those in other gold-bearing districts, notably to the deposits in the Chaudiere Valley in South-Eastern Quebec, which have been wrought for gold since 1846. Alluvial gold has been found along the river from a point about two miles above its junction with the Right Hand Branch nearly to the "deadwaters," which are about twelve miles from its mouth. It seems, however, to be more plentifully distributed above the big falls, about eight miles and a half from the mouth of the river, than below. Coarse gold has been discovered there in pieces weighing from five to six grains. At the time of my visit but little prospecting had been carried on in that part of the valley, except in the bed of the river and a few places in the banks, and nearly all the washing had been done by the ordinary process of panning. Since then, however, Mr. Perley has extended his explorations as far up as the "deadwaters," mentioned above, and discovered gold, both coarse and fine, at places from three miles and a half to four miles above the big falls. Sections of the deposits in which gold occurs were noted by me in several places and exhibit the following series in descending order :

1. Coarse, river gravel with boulders of all dimensions up to a foot in diameter.

2. Fine gravel on bed rock, sometimes oxidized, and containing gold.

3. Rock, presenting broken, unglaciated surfaces, with gold in the crevices.

In one place about two miles above the big falls, in what seemed to be an old channel, on the north side of the river, the following beds were observed in a pit opened by Mr. Perley :

1. Fine river sand or loam, 1 to 2 feet thick.

2. Sandy clay with rusty, gravelly layers, from 18 inches to 2 feet in depth. Gold colours were sparingly met with in this.

3. Decomposed, talcose slates, 15 inches deep in the shaft, but the bottom was not reached. Colours of gold were also found in this material.

Mr. Perley also showed me particles of gold obtained from the alluviums of Silver Brook, a small stream flowing into the Nepisiguit River about three miles below Third Nepisiguit Lake, and I have been informed that gold likewise occurs along Little South Branch, the next tributary to the east. In the beds of these streams no exploratory work has been done further than washing with a pan.

Reviewing all the facts relating to the occurrence of alluvial gold in this part of New Brunswick they tend to confirm the observations made by Prof. Hind in 1864, namely, that deposits containing it exist in the valleys of a number of the rivers and brooks flowing into the Right Hand Branch of the Tobique and into the upper part of the Nepisiguit, especially from the south. The precious metal which these alluviums contain is, however, apparently in an extremely scattered condition, though so far as can be ascertained, entirely of local origin. But so very little systematic exploration has been carried on, either along the Serpentine, or the small tributaries flowing into it from the north, that it is difficult to arrive at any conclusion in regard to its occurrence. Further preliminary work is desirable, to ascertain not only the limits of the auriferous deposits and the precise localities where these contain the most gold, but also to test the quartz veins in new localities, more particularly at and above the big falls of this river. Sluicing should likewise be more generally undertaken, especially at these falls and for two or three miles above them. The flats on either side of the river should also be prospected, as they often have old buried river channels beneath, and the contents of the alluviums throughout the valley proved. Though the precious metal has not yet been found in paying quantities, nevertheless, judging from the specimens obtained and from the character of the deposits, it is not unreasonable to suppose that in some spots at least, it has been sufficiently concentrated to be profitably mined.

In regard to the original source of the gold which occurs in this part of the province, it seems probable that it is in that portion of the wide band of pre-Cambrian rocks that lies between Campbell River on the south and the Nepisiguit on the north. These rocks consist chiefly of schists and slates, often chloritic or talcose, with quartzites, intrusive granites, etc., and are traversed by numerous quartz veins. Though gold has not yet been discovered in the matrix, nevertheless, grains or small nuggets with quarts attached have have been met with in the alluviums. The small three-stamp crusher referred to, it is hoped, will be put to further use in testing these quartz veins.

Black magnetic sands are quite abundant in some parts of the Serpentine valley. These when found in the auriferous alluviums contain some fine gold.

The Serpentine, which drains a lake system, has an abundant water power, sufficient for sluicing and washing the alluviums throughout the whole summer, and for hydraulic work should it ever be desirable to undertake this. The average gradient of this river below the "deadwaters" is not less than forty-five or fifty feet per mile, and it has several water-falls in that part of its course, the highest, called "Big Falls," having a descent of about twenty-eight feet.

After examining the Serpentine alluviums I visited the Nashwaak and Cross Creek district where gold was reported to occur in quartz veins, and where a large number of mining areas were sold in the winter of 1898-99 and located on top of the snow, so eager were people to secure them. During the summer of 1899 some prospecting was done, but I could not definitely ascertain whether any gold had been found. While examining this district I was fortunate in meeting Mr. Charles Welch of Boiestown, N. B., a Klondyke miner, and we carried out the exploration together. No gold was discovered by us at Cross Creek, either in the gravels or the rocks, but in the Nashwaak valley, in the vicinity of Stanley village, a few very fine colours were panned out of the alluviums. This gold may have been scattered hereabouts by prospectors and others, who appear to have been washing these alluviums at various times in the last thirty or forty years. If it really belongs to the deposits of the Nashwaak valley it must have been transported thither a long distance, probably from the source of the river, or from the valley of the South-west Miramichi. Indeed, it is not unlikely that it may have been brought here from the central area of pre-Cambrian rocks drained by the Serpentine and Little South-west Miramichi during the glacial period, this being the direction from which the ice came that passed over the Nashwaak district.

In conclusion it may be stated that the gold-bearing alluviums of North Central New Brunswick bear a close resemblance to those of South-eastern Quebec, and appear to have their source in that belt of rocks classified as pre-Cambrian, which forms part of the North-east Appalachian system, and is sometimes called the New Brunswick Highlands. Here, as in the Notre Dame Mountains and south-westward to Georgia and Alabama in the United States, these rocks seem in places to be auriferous, and in their disintegration and waste to have yielded gold to the alluviums. The similarity of these gold-bearing deposits throughout is shown in their mode of occurrence and in the fineness and scattered condition of the gold they contain.

Ottawa, February 24th, 1900.

A VISIT TO ST. ANDREW'S, N. B.,

WITH A

CATALOGUE OF PLANTS COLLECTED IN ITS VICINITY.

BY PROF. J. FOWLER, M.A., LL.D., F. R. S. C., QUEEN'S UNIVERSITY.

(Read Dec. 14.)

Last summer (1900) the writer enjoyed the pleasure of a visit to the old town of St. Andrew's in New Brunswick. The town is pleasantly situated on a peninsula at the mouth of the St. Croix on the shore of the Bay of Fundy. From an elevated ridge in the rear of it, the visitor obtains a fine view of the charming scenery of the neighborhood. On the one side his eye can travel over a wide expanse of farms, forests, and waste lands, bounded in the distance by Chamcook mountains, while in the opposite direction lies the broad expanse of the Bay, studded with islands to the distant horizon. Across the St. Croix and far away along the coast lie villages and farms of the State of Maine. A few miles away in the direction of Bocabec may be seen the beautiful farm and princely buildings of Sir W. Van Horne on Minister's Island. Few localities, if any, in the province can furnish such a splendid view of mountain and plain, river and sea. Stillness reigns on every hand. Many wealthy visitors from the United States and the western provinces of Canada spend their summer vacation here, away from the rush and noise of busy streets. Their repose is unbroken by the screams of steam whistles or the rush of electric cars. No tall chimneys pour out their dark columns of smoke to darken the sky, or obstruct the views of the beautiful scenery that stretches away on every hand.

The primary object of the writer's visit was to collect and study the Marine Algæ of that part of the Bay of Fundy. At the hour of his arrival (on June 9th) at the Biological Laboratory, the ebb tide had left dry a broad fringe of the rugged, rocky shore covered with a dense mass of Rockweed, *Fucus vesiculosus* and *F. nodosus*, giving promise of an abundant botanic harvest. A couple of days, spent in wandering about among the rocks and mud, revealed the unwelcome fact, that very few species could be obtained in the immediate neighborhood. The rugged character of the beach rendered it impossible to travel far along the shore, and only the fortunate possessor of a boat could visit other localities.

The small number of the species may be accounted for by the strong currents raised by the great tides of the Bay, the low temperature of the waters, and the exposure of all plants, clinging to the rocks, to the warm winds and the hot rays of the summer sun for several hours each day. The union of these factors constitute an environment to which only the hardiest species can adapt themselves, and all delicate forms must perish. In quiet coves, sheltered from the rush of the tide currents, many of the more delicate forms might be found, but these can only be visited by boat. Having thus, to some extent, failed in securing the special object of his visit the writer turned his attention to the abundant harvest furnished by the streets and fields of the town and its neighborhood.

In the early half of the century St. Andrew's was one of the busiest centres of commercial activity in the province, and was especially distinguished for its export of lumber. The long line of wharves and the numerous warehouses, now fallen into decay, along the water front of the town, are sad monuments of a prosperity which has completely passed away with the destruction of the forest upon which it depended. The seeds of weeds brought in vessels from foreign lands secured a foothold on the vacant grounds along the streets. The hardy constitution acquired by the stern struggle for existence in the cultivated lands and pastures of Europe, fitted them for the new conflict upon which they entered with the native vegetable population; and as the Red man was driven back by the advances of the White man, so the foreign plants disinherited the indigenous possessors of the soil and still retain the conquered territory. The less frequented streets and abandoned gardens and fields have been appropriated, and now furnish a most attractive field for the botanist. Native plants, whose constitution fits them for living in the cool and damp atmosphere under the shadow of the great forests, are unable to endure the assaults of the wind and the sunshine to which they are exposed when the forest is removed, and are consequently incapable of successfully resisting the encroachments of the invaders. Probably no locality of equal area in Canada can boast of a larger percentage of foreign plants in its Flora. than that which flourishes on the streets and in the neighborhood of St. Andrew's. The old park, once an object of beauty, with its winding paths—its artificial lake, now filled with aquatic plants—its grassy plots and forgotten flower beds, furnishes a field for a collection of foreign species which might well gladden the heart of any botanist.

When the writer arrived, early in June, some of the streets and the neighboring fields were brilliant with Dandelions, of which two species are found beside the Biological Laboratory. In July the white flowers of Caroway *Carum Carui* covered the fields for miles around the town. A collection of the seeds might have produced enough to supply the demand for the whole province. In the month of August, the roads and fields were covered with the Fall Dandelion *Leontodon autumnale.* In July, *Hieracium aurantiacum*, *Euphrasia Americana* and *Rhinanthus Crista-Galli*, were exceedingly abundant in the neighborhood of the Laboratory. Of 32 species of Compositæ collected, 20 were of foreign origin.

The following list contains only the names of species of which the writer collected specimens in flower or fruit during his visit. At the time of his arrival the early plants, including the forest trees, had shed their flowers and when he left the autumnal species such as the Asters and Solidagoes were only beginning to appear. He regrets that his very inadequate equipment for collecting and drying specimens prevented him from securing many other species, such as the Mosses and Fungi, which were abundant and would have largely swelled the list.

LIST OF PLANTS COLLECTED AT ST. ANDREW'S, N. B., BETWEEN JUNE 9TH AND AUGUST 18TH, 1900.

NOTE.—The nomenclature is that of Brown & Britton, Illustrated Flora.

ORDER I. RANUNCULACEÆ.

1. Thalictrum polygamum, Muhl.
2. Ranunculus repens, L.
3. Ranunculus acris, L.
4. Oxygraphis Cymbalaria, Prantl.
5. Coptis trifolia, Salisb.
6. Actæa ruba, Willd.

ORDER II. NYMPHAEACEÆ.

7. Castalia odorata, Woodr.
8. Nymphæa advena, Soland.

ORDER III. CRUCIFERÆ.

9. Barbarea Barbarea, MacM.
10. Erysimum cheiranthoides, L.
11. Brassica arvensis, L.
12. Brassica nigra, Koch.
13. Brassica campestris, L.
14. Bursa Bursa-pastoris, Britton.
15. Lepidium ruderale, L.
16. Cakile edentula, Hook.
17. Raphanus Raphanistrum, L.

ORDER IV. VIOLACEÆ.

18. Viola obliqua, Hill.
19. Viola blanda, Willd.
20. Viola primulaefolia, L.
21. Viola lanceolata. L.

ORDER V. CARYOPHYLLACEÆ.

22. Moehringia lateriflora, L.
23. Alsine media, L.
24. Alsine longifolia, Britton,
25. Alsine graminea, Britton.
26. Alsine humifusa, Britton.
27. Cerastium vulgatum, L.
28. Sagina procumbens, L.
29. Tissa rubra, Britton,
30. Tissa Canadensis, Britton.
31. Spergula arvensis, L.

ORDER VI. HYPERICACEÆ.

32. Hypericum perforatum, L.
33. Hypericum mutilum, L.
34. Hypericum Canadense, L.

ORDER VII. TILIACEÆ.

35. Tilia Americana, L.
36. Tilia Europæa, L.

ORDER VIII. GERANIACEÆ.

37. Geranium pratense, L.
38. Oxalis Acetosella, L.
39. Oxalis stricta, L.
40. Impatiens biflora, Walt.

ORDER IX. ILICINEÆ.

41. Ilex verticillata, Gray.

ORDER X. SAPINDACEÆ.

42. Æsculus Hippocastanum, L.
43. Acer spicatum, Lam.
44. Acer platanoides, L.
45. Acer pseudo-platanus, L.

ORDER XI. LEGUMINOSÆ.

46. Trifolium pratense, L.
47. Trifolium repens, L.
48. Trifolium procumbens, L.
49. Melilotus officinalis, Willd.
50. Melilotus alba, Lam.
51. Medicago lupulina, L.
52. Robinia Pseudacacia, L.
53. Vicia Cracca, L.
54. Lathyrus maritimus, Bigel.
55. Lathyrus palustris, L.
56. Caragana arborescens, Lam.

ORDER XII. ROSACEÆ.

57. Prunus Virginiana, L.
58. Spiræa salicifolia, L.
59. Spiræa tomentosa, L.
60. Spiræa sorbifolia, L.
61. Spiræa Ulmaria, L.
62. Rubus Americanus, Britton.
63. Rubus strigosus, Michx.
64. Rubus villosus frondosus, Bigel.
65. Geum strictum, Ait.
66. Fragaria Virginiana, Mill.
67. Potentilla Norvegica, L.
68. Potentilla argentea, L.
69. Potentilla tridentata, Ait.
70. Potentilla Anserina, L.
71. Potentilla Canadensis, L.
72. Comarum palustre, L.
73. Rosa humilis lucida, Best.
74. Cratægus oxyacantha, L.
75. Aronia nigra, Britton,
76. Sorbus Americana, Marsh.
77. Sorbus sambucifolia Roem.

ORDER XIII. SAXIFRAGACEÆ.

78. Philadelphus coronarius, L.
79. Ribes oxyacanthoides, L.

ORDER XIV. CRASSULACEÆ.

80. Sedum acre, L.

ORDER XV. DROSERACEÆ.

81. Drosera rotundifolia, L.

ORDER XVI. HALORAGEÆ.

82. Callitriche palustris, L.

ORDER XVII. ONAGRACEÆ.

83. Chamænerion angustifolium, Scop.
84. Epilobium lineare, Muhl.
85. " coloratum, Muhl.
86. " adenocaulon, Haussk.
87. Onagra biennis, Scop.
88. Kneiffia pumila, Spach.
89. Circæa alpina, L.

ORDER XVIII. UMBELLIFERÆ.

90. Carum Carui, L.
91. Cicuta bulbifera, L.
92. Hydrocotyle Americana, L.
93. Ligusticum Scoticum, L.

ORDER XIX. ARALIACEÆ.

94. Aralia hispida, Vent.
95. " nudicaulis, L.

ORDER XX. CORNACEÆ.

96. Cornus Canadensis, L.

ORDER XXI. CAPRIFOLIACEÆ.

97. Viburnum cassinoides, L.
98. Linnaea borealis, L.
99. Diervilla Diervilla, MacM.
100. " florida, Sieb & Zucc.

ORDER XXII. RUBIACEÆ.

101. Houstonia cœrulea, L.

ORDER XXIII. COMPOSITÆ.

102. Eupatorium perfoliatum, L.
103. Solidago puberula, Nutt.
104. " juncea, Ait.
105. " rugosa, Mill.
106. " Canadensis, L.
107. Euthamia graminifolia, Nutt.
108. Aster tardiflorus, L.
109. " latenflorus, Britton.
110. Dœllingeria umbellata, Nees.
111. Leptilon Canadensis, Britton.
112. Erigeron ramosus, B. S. P.
113. Anaphalis margaritacea, Benth & Hook.
114. Gnaphalium uliginosum, L.
115. Ambrosia artemisiæfolia, L.
116. Rudbeckia hirta, L.
117. Anthemis Cotula, DC.
118. Achillea Millefolium, L.
119. Chrysanthemum Leucanthemum, L.
120. Artemisia vulgaris, L.
121. Senecio " L.
122. Antennaria neodioica, Greene.
123. Arctium minus, Schk.
124. Carduus arvensis, Robs.
125. Centaurea nigra, L.
126. Tragopogon pratensis, L.
127. Leontodon autumnalis, L.
128. Hieracium aurantiacum, L.
129. Taraxacum Taraxacum, Karst.
130. " erythrospermum, Andrz.
131. Sonchus oleraceus, L.
132. " asper, Vill.
133. " arvensis, L.

ORDER XXIV. LOBELIACEÆ.

134. Lobelia inflata, L.
135. " Dortmanna, L.

ORDER XXV. CAMPANULACEÆ.

136. Campanula rapunculoides, L.
137. " rotundifolia, L.

ORDER XXVI. ERICACEÆ.

138. Vaccinium Pennsylvanicum, Lam.
139. " Canadense, Richards.
140. " Vitis-Idæa, L.
141. Oxycoccus, macrocarpus, Pers.
142. Kalmia angustifolia, L.
143. Rhodora Canadensis, L.
144. Ledum Grœnlandicum, Œder.
145. Pyrola elliptica, Nutt.
146. Monotropa uniflora, L.

ORDER XXVII. PLUMBAGINACEÆ.

147. Limonium Carolinianum, Britton.

ORDER XXVIII. PRIMULACEÆ.

148. Trientalis Americana, Pursh.
149. Lysimachia, terrestris, B. S. P.
150. Lysimachia nummularia, L.
151. Glaux maritima, L.

ORDER XXIX. OLEACEÆ.

152. Fraxinus nigra, Marsh.
153. Syringa Persica, L.

ORDER XXX. GENTIANACEÆ.

154. Menyanthes trifoliata, L.

ORDER XXXI. BORRAGINACEÆ.

155. Myosotis arvensis, Hoffrn.
156. Lappula Lappula, Karst.
157. Pneumaria maritima, Hill.

ORDER XXXII. CONVOLVULACEÆ.

158. Convolvulus sepium, L.

ORDER XXXIII. SCROPHULRIACEÆ.

159. Linaria Linaria, Karst.
160. Chelone glabra, L.
461. Leptandra Virginica, Nutt.
162. Veronica scutellata, L.
163. Euphrasia Americana, Wettst.
164. Rhinanthus Crista-Galli, L.

ORDER XXXIV. LABIATÆ.

165. Mentha sativa, L.
166. " Canadensis, L.
167. Lycopus Americanus, Muhl.
163. Scutellaria galericulata, L.
169. Brunella vulgaris, L.
170. Galeopsis Tetrahit, L.
171. Stachys palustris, L.
172 Glecoma hederacea, L.

ORDER XXXV. PLANTAGINACEÆ.

173. Plantago major, L.
174. " maritima, L.

ORDER XXXVI. CHENOPODIACEÆ.

175. Atriplex hastata, L.
176. Salicornia herbacea, L,
177. Dondia Americana, Britton.

ORDER XXXVII. POLYGONACEÆ.

178. Rumex Brittanica, L.
179. " Acetosella, L.
180. Polygonum ariculare, L.
181. " erectum, L.
182. " Persicaria, L.
183. " sagittatum, L.
184. " Convolvulus, L.

ORDER XXXVIII EUPHORBIACEÆ.

185. Euphorbia Cyparissias, L.

ORDER XXXIX. URTICACEÆ.

186. Ulmus campestris, L.

ORDER XL. MYRICACEÆ.

187. Myrica Gale, L.

ORDER XLI. CUPULIFERÆ.

188. Betula lutea, L.
189. Betula populifolia, Ait.
190. Alnus Alnobetula, Koch.
191. " incana, Willd.

ORDER XLII. SALICACEÆ.

192. Salix lucida, Muhl.
193. " Bebbiana, Sarg.
194. " balsamifera, Barratt.

ORDER XLIII. CONIFERÆ.

195. Larix laricina, Koch.
196. " Europæa, DC.
197. Thuya occidentalis, L.
198. Juniperus nana, Willd.
199. " Sabina, L.

ORDER XLIV. ORCHIDACEÆ.

200. Achroanthes unifolia, Raf.
201. Leptorchis Lœselii, MacM.
202. Corallorhiza multiflora, Nutt.
203. Gyrostachys Romanzoffiana, MacM.
204. Pogonia ophioglossoides, Nutt.
205. Habenaria hyperborea, R. Br.

ORDER XLV. IRIDACEÆ.

206. Iris versicolor, L.
207. Sisyrinchium angustifolium, Mill.

ORDER XLVI. LILIACEÆ.

208. Hemerocallis fulva, L.
209. Vagnea stellata, Morong.
210 Unifolium Canadense, Greene.
211. Streptopus roseus, Michx.

ORDER XLVII. JUNCACEÆ.

212. Juncus, effusus, L.
213. " Balticus, Willd.
214. " Gerardi, Loisel.
215. " bufonius, L.
216. " articulatus, L.
217. " Canadensis brevicaudatus, Engelm.
218. Juncoides campestre, Kuntze.

ORDER XLVIII. TYPHACEÆ.

219. Typha latifolia, L.

ORDER XLIX. ALISMACEÆ.

220. Sagittaria latifolia, Willd.

ORDER L. NAIADACEÆ.

221. Triglochin maritima, L.
222. Potamogeton nuttallii, Cham. & Sch.
223. Zostera marina, L.

ORDER LI. CYPERACEÆ.

224. Eleocharis ovata, R. Br.
225. " palustris glaucescens, Gray.
226. " tenuis, Schultes.
227. " microcarpus, Presl.
228. " atrovirens, Muhl.
229. " fluviatilis, Gray.
230. " cyperinus, L.
231. " Americanus, Pers.
232. Eriophorum Virginicum, L.
233. Carex arctata, Boot.
234. " aurea, Nutt.
235. " brunnescens gracilior, Britton.
236. " canescens, L.
236 a. " glaucodea Tuck.
237. " crinita, Lam.
238. " flava, L.
239. " Goodenovii, J. Gay.
240. " intumescens, Rudge.
241. " lurida, Wahl.
242. " maritima, Muller.
243. " Novæ-Angliæ, Schwein.
244. " pallesceus, L.
245. " pedicellata, Britton.
246. " scoparia, Schk.
247. " sterilis, Willd.
248. " " cephalantha, Bailey.
249. " stipata, Muhl.
250. " tenera, Dewey.
251. " tenuis, Rudge.
252. " retrorsa, Schwein.
253. " viridula, Michx.

ORDER LII. GRAMINEÆ.

254. Spartina cynosuroides, Willd.
255. " patens, Muhl.
256. " stricta maritima, Scrib.
257. Panicum implicatum, Scrib.
258. " pubescens, Lam.
259. Anthoxanthum odoratum, L.
260. Phleum pratense, L.
261. Alopecurus geniculatus, L.
262. Agrostis alba, L.
263. " hyemalis, B. S. P.
264. Danthonia spicata, Beauv.
265. Poa compressa, L.
266. " flava, L.
267. " pratensis, L.
268. " trivialis, L.
269. Panicularia nervata, Kuntze.
270. " Canadensis, Kuntze.
271. " Americana, MacM.
272. Puccinella maritima, Parl.
273. Dactylis glomerata, L.
274. Festuca ovina duriuscula, L.
275. " elatior, L.
276. Agropyron repens, L.
277. Hordeum jubatum, L.
278. Elymus arenarius, L.

ORDER LIII. EQUISETACEÆ.

279. Equisetum arvense, L.
280. " sylvaticum, L.

ORDER LIV. FILICES

281. Polypodium vulgare, L.
282. Pteris aquilina, L.
283. Asplenium Filix-fœmina, Bernh.
284. Phegopteris Phegopteris, Underw.
285. " Dryopteris, Fee.
286. Dryopteris spinulosa intermedia, Underw.
287. Dryopteris spinulosa dilatata Underw.
288. Dryopteris cristata, Gray.
289. " acrostichoides, Sw.
290. Onoclea sensibilis, L.
291. Woodsia Ilvensis, R. Br.
292. Dicksonia punctilobula, Gray.
293. Osmunda Claytoniana, L.
294. " cinnamomea, L.

ORDER LV. OPHIOGLOSSACEÆ.

295. Botrychium simplex, Hitch.
296. " ternatum, Sw.

ORDER LVI. LYCOPODIACEÆ.

297. Lycopodium lucidulum, Michx.
298. " obscurum, L.
299. " complanatum, L.

MUSCI.

300. Ceratodon purpureus, L.
301. Leucobryum glaucum, L.
302. Polytrichum commune, L.
303. " juniperinum, Willd.
304. Sphagnum cymbifolium, Ehrh.
305. " acutifolium, "
306. Ulota crispa, Brid.
307. " crispula, Brid.
308. " Ludwigii, "

ORDER JUNGERMANNIACEÆ.

Ptilidium ciliare, Nees.

LICHENES.

Alectoria jubata, L.
Unea barbata, L.
Theloschistes parietinus, L.
Peltigera aphthosa, Hoffm.
Cladonia rangiferina, L.
" cristatella Tuck.
Sticta pulmonaria, L.
Stereccaulon corolloides, Fr.

ALGÆ.

Corallina, officinalis, L.
Fucus vesiculosus, L.
" nodosus, L.
Polysiphonia fastigiata.
Rhodymenia palmata, Grev.
Laminaria longicruris, Dela Pyl.

Agarum Turneri, Post.
Ulva latissima, L.
" Sinza, L.
Porphyra vulgaris, Ag.
Enteromorpha compressa, Grev.
Chordaria flagelliformis, Ag.
Gigartina mamillosa, J. Ag.

CLASS FUNGI.

Uredo luminata--Æcidium nitens.
Agaricus muscarius.

Total number:	Genera	220
	Species	335
	Specimens	6,127

MIGRATION OF BIRDS.

BY J. McGREGOR BAXTER, M. D.

Very much information which would be of great interest to ornitnologists might be obtained by systematic observation of the arrival and departure of our migratory birds, the influence of temperature and the direction and force of winds upon such flights, the course the birds pursue, etc., etc. For instance if stations were appointed at Blackville, Boiestown and Fredericton in one direction and Richibucto, Moncton and St. John in the other (as it is very unlikely that birds would cross the unbroken forest between these two directions), one could easily find out the course they took, principally by their numbers, and the rapidity of their flights by the days of their first arrival at the different points. So little has been done in this line that I feel justified in contributing the following table of the spring arrivals here for the last 16 years, as I happened to notice them. It is very imperfect, as I am only an amateur, and could not devote as much time to it as it required; and the year 1900 is wanting altogether, as I was unable to attend to it at all. The asterisks in relation to the crows show where I knew myself positively that some stayed all winter, and also where, in the case of the English snipe, two stayed around an open spring during the winter of '98 and '99-'00.

The table of temperatures are the mean temperatures of the four months of five years obtained from the Meteorological Station here at Chatham, which was all I could obtain.

MEAN TEMPEEATURE FOR FOUR MONTHS MADE UP AT THE METEOROLOGICAL STATION HERE.

	1895.	1896.	1897.	1898.	1899.
February.........	13.2	14.5	16.7	18.3	12.4
March......	21.3	23.9	22.9	31.2	22.6
April...............	38.7	39.6	37.1	35.5	38.5
May.........	54.8	50.7	50.3	51.6	50.

		'84.	'85.	'86.
Canada wild goose	*Branta Canadensis*	Mr 18	Ap 7	Mr 30
Brant	*Branta Bernicula*	Ap 24		
Crow	*Corvus Americanus*		Mr 15	Mr 3
Robin	*Turdus Migratorius*	Ap 15	Ap 19	Ap 1
Chipping sparrow	*Spizella Socialis*	Ap 17	Ap 8	Ap 13
Fox sparrow	*Passerella Iliaca*	Ap 20		
Gulls of different kinds, quite a	number stay all winter around	smelt	holes	
Sparrow hawk	*Falco Sparverius*	Ap 21	My 2	
Crow Black-bird	*Quiscalus Purpureus*	Ap 21	My 6	Ap 18
Song sparrow	*Melospiza Melodia*	Ap 21	Ap 17	Ap 11
American Widgeon	*Mareca Americana*	Ap 24		
Black Duck	*Anas Obscura*	Ap 24	Ap 26	
Sea Coot	*Oedemia Perspicilata*	Ap 24		
Eagle	kind unknown	My 1		
Singing Swallow	*Taychinetta Bicolor*	My 3	Ap 26	My 1
Peabody Bird	*Zonotrichia Albicollis*	My 6	My 9	Ap 27
Loon	*Colymbus Torquatus*	My 6		
Bittern	*Botaurus Minor*	My 7	Ju 4	
Kingfisher	*Ceryle Alcyon*	My 8	My 25	My 8
Purple Martin	*Progne Purpurea*	My 10	My 12	My 9
King bird	*Tyrannus Carolinensis*	My 20	My 22	My 23
Chimney swift	*Chœtura Pelasgia*	My 20	My 22	My 28
Barn Swallow	*Hirundo Horreorum*	My 22	My 14	My 24
American Goldfinch	*Chrysomitris Tristis*	My 25	Ju 7	My 19
Greater Telltale	*Totanus Melanoleucus*	My 25		
Blue eyed Yellow Warbler	*Dendrœca Aestiva*	My 26	My 31	Ju 2
Bobolink	*Dolichonyx Oryzivorus*	My 27		My 23
Sandpiper	*Tringa Minutilla*	My 27		
Redstart	*Setophaga Ruticilla*	My 23		
Maryland yellow throat	*Geothlypis Trichas*	Ju 1		My 21
Night Hawk	*Chordeiles Virginianus*	Ju 1	Ju 3	
Shag	*Graculo Carbo*	My 15		
Tern	*Sterna Anglica*	My 15		
Flicker	*Colaptes Auratus*	My 15		My 19
Red eyed Vireo	*Vireo Olrvacens*	Ju 6		
Nashville Warbler	*Helminthophaga R. Capilla*	Ju 6	My 27	
Purple Finch	*Carpodacus Purpurens*	Ju 6		
Junco	*Junco Hyemalis*	Ap 8	Ap 8	Ap 11
Vesper Sparrow	*Pooecetes Gramineus*		Ap 8	Ap 12
Marsh Harrier	*Circus Hudsonius*	Ju 1	Ap 26	Ap 14
Engish Snipe	*Gallinago Wilsonii*		My 12	
Humming bird	*Trochilus Colubris*		My 31	Ju 1
Cherry bird	*Ampelis Cedrorum*		Ju 8	
Osprey	*Pandion Haliœtus*			
Green Black Caped Flycatcher	*Myeodioctes Pusillus*			
Yellow rumped warbler	*Dendracca Coronata*			
Black polled warbler	*Dendrocca Striata*			
Brown Creeper	*Certhia Familiarus*			
Cerulian warbler	*Dendrocca Cerulia*			
Tree Sparrow	*Spizella Monticolla*			
Savanah Sparrow	*Passerculus Savanna*			
Titlark	*Anthus Ludovicianus*			
Gannet	*Sula Bassana*			
Blue bird	*Sialia Siales*			
Swamp Sparrow	*Melospiza Palustris*			
Blue Crane	*Ardea Herodias*			
Ruby crowned Kinglet	*Regulus Calendulus*			
Merganser	*Mergus Merganser*			
Wilson's Thrush	*Turdus Fuseacens*			
Least Flycatcher	*Enipidonax Minimus*			
Water Thrush	*Sciurus Noveboracensis*			
Hermit Thrush	*Turdus Pallasii*			
Oven bird	*Seinrus Aurocappilis*			
Solitary Sandpiper	*Totanus Solitarius*			
Rusty Grackle	*Scolecophagus Ferrugineus*			
Spotted Sandpiper	*Tringoides Macularius*			
White eyed Vireo	*Vireo Noveboracensis*			
Broad winged Hawk	*Buteo Pensylvanicus*			

* Some stayed all Winter. † Very few seen that year.

	'87.	'88.	'89.	'90.	'91.	'92.	'93.	'94.	'95.	'96.	'97.	'98.	'99.	'00.
....	Mr 14	Ap 4	Ap 5							Ap 5	Mr 23	Mr 29	Ap 4	
....			Ap 28											
....	Mr 16	Mr 3	Mr 17	Mr 17	Mr 6	Mr 6	My 16	*	Mr 26	Mr 9	Mr 13	Mr 12	*	
....	Ap 15	Ap 27	Ap 10	Ap 11	Ap 17	Ap 17	Ap 23	My 31	Ap 21	Ap 15	Ap 9	Mr 25	Ap [illegible]	
....	Ap 16	Ap 28	Ap 7	Ap 14	Ap 17	Ap 17	Ap 21	Ap 23	Ap 20	Ap 13	Ap 22	Mr 29	Ap 23	
....								My 3	My 1				Ap 11	
....														
....												My 23		
....	Ap 17	Ap 28	Ap 21	Ap 19	Ap 17	Ap 17	Ap 14	Ap 16	Ap 19		Ap 5	Mr 25	Ap 14	
....	Ap 23	Ap 23	Ap 15	Ap 19	Ap 17	Ap 17		Ap 16	Ap 19	Ap 13	Ap 21	Mr 29	Ap 14	
....			Ap 23											
....			Ap 20									Mr 14		
....			Ap 23									Ap 26		
...														
....	My 6	My 10	My 7	My 16	My 9	My 9	My 8	My 1				My 15	23	
....	My 6	My 7	Ap 28	My 11	My 1	My 1	My 3	My 3	My 6	My 4	Ap 27	My 11	My 1	
....			Ap 20				My 10	My 12	My 7					
....					My 29	My 29	My 28	Ju 4	Ju 3					
....	My 7	My 25	My 8	My 20	My 18	My 13	Ju 1	My 7	My 14	My 26	Ap 28		Ap 30	
....	My 2	My 5	My 10	My 17	My 26		My 12	My 12	My 6	My 10	Ap 25	My 1	Ap 28	
....	My 26	My 24		My 16	My 25	My 26	My 23	Ju 15	My 22	My 17		My 22	My 24	
....	My 16	My 30	My 16	My 16	My 26	My 26	My 20	My 1	My 7	My 17		My 15	My 12	
....	My 6	My 7	My 11	My 3	My 2	My 2	My 7	My 1	My 2	My 10		My 15	My 7	
....	My 26	My 24		My 20	My 20	My 20	My 31	Ju 1	Ju 1	Ju 12		My 29	Ju 9	
....											Ap 26			
....	Ju 4	My 24		My 13			My 21	Ju 1	Ju 1	Ju 4		My 21		
....	My 25		My 22	My 21	My 29	My 29	My 28	My 28	†	My 17			Ju 3	
....	My 26													
....											Ap 29	My 21		
....		My 31	My 22	My 25	Ju 6	Ju 6	My 23	My 28	My 13	My 17		My 25	My 1	
....		My 30		Ju 2	Ju 4	Ju 4	Ju 8	Ju 3	My 22	Ju 18				
....														
....														
....							My 8	My 7	My 6		Ap 26	Ap 29	My 26	
....		Ju 3		My 25			My 21	My 14	My 10	My 17		My 21		
....														
....	My 1			My 8	My 23	My 23	My 20	My 14	My 5	My 10	Ap 28	My 22		
....	Ap 17	Ap 23		Ap 13	My 8	My 7	Ap 17	Ap 17	Ap 22	Ap 26		Mr 29	Ap 16	
....	Ap 20		Ap 12	Ap 13	Ap 17	Ap 29	Ap 17	Ap 19	Ap 21	Ap 26	Ap 20	Ap 24	Ap 23	
....				My 9										
....		Ap 28			My 24	My 24	My 24	Ju 1				Ap 30	*	*
....	My 20	My 30	My 20	Ju 2	My 29								My 26	
....	Ju 9	My 31			My 11	My 11	Ju 6	Ju 1	My 20	Ju 4				
....	Ap 29						My 4	Ap 29	Ap 22			My 14		
....	My 29						Ju 3							
....				My 21								My 13	My 28	
....				Ju 1					My 6	My 10	Ap 30	My 23	Ap 30	
....					My 17	My 17	My 17	My 12	My 10	My 17				
....					My 25									
....									Ap 24	Ap 25				
....									My 5	My 10		Ap 24	Ap 23	
....									My 6					
....										Ap 5				
....											Ap 24			
....											Ap 28	My 21		
....											Ap 28	My 23		
....											Ap 30	My 23		
....												Ap 2		
....												My 11		
....												My 20	My 28	
....												My 21		
....												My 21		
....												My 21		
....												My 21		
....												My 21	Ap 23	
....												My 22		
....												My 21		
....												My 21		

NOTES ON CLISIOCAMPA DISSTRIA (Hubner), C. SYLVATICA (Harris).

By J. D. B. F. Mackenzie.

During the early part of the summer—i. e.—the month of July—reports frequently reached me from the interior of this county of the appearance of caterpillars in large numbers on the trees in the forest. From descriptions received I judged it to be the Forest Tent Caterpillar. Investigation proved my surmise to be correct. On the 9th of July, at the annual outing of the Miramichi Natural History Association, I visited the village of Red Bank, about twenty miles from Chatham, on the Miramichi River, and with very little trouble found a district where the caterpillars left unmistakable evidences of their presence. There was little difficulty in locating them, as a ridge of Poplar trees, *Populess Alba*, extending for miles and miles across the country was entirely devastated of its foliage, presenting the appearance of trees in mid-winter. This is the first year these insects have appeared in any great numbers in this district, and, so far, their ravages were confined to the Poplar in the above place. Although birch and withwood, as well as fir, were abundant all around it, none of them were eaten. One peculiarity I noticed was that after caterpillars fed on the Poplar the cocoons were invariably found on the birch trees if any were near, always between two or more leaves rolled or gathered together to form a protective covering. When this tree was not near the fir appeared to be the favorite, the cocoons being always on the underside of the limb; but if both trees were near, the birch was invariably selected. Careful search among the trees failed to reveal any evidences of the so-called tent. Miss Treat, in her work, "Injurious Insects of the Farm and Garden," insists that the tent is always woven, although sometimes overlooked for the reason that it is spun near the trunk of the tree and not on top of the branches as is the case with the Apple Tree Tent Caterpillar. I failed to find any, so must look upon the presence of the tent as a disputed point still until I find further evidence of its existence. Very few of the caterpillars were found, nearly all having gone into the cocoon stage, of which there were thousands. When opened it was found that an enemy had already appeared in the form of an ichneumon, which I unfortunately failed to identify, the cocoons gathered for this purpose being accidentally destroyed on my way home. The percentage of these examined showed one in ten infected with the ichneumon. Pickard gives its food plant as the apple and oak; Harris, the oak and walnut; while Treat gives apple, oak and hickory, showing it to be practically a cosmopolitan feeder, as we will no doubt see as it increases in numbers in this section, feeding on many other kinds of food plants. So far its ravages were confined entirely to the poplar in the above district, but I found in August, large numbers of the moths on elms around the electric light in Elm-Linden Park in Chatham. To the ordinary observer the Apple Tree Tent Caterpillar and the Forest Tent Caterpillar are identical, and at first sight this appears to be the case, but closer examination will show the latter to have a row of spots along the back instead of a line as is the case in the former.

PRELIMINARY LIST OF MOTHS

OF

NORTHERN NEW BRUNSWICK.

BY J. D. B. F. MACKENZIE.

(Continued from Bull. No. I.)

SPHINGIDÆ.

DEILEPHILA.
Chamænerii *Harr.*

PAONIAS,
Excæcatus *A. & S.*

TRIPTOGON,
Modesta *Harr.*

DRYOCAMPA,
Rubicunda *Fabr.*

ZYGÆNIDÆ.

CTENUCHA
Virginica, *Charp.*

BOMBYCIDÆ.

CROCOTA,
Rubicundaria *Hubn.*

ARCTIA,
Americana *Harr.*

ICHTHYURA,
Albosigma *Fitch.*

PLATYSAMIA,
Cecropia *Linn.*

CLISIOCAMPA,
Americana *Harr.*
Disstria *Hubn.*

HEPIALUS,
Argenteomaculatus *Harr.*

NOCTUÆ.

RAPHIA,
Frater *Gr.*

HERRICHIA,
Montifera.

ACRONGCTA,
Lancolaria.

HADENA,
Lignicolor *Guen.*
Verbascoides *Guen.*

APAMEA,
Nictitans *Bkh.*

ACHATODES,
Zeæ *Harr.*

PLUSIA,
Aereoides *Gr.*
Mortuorum *Guen.*

RHODOPHORA,
Florida *Guen.*

DRASTERIA,
Erechtea *Cram.*

COTOCALA,
Ultronia *Hubn.*

HYPENA,
Scabra *Fabr.*

MAMESTRA,
Grandis *Boisd.*

AGROTIS.
C. nigrum *Linn.*

GEOMETRIDÆ.

ENDROPIA,
Effectaria *Walk.*
Hypochraria, *H.-S.*

CORYCIA,
Vestaliata *Guen.*

EUFITCHIA,
Ribearia *Fitch.*

LOBOPHORA,
Vernata *Pack.*

RHEUMAPTERA,
Lacustrata *Guen.*

OCHYRIA,
Ferrguata *Linn.*

PYRALIDÆ.

DESMIA,
Maculalis *Westw.*

ARGYRIA,
Nivalis *Drury.*

CYPRINIDÆ OF EASTERN CANADA.*

By Philip Cox, Ph. D.

1. **Chrosomus erythrogaster** Ag.

Red-bellied Dace.

This species was first reported from N. B. by the writer, who collected it from Clear Lake, Lepreaux, St. John Co., a body of water only a few acres in extent, drained into the Bay of Fundy near by, and having no connection with any river system (Vide Bull. No. XIII, Nat. Hist. Soc. of N. B., pp. 44-47). The following year he got specimens from a pond near Golden Grove, nine miles from St. John, and there remained, as far as he knew, its only Canadian records until the summer of 1898, when he collected it from a few small lakes in the valleys of the Grand and Little Cascapedia, and the Nouvelle lakes near New Carlisle, Gaspe, P. Q., where it is associated with *Phoxinus neogæus* Cope. Its distribution, too, recalls that of the latter, for both are reported from Michigan and a few stations in the upper part of the Mississippi basin. *Erythrogaster* has been also reported from Free Port, near Portland, Maine, by W. C. Kendall and Hugh M. Smith (Vide Bull. U. S. Fish Commission, 1894, pp. 15-21).

All our *Chrosomi* have *eight* dorsal rays, whereas *erythrogaster* has but *seven*; and in this deviation from the established type the Maine fish agree, as well as *C. dakotensis* Evermann & Cox, a western form, and *C. eos* Cope, from the Susquehanna, its next station to the south; but the latter presents a slightly different color pattern. (Proc. Acad. Nat. Sci. Phil, 1861.) Unless then Agassiz made a mistake in the count, our eastern *Chrosomi* should not be designated *erythrogaster*; a structural character so marked and constant calls for recognition; and a separation should, in the interests of sound classification, be made. Specimens from Algonquin Park, Ontario, collected by Prof. Macoun, Naturalist of the Geological Survey, Canada, though differing somewhat

*Reprinted in part by permission from Fresh Water Fishes and Barachia of the Peninsula of Gaspe, P. Q., by Philip Cox, Vol. V, Sec. IV, Trans. Royal Society of Canada, 1899.

from our eastern form in coloration and proportion of parts, have also *eight* dorsal rays. They are very dark with more elongate bodies, shorter heads, subequal jaws, and dorsal insertion more posterior. They seem to form a connecting link between ours and *C. dakotensis* Evermann & Cox.

The Gaspe fish, especially those from the Grand and Little Cascapedia, are the smallest and most brilliantly colored of all coming under the writer's notice. The body is slender and longer in proportion to the head, with generally *seven* instead of *five* dark longitudinal bands, the two extra ones often well defined in life, one on each side of the vertebral line.

2. **Leuciscus cornutus** Gnthr.

Red-fin.

This attractive and well-known little cyprinid is found all over eastern Canada. It is extremely variable and has afforded ichthyologists many nominal species, but the differentiation is made to rest upon such slight and varying characters that it is more scientific to regard them all as local representatives of one general type. Specimens from Ontario have abruptly blunted muzzles, those of the males being obliquely truncate. It occurs at least at one station on the Gaspe Peninsula, namely, the Grand Cascapedia, where it is much smaller than elsewhere in eastern Canada, being barely four inches long. Like all the cyprinids of that region, its coloration is brilliant in life, with the two commonly evanescent golden lateral bands visible after months of immersion in spirit, and all the fins including the chin and throat scarlet. The anal fin rays are *eight* instead of *nine*, and the free margin of the dorsal is straight or slightly convex, owing to a shortening of its anterior rays. There are twenty-seven scales before the dorsal, while the N. B. and N. S. forms vary from sixteen to twenty-two. This boreal type is the most strongly marked variety the writer has met.

3. Notemigonus chrysoleucus (Mitch.) Jordan.

Golden Shiner.

The "Pond-Fish," as it is frequently called, is widely distributed all over eastern Canada, and was the only fresh-water fish found on P. E. Island by Roy McLean Vanwart and the writer, while making an investigation of its fishes and batrachia in 1896. It occurs at Afton Lake, near Mount Stewart. No information could be had of the time and manner of its introduction, nor was its presence known to the people of the vicinity; and, as the lake is only a few acres in extent, without affluents and with an outlet only during spring freshets, it is just possible some admirer of this handsome species planted it there long ago. Be that as it may, the absence of fresh-water fishes from an island so convenient to the coasts of New Brunswick and Nova Scotia and lying in the general line of bird migration, argues strongly against the theory of the dispersal of fishes through bird agency. Even where lakes and ponds, belonging to different but neighboring river-basins, are the summer home of fish- and ova-eating birds, the results appear to be no way otherwise. In New Brunswick the St. John River, with its numerous branches and lakes, seems favorably disposed to receive forms from the contiguous headwaters and lakes of the Androscoggin and other Maine rivers; but there is no evidence of transmission by such means having occurred. It is true that within recent years the Eastern Pickerel, *Esox reticulatus* LeS., a common fish in the Maine rivers, made its appearance in the St. John; but inquiry showed that it had been artificially introduced a few years before, into the Maduxnakik, a branch of that river.

The Golden Shiner is said by American ichthyologists to have *thirteen* anal rays, and many New Brunswick and Nova Scotia specimens show that number; but the stock of Lac a Canard and Murphy's Lake in the basin of the Grand Pabos, its only station on the Gaspe peninsula, has uniformly *twelve* rays. There, too, the fish are, as a rule, much smaller.

4. **Rhinichthys cataractæ** (Val.) Jordan.

Long-nosed Dace.

5. **R. atronasus** (Mitch.) Ag.

Blunt-nosed Dace.

These two species are with us very closely related, and present at all times such an instability of characters as to suggest intergrading. In fact no typical dace of either alleged species, as they are represented and described from the United States, occur in eastern Canada as far as the writer's experience goes, and he has collected all over the Maritime Provinces, including a portion of Quebec. All ours have the 8-rayed dorsal, characteristic of *cataractæ*, the dark lateral band marking *atronasus*, the small size, too, of the latter, but an increased scale formula approaching, but never equalling, that ascribed to the former. Our representative of *atronasus* is peculiar in having a narrow silvery band bordering the black lateral one above—a feature nowhere else ascribed to it.

Couesius (Ceratichthys) Jordan.

The genus is widely distributed in North America, consisting, however, of only a few closely allied species, whose differentiation is made to rest upon such slight and varying characters as to render the classification a mere recognition of the extremes of variation, blending with each other through a series of intermediate forms. For the purpose of illustrating this point, it is only necessary to compare the three most marked northern forms, *C. plumbeus* Gunther, *C. dissimilis* Girard, and *C. greeni* Jordan. The first is our alleged eastern form; the second peculiar to Lake Superior and the northern and northwestern portion of the Mississippi basin; the last a recently described species from Fort St. James, B. C. (Bull. Nat. His. Soc. of B. C., 1893.) The element of chief value, indeed of any value, is the scale formula, which is as follows :—

C. greeni Jordan. 10-57-7.
C. plumbeus Agassiz. 11-65-7 (11-60 to 70-7).
C. dissimilis Girard. 12-68-8.

To one who has been afield, examined hundreds of specimens, and noticed the wide range of variation in this respect among stock of the same or neighboring places, the founding of species on such small, inconstant, and largely individual differences must appear as little else than designating the extremes of variation in a given species. The writer has found *plumbeus* to vary from 9-55-6 or 7 to 12-70-8; and hence to comprehend within its limits the three above species, at least as far as this, the chief feature, is concerned.

While individualism may be of much interest to the naturalist or physiologist as marking a reversion or the extent of variation between present and ancestral types, it can be of no direct value in classification, unless it be found to spread out, so to speak, and become a general character of stock occupying a wide range. Then it ceases to be individualism, and rises into varietal or specific value, according to its significance and the degree of structural modification it represents. Among New Brunswick *Couesii* the scale formula ranges from 10-60-7 to 11-67-7 or 8, but as the type hovers around 10-65-7, the extremes must be attributed to individualism, for they are seldom or never associated with any other difference. It is interesting, however, to note how individualism here becomes a general characteristic of stock in remote and isolated districts. Nova Scotia fish, collected by the writer from the Annapolis and La Have rivers, show a marked tendency towards a reduction of the formula and approximation to the minimum standard of New Brunswick, 9-55-6 or 7 being frequently met with, while 10-60-7 is seldom exceeded. In Gaspe, on the other hand, the common average is higher than the maximum, especially in the Grand Cascapedia, Nouvelle (New Carlisle) Lake, Grand Pabos, and streams eastward, where it balances at about 12-70-8.

From these facts it must be apparent the scale formula can afford no sufficient ground for specific differentiation within the limits noted; yet the extremes occupy certain geographical ranges, are more or less isolated, and may evidence certain physical and biological forces, making for uniformity and stability in definite directions. As yet, however, the series is too complete, any two consecutive links in the chain too much alike, to permit of the group being divided into two species, though an extreme may deserve recognition as a variety.

To the relative height, too, of the dorsal and the form of its free margin is attached some significance in the attempted separation of *dissimilis* from *plumbeus*, the former having the margin nearly straight with anterior rays not produced, the latter with the margin concave and rays produced. When somewhat marked, constant, and associated with other contrasts, the feature would be of some value ; otherwise it should be used with much caution, for it is just in these two respects that fins of the *same* species are often found to differ. Age, sex, season, and nature of summer and winter habitats are modifying causes. Anadromous tribes, and fishes of lacustrine habit, resorting to the upper courses of rivers for breeding purposes, exhibit at different seasons a considerable variation in this respect. Our Atlantic salmon is a good example. Under these circumstances there is extra wear or abrasion of the anterior rays and external parts, often materially changing the outline. *Ceratichthys* exhibits all these modifications; but the *shortened anterior rays* and *straight* or *convex margin* of the dorsal are, as a rule, associated with the *maximum scale formula* in the isolated colony referred to. The shape, size, and profile of the head and degree of convexity of outline anterior to the dorsal fin vary much. Indeed, within the range described, *plumbeus* seems to include the three forms noted above, and it would, therefore, appear more scientific to regard them as varieties of one widely dispersed species. In "Fishes of North and Middle America," by David Starr Jordan, Ph. D., and Barton W. Evermann, Ph. D., Washington, 1896, the learned authors are disposed to recognise the specific identity of *plumbeus* and *dissimilis*. There are equally good reasons for including *greeni* as well.

6. **C. plumbeus** Agassiz.

Generally distributed over eastern Canada : not found on P. E. Island. Not uncommon in Ontario (Macoun).

a

7. **C. plumbeus rubi=laterolis** Var. Nov., Cox

Size small. stout; snout short and blunt; *mouth small*, terminal; *no barbel*. Eye 1 or less in snout, $3\frac{2}{3}$ in head. *Fins all small; dorsal inserted far back*, $1\frac{1}{2}$ *times width of eye behind ventral, about midway between snout and end of caudal*, its anterior rays *shortened* and free margin *convex*. Anal same form. Caudal peduncle hardly compressed, with fin less emarginate. *Vent more posterior.*

Scales *smaller* and *more closely imbricated* than in other forms, hardly reduced forward, the exposed border *more broadly rounded*: *about* 42 *in front of dorsal*. Lateral line less decurved.

Coloration brilliant. Back olive, soon passing into steel blue: a dark lateral band from snout through eye to base of caudal most distinct on posterior half of the body; a pale one above. *Sides from operculum to base of caudal almost scarlet in life.*

H. $4\frac{1}{3}$, D. $4\frac{1}{3}$. D. 8, A. 8. Scales 12-70-8. Length 4 inches. Locality: Harriman's Lake and Brook, Grand Cascapedia; Nouvelle (New Carlisle) Lake, Gaspe, P. Q.

A handsome little fish, deserving recognition as a well-marked variety.

8. **Semotilus atromaculatus** Mitch.

Horned Dace.

This well known fish is distributed all over eastern Canada; for, being partial to small streams and the upper courses of rivers, where it mingles with the Black-nosed Dace, *Rhinichthys atronasus et cataractæ*, it must, in time, find its way to every river system. As would be expected, it is found to vary a good deal, especially in the size and shape of the head and number and character of the scales. Mountain forms, notably those of the rivers of Gaspe, P. Q., have smaller heads with more pointed muzzles, and show an increase in the scale formula; the dorsal fin has *eight* instead of *seven* rays, and the coloration is less dusky. The fish are also smaller. Specimens from Ontario, kindly placed at my service by Professor Macoun, are heavier, anteriorly, with broader heads and blunter muzzles, and of more dusky coloration.

Semotilus bullaris Raf.

Silver Chub.

This species has a less extensive and continuous distribution than the last, being confined entirely to the Atlantic slope. It is seldom met with, like *atromaculatus*, in the smaller and more boisterous tributaries of rivers, and is, consequently, less able to pass from one river system to another and attain in time a wide and continuous distribution. This seems to be the only reason for its absence from certain waters well suited to it, and favorably situated to be stocked from others adjacent. *Bullaris* is one of the most common fishes to be met with on the St. John River, the upper courses of which are interlaced with tributaries of the Restigouche, in a comparatively level district, yet it is not known to occur in the latter, nor in the Metapedia, where it was industriously sought after by the writer in the summer of 1898. Neither does it occur in any of the Gaspe rivers, and the writer failed to find it in the Annapolis and La Have rivers, N. S., in 1899, when he made a careful examination of those waters.

Restriction to a fairly uniform environment may better account for the absence of that variation, so characteristic of *atromaculatus*, than that sometimes assigned, namely, the great antiquity of the species. This is said to result in such an equilibrium of the specific characters as imparts greater stability and less tendency to variation, rendering the creature not so responsive to influences of new environments. Though formally inclined to admit this principle of stubborn balance and attribute to it a certain degree of conservative force, as he extends his inquiries and investigation, the writer is becoming more and more convinced that the creature is but the vitalized history of its environment. That *bullaris*, then, shows a greater degree of stability in its specific characters than many of our cyprinids seems, at least in eastern Canada, due to the uniformity of its habitat.

The only variation noticed by the writer in this species is met with sometimes among immature specimens, four or five inches long, and consists in the development of an intensely black lateral band, which seems to disappear with age, for it has never been seen in the case of full grown fish. It was upon this feature that Storer based the apocryphal species *S. pulchellus.*

Specimens from Ontario, collected by Prof. Macoun, are identical with New Brunswick forms.

Phoxinus neogaeus Cope.

Minnow.

In Bull. No. XIII., Nat. Hist. Soc. of New Brunswick, pp. 44-7, will be found the first record of the occurrence of this little syprinid on the Atlantic slope of North America. It was taken by the writer from a pond in the valley of the St. John at Maugerville, Sunbury Co., and submitted to Dr. B. E. Bean, of the National Museum, Washington, who identified it as this species. The writer subsequently collected it from several small lakes near the mouth of the river in the vicinity of St. John (Dark Lake, Water-works Lake, McDonald Lake); but, though carefully sought after, it has not been found at any other station in the province. In the summer of 1898, however, he collected it from Nouvelle (New Carlisle) Lake, Gaspe, P. Q., where it is associated with *Chrosomus erythrogaster* Ag.

Previously its only records had been the Saginaw and Grand rivers, Michigan, and the Baraboo river, Wisconsin. As great activity has characterized ichthyological research in recent years, the lack of any further stations for this species being recorded might be accepted as proof of its rarity, and lend additional interest to the isolated and discontinuous character of its known distribution.

In New Brunswick the waters frequented by *Phoxinus* are generally free from predaceous fishes except perhaps *Anguilla rostrata* LeS., and *Gasterosteus pungitius* L., and its Quebec station is quite similar in this respect, so that the brightly colored and otherwise attractive minnow may, in part, owe its preservation here and there to this cause.

It varies considerably, the stock of one lake being easily distinguished from that of another, not alone by size and coloration, but by certain structural differences. The Dark Lake fish are the smallest known to the writer, never exceeding two and three-quarters inches in length. This diminutive form seems to represent the western type, which, it is said, never exceeds three inches though it differs from it in many ways. The anal fin is mostly 9 instead of 8-rayed ; the dorsal insertion more posterior by two-thirds the length of the caudal ; branchial leaflets oblong and stouter ; gill-rakes shorter, less acute and with broader bases ; snout shorter and blunter ; lateral line relatively longer, and the band on the side intensely black in life and forming a conspicuous patch on the operculum.

The fish of McDonald Lake are fully *five* inches long, and are peculiar in that the females are more rosy in the breeding season than the males.

The Gaspe *Phoxinus* is very close to the larger New Brunswick form, being about four inches in length, but the dorsal and anal are more pointed, the pectoral longer and muzzle more acute. It seems, too, to be less brilliantly colored. The dentition, however, is very irregular.

The writer is not aware that *Phoxinus* occurs anywhere else in the Dominion of Canada.

SECOND REPORT OF THE COUNCIL OF THE NATURAL HISTORY ASSOCIATION OF MIRAMICHI.

In presenting the Biennial Report of the Association your Council wish to refer to the loss it suffered in the death of its patron, Honorable Peter Mitchell. A native of Northumberland, personally known to so many members, distinguished for his brilliant abilities and long public services, his death was not only a blow to the Association, but a general loss to the whole province. As an expression of respect and regret, the Association provided a funeral wreath, and our president attended the obsequies on behalf of the Association.

It is, however, gratifying to be able to refer to the election as patron of Dr. G. W. Dawson, Director of the Geological Survey of Canada, a scientist of great ability and promise, occupying a very prominent position in the scientific world. Indeed, your Council feel that the Association was not only very happy in the choice but highly honored by his acceptance of the position.

We are pleased to be able to state that the Association was represented and its report presented by Dr. J. V. Ellis, M. P., at the meeting of The Royal Society of Canada, held in Ottawa, May, 1899; and at the meeting in May, 1900, by our patron, Dr. G. W. Dawson. Both reports were favorably commented upon.

Membership.

We are happy to say that no death or resignation occurred since the last report. While a number ceased to be members, owing to removal from Chatham, an increased number was added to the list. The following represents the membership at present:

Honorary members,	2
Members,	40
Associate members,	41
Corresponding members,	11
Total,	94

Financial Standing.

Balance on hand in February, 1899,	$ 24.38		
Receipts for two years ending February, 1901,	295.10		
		$319.48	
Expenditure,..		215.15	
Balance on hand........			$104.33
Estimated cost of printing Bulletin,............			50.00
			$54.33

Cabinets ordered, to be paid out of this balance.

Museum.

Owing to the lack of space for the reception and arrangement of materials, especially large objects, the Association was unable to add as generously to its collection as it would have done. Now, however, as the old custom house, a large stone building, has been secured for a museum, the future will, we trust, be marked by a satisfactory increase of specimens of all kinds. As the reports of the various committees and curators show, there was considerable material added since the last report.

Botany.

The growth of the herbarium has been steady and gratifying. A cabinet was procured, a large number of plants mounted and labelled, and many collected during the summer will be placed in the cabinet in due time. Little, however, was done with the cryptogamous flora of the district, and we beg to express the hope that the ensuing year will be marked by some special work in this direction. The mosses and ferns deserve early attention.

A few fine specimens of fossil carboniferous plants were received as donations.

Ornithology.

There has been a gradual increase in the material under this head, but the lack of cabinet space was felt here as elsewhere; still a large number of the birds of New Brunswick were added during the year and many donations, too, were received. The work of classifying and labelling the collection is finished and a fine large cabinet was procured, in which the collection is placed. A few of the winter birds of the Miramichi have not yet been secured. Some interesting or rare specimens were collected, such as the Laughing Goose, *Anser hyperboreus*, and the Brown Thrasher. *Harporhynchus rufus*, the latter never before, it seems, reported from New Brunswick. A. Scott Dawson, taxidermist, of Pictou. N. S., has been engaged to do work for the Association.

Mammology.

A few mounted small New Brunswick animals and a fine specimen of the Bay Lynx. *Lynx rufus*, have been added to this department.

Ichthyology.

Many alcoholic specimens, especially of fresh-water fishes, were added to the large number already on hand. They were collected from the Miramichi and Tobique, N. B., and Annapolis and La Have rivers, N. S., by the Corresponding Secretary, who also obtained small collections from the Columbia River and Assinaboine. We are also indebted to Prof. Macoun for Ontario cyprinids. A 9½ ft. specimen of the Albicore was mounted, and a medium sized Sturgeon also placed in the museum. Steps are being taken to add mounted representatives of all our larger food-fishes.

Herpetology.

There was a satisfactory growth under this head. Some specimens of interest were donated, among them a mounted alligator and a frog from Demerara, by Harry Creighton. A collection of salamanders, frogs, toads and snakes was made in the valleys of the Tobique, N. B., and the Annapolis and La Have, N. S., besides a considerable number received from Manitoba and British Columbia.

Invertebrate Zoology.

Important additions were made to the list of Butterflies, Moths and Beetles of the Miramichi by Vice-President J. D. B. F. Mackenzie, and some crustaceans, molluscs and sponges from our coast waters were secured. A few fossil shell-fish from various places were also received.

Library.

We would respectfully suggest that the Association furnish a library cabinet for the reception of the rapidly increasing number of books and scientific exchanges. A catalogue of such is hereby appended.

Meetings, Papers, Lectures, Outings, etc.

The anniversary of the founding of the Association was, in February, 1899, celebrated by a public reception and conversazione, at which about 200 members, associate members and friends were present, when an interesting programme of addresses, readings and music was carried out. The museum exhibit attracted much attention; and the whole event was very successful, thanks to the admirable arrangements made by the ladies of the various committees. For several reasons no formal celebration was held this year.

The annual outing was made to Red Bank, where a week was spent investigating its natural history and the stone age remains for which the locality is remarkable. A large collection of Indian stone implements was made, and many plants, insects and reptiles secured.

The meetings held, subjects discussed, etc., are to be seen in the following abstract of proceedings:

1899.

Jan. 17. Spring Arrivals. Dr. Baxter.

Jan. 31. Homes without Hands. Dr. Baxter.

Feb. 14. Study of Natural History (anniversary address). Dr. Baxter.

Feb. 21. The Miramichi Wilderness in Summer. Dr. Cox.

Feb. 28. Same subject continued.

Mar. 7. Classification of Birds. Dr. Baxter.
Mar. 14. Monthly meeting.
Mar. 21. Wonders of a Speck of Life. Prof. Andrews.
Mar. 28. A Long Journey, Man through Evolution. Dr. Baxter.
Ap'l 11. Monthly Meeting.
Ap'l 18. The Coffee Plant. R. P. B. Joyce.
Ap'l 25. Flora of the Nepisiguit and Tobique (paper). G. U. Hay.
May 9. Monthly meeting. Paper on psychic research. Dr. Baxter.
June 13. Monthly meeting. Arrival and habits of spring birds. H. H. Pallen, Jr.
Oct. 10. Monthly meeting. Geology and mineral resources of Northern New Brunswick. R. Chalmers, Geo. Surv.
Nov. 14. Monthly meeting· Life habits of objects donated that evening. Dr. Cox.

1900.

Jan. 9. World building, the Nebular Theory. Dr. Baxter.
Jan. 16. The Cotton plant in the arts and sciences. Dr. Baxter.
Jan. 23. Hibernation of animals, the philosophy of. Dr. Cox.
Feb. 6. Special business meeting.
Feb. 13. Annual meeting. President's Address, Work, Aim and Object of Association. Address by Vice-President Ferguson. Public reception and conversazione.
Feb. 27. Plant structure. Dr. Cox.
Mar. 6. Relation of lower and higher forms of plant life. Dr. Cox.
Mar. 13. Coloration of plants. Dr. Cox.
Mar. 20. Lord Kelvin and his works. Rev'd D. Henderson.
Mar. 27. Physics and economy of rain. Rev'd G. M. Young.
Ap'l 3. Ants. J. D. B. F. Mackenzie.
Ap'l 10. Monthly meeting.
Ap'l 17. Ants. J. D. B. F. Mackenzie.
Ap'l 24. A Pebble. Dr. Baxter.
May 1. Ideals and Realities, J. L. Stewart.
May 8. A Promenade (A journey through space). Dr. Baxter.
June 12. On the Occurrence of Gold on the Tobique (paper). R. Chalmers, F. R. S. C., Geological Survey.

Oct. 9. Monthly meeting. The Stone Age at Red Bank. Dr. Cox.
Nov. 13. Monthly meeting. Glaciation of Bartibogue Island. Dr. Cox.
Dec. 11. Monthly meeting. A Visit to St. Andrew's, N. B. (paper). Prof. Jas. Fowler, D. C. L., Queen's University, Kingston.
The Natural Theology of the Vegetable Kingdom. Rev'd P. G. Snow.

1901.
Jan. 22. Rest. Dr. Baxter.
Jan. 29. Adjourned monthly meeting. The Physiography of the Tobique Region. Dr. Cox.
Feb. 5. Biological Character of the Tobique Region. Dr. Cox.
Feb. 12. Prehistoric Zoology. Dr. Baxter.

Donations to the Museum and Library.

3 Fossil shell-fish, Alberta. W. J. Cox.
4 Gull's eggs, Gaspe. Dr. Baxter, Gaspe.
Albicore, Miramichi Bay. A. & R. Loggie.
Barnacles, Miramichi Bay. Martin Wallace.
Fossil Calamite, French Fort Cove. Wm. Lawler.
Hermit Crab, Miramichi Bay. A. G. Williston.
Giant fossil Calamite and Lepidodendron. Rev'd Mother Superior, Hotel Dieu.
Shell fossils and petrified wood, Rocky Mountains. T. A. Cox, B. C.
120 Butterflies, Moths and Beetles, Miramichi. J. D. B. F. Mackenzie.
Specimen *Rana catesbiana*, Parker's Lake. J. J. Clarke.
60 pressed Miramichi plants. Dr. Cox.
King-fisher and Black-backed gull. Dr. Cox.
Sponges. Northumberland Straits. P. Connors.
Eskimo kayak. Miss M. A. Haviland.
Rocky Mountain Whitefish, *Coregonus williamsoni* Grd; Rocky Mountain Brook Trout, *S. purpuratus* Pallas, 2 specs.; Dolly Varden Trout, *Salvelinus malma* Walb.; Toad, *B. columbiensis* Baird; Green Frog, *R. r. brachycep-*

hala Cope; Western Frog, *R. temporaria pretiosa* Bd. & Grd.; Western Salamander, *A. tigrinum* Green; Miller's Thumbs (*Uranidea*), 3 specs.; Spotted Snake, *Eutaenia s. parietalis* Say; Fresh Water Crustacea, *Lepidurus* ——— ?, 2 specs. Messrs. M. J. & T. A. Cox, Fernie, B. C.

4 specs. Fossil Shell-fish, Belly River. Alberta. Chas. R. Mitchell, Medicine Hat.

Great Blue Heron. White-winged Coot. Anthony Adams.

Weasel and Flint Stone. Rev'd W. Morrisey.

About 200 lances, arrow-heads, scrapers, chisels, knives, axes and other stone implements, Red Bank, Mir. R.W. Alward and Dr. Cox.

Mounted Water Ousel, Fernie, B. C. T. A. Cox.

Old-fashioned knife, from a grave, Tracadie. A. C. Smith, M. D.

Spider Crab, Gulf of St. Lawrence. Wm. Stewart.

12 specimens of birds for mounting. R. W. Alward and Dr. Cox.

Humming Bird. Miss A. Russell.

Humming Bird. J. D. B. F. Mackenzie.

Stone Axe. D. Sharkey, Upper Maugerville.

Stone Axe. Wm. McAllister, Red Bank.

A collection of arrow-heads, lances, scrapers, oval stones, etc. Mir. N. H. Ass. Outing.

Stone Mallet, Chisel and large Cleaver, Tobique. Dr. Cox.

Samples of iron ore from Newfoundland. Wm. Tait.

Samples of iron ore from Belle Isle. A. Adams.

Hercules Beetle (a pair). St. Lucia, W. Indies. W. C. Clark, Dal. College.

2 large Water Beetles, Bay du Vin. Mrs. McLeod.

A bird-nest Fungus, Maugerville. G. A. Treadwell.

Samples of silver ore, Rossland. M. J. Cox.

Gannet, *Sula bassana*. Col. McCulley.

Bonaparte's Sand-piper. E. Jarvis.

The Little Auk, *Margulus alle*. W. Tait.

Samples of Glaciated Sandstone, Bartibogue Island. J.L.Stewart.

Flying squirrel. R. G. Earle, Hampton.

Mounted Rabbit. Dr. Cox.

Samples of Plaster Rock, Entry Island, Magdalen. Capt. Geo. Savoy.

2 bayonets, a pistol barrel, a stirrup, a spur, 2 carranade balls, a flint gun lock, 2 shoe-buckles, from site of old French Battery, six miles above Campbellton, Rest.; and a large fossil oyster, a stone chisel and two arrow heads. R. W. Ferguson, Campbellton.

Piece of oak plank from one of the French frigates, sunk in the Battle of the Restigouche, 1760. T. R. Busteed. Bourdeaux, Rest.

Western Garter Snake. M. J. Cox, Rossland.

Hepatica, *Hepatica triloba* Chaix, collected by the donor at Doaktown; its first record norrh of the St. John River. Miss Jessie Murray.

Bohemian Waxwing, Black-poll Warbler and four eggs of the Least Bittern, *Ardetta exilis*. J. Hughes Samuel, Toronts.

A few interesting Cyprinids from Ontario. Prof. Macoun.

Carved and ornamented Sea Pumpkin, Madagascar. Mrs. H. Brobecker.

G. B. Fraser, Secretary.

LIST OF BOOKS, REPORTS, ETC., DONATED TO THE NATURAL HISTORY SOCIETY OF MIRAMICHI.

20 Vols. of the Ottawa Naturalist.
16 Bulletins of Nat. His. Society of New Brunswick.
13 Vols. of Proceedings of Boston Society of Nat. History.
Notes on Birds observed during a cruise in Gulf of St. Lawrence, by W. Brewster. (Boston Soc. of Nat. His.)
3 Annual Reports of the Historical & Scientific Society of Manitoba. (H. & S. Soc. Man.)
The Game Birds of Manitoba, by G.E.Atkinson. (H.&S.Soc.Man.)
Manitoba Birds of Prey, and the Small Mammals Destroyed by, by A. E. Atkinson. (H. & S. Soc. Man.)
The Present Status of Natural Science in Manitoba and the Northwest, by Rev.W.A.Burman,B.D. (H. & S. Soc. Man.)
Sketch of the Life and Discoveries of Robert Campbell, by George Bryce, LL. D. (H. & S. Soc. Man.)
Historical Sketch of the Charitable Institutions of Winnipeg, by Mrs. G. Bryce. (H. & S. Soc. Man.)
Pamphlets on United States Fish, from Smithsonian Institution, Washington.
2 Annual Reports of Smithsonian Institution.
9 Vols. Annual Reports of Geological Survey of Canada.
5 " Summary " " " " " "
A Preliminary Report of Klondike Gold Fields. (Geo. Sur. Can.)
Descriptive Notes of Sydney Coal Fields. (Geo. Sur. Canada.)
Notes on the Pleistocene Geology of a Few Places in the Ottawa Valley. (Geo. Sur. Canada.)
A Morphological Study of Naias and Zannichella, by D. H. Campbell.
Development of Glyphioceras, and the Phylogeny of the Glyphioceratidæ, by J. P. Smith.
Phycological Memoirs, by D'Alton Saunders.
Geological Reconnaissance of Coal Fields of Indian Territory.

Geology of Palæozoic Area of Arkansas South of Novaculite Region.
Development of Sytoceras and Phylloceras.
Several pamphlets on United States Fish.
Description of a species of fish (*Mitsukurina owstoni*) from Japan. The last eight from the Hopkins Seaside Laboratory.
Bulletin of Museum of Comparative Zoology of Harvard College.
5 Vols. of Transactions of Nova Scotia Institute of Science, Halifax.
Pamphlets on the Barren Lands, by J. W. Tyrrell.
Special Reports, by Prof. Prince (Com. of Fisheries).
Summer Birds of P. E. Island.
Economic Mollusca of Acadia, by Prof. Ganong.
A Monograph of Historic Sites in N. B., by Prof. Ganong.
Canadian Plants. Vols. I.-VI., by J. Macoun.
Catalogue of Canadian Birds, by J. Macoun.
John Goldie, Botanist, by G. U. Hay, Ph. B.
A Wilderness Journey in New Brunswick, by G. U. Hay, Ph. B.
Notes on a Wild Garden, by G. U. Hay, Ph. B.
Contribution to Canadian Palæontology, by J. F. Whiteaves.
List of Publications of Geo. Sur. of Canada.
Report of Entomological Society of Ontario.
The Birds of Ontario in Relation to Agriculture. (C. W. Nash.)
Notes on Orthoptera of Nova Scotia, by Harry Piers.
4 Vols of Transactions of the Royal Society of Canada.
Canadian Archives.
Bulletin of Nat. His. Association of Miramichi.
3 Annual Reports (1897, 1898, 1899), of American Museum of Nat. His., New York.
Several pamphlets on United States Fish.
14 numbers of The Auk.
Glaciation of Eastern Canada, R. Chalmers. F. G. S. A.
Studies in Fresh-water Entomostraka, by Wilder.
Review of the Erythrininæ.
Monograph of the Cartography and Place-Nomenclature of New Brunswick.

3 Abstracts of Proceedings of the Linnæan Society of New York.
Annual Report of the Botanical Club of Canada.
" " " Deaf and Dumb Institution, F'ton. 1899.
Bulletin of U. S. Geological Survey, No. 132.
Surface Geology of Northern N. B. and South-eastern Quebec. (R. Chalmers.)
2 Vols. Transactions of American Institute of Mining Engineers.
Surface Geology of Eastern N. B.; North-western N. S. and portion of P. E. I. (R. Chalmers.)
2 Vols. Collections of the N. B. Historical Society.
Check List of B. Columbia Birds. (John Fannin.)
A Contribution to the Geology of the Lower Amazonas, by Orville Derby.
Geology of Diamantiferous Region of Prov. Parana, Brazil, by Orville Derby.
Discussion on significance of Muscular Anomalies, by R. J. Anderson.
Proceedings and Transactions of Royal Society of Canada (Vol.3).
Report of Dep't of Marine and Fisheries, Ottawa. (29th.)
On Dendrerpeton Acadianum, by Sir J. W. Dawson.
A Quarterly Journal of Boston Zoological Society.
Annual Report (28th) of the Entomologist. (Dep't Agriculture.)
Annual Report of the State Geologist, New Jersey, U. S.
Annual Report of Newfoundland Dep't of Fisheries.
Notes on certain species of N. S. Fishes, by J. Jones, F. L. S.
The Fisheries of Canada, by L. Joncas.
Catalogue of Canadian Pinnipedia, Cetacea, Fishes and Marine Invertebrata, exhibited by Dep't of Fisheries of Dom. Gov., by J. F. Whiteaves, F. G. S., F. R. S. C.
2 Vols. (2 and 3) Transactions of the Canadian Institute, Toronto.
The Forestry Problem of N. B., by Prof. Ganong.

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MICROSCOPIC FORMS IN FRESH WATER.

By J. McG. Baxter, M. D.

THE excuse for a paper such as this is that (so far as the writer knows) no one has touched upon the subject in New Brunswick at all, and yet it is one of the most interesting in which the student of Natural History could possibly engage.

He will need, of course, first of all, to be furnished with a good microscope and the necessary appliances.

When he starts out to explore the world in miniature which exists in fresh water alone, he will be at first rather disappointed, for he knows not where nor how to look, but gradually the field opens up as he becomes more and more expert, and at last he is simply overwhelmed with a whole world of life in miniature, living, procreating, dying, being devoured by enemies, yet never failing in the continuation of the species under even the most trying circumstances, such as omnipresent enemies, rigorous, one might say almost Arctic cold, and intense heat, for we have both here.

Also one notices the exquisite adaptation of means to end in the life of each of these tiny individuals, as though the continuation of the Universe depended upon the preservation of this particular species alone.

We need not here speak particularly of the different habitats, modes of life and of procreation, of the different forms of life found in fresh water, as this is not the object or scope of this paper. We propose only to make it a nucleus around which may be added from time to time the additional forms noted in the vicinity.

The particular place where each of the following species was found is not noted particularly; suffice it to say that they were all found within a radius of two miles of Chatham, in ponds, pools, puddles, brooks, etc., of fresh water, although some of these sources approached the line of salt or brackish water.

It is only necessary to call attention to one rich source of Desmids here, viz., Kerr's brook, which rises on the Old Napan road, in a black swamp, runs about one mile, and empties into the Miramichi River near the post office.

In it were found almost all the common species, and also many that were found nowhere else, so that anyone here wishing to study Desmids can find no source at all equal to it for variety of forms.

The water plants and Algæ are not taken up in this paper, as it is absolutely necessary to make a protracted study of their modes of propagation and conjugation to be at all sure of the species, and consequently they are reserved for a future paper.

The nomenclature is principally that of Wolle, and the following forms are all that so far have been noted in this immediate vicinity :

DESMIDS.

Arthrodesmus octocornis.
Bambusina Brebisonii.
Closterium acuminatum.
“ acerosum.
“ Dianæ.
“ lineatum.
“ Venus.
“ parvulum.
“ lanceolatum.
“ strigosum.
“ juncidum.
“ acutum.
“ gracile.
“ macilentum.
“ didymotitum.
“ decussacum.
“ nasutum.
“ lunula.
“ “ var. striatum.
“ costatum.
“ decorum.
“ subtile.
“ subcostatum.
Cosmarium Ralfsii.
“ margaritiferum.
“ pyramidatum.
“ Brebisonii.
“ læve.
Cosmarium botrytis.
“ perforatum.
“ circulare.
“ contractum.
“ homalodermum.
“ De Baryi.
“ ovale.
Calocylindrus pseudoconnatus.
Desmidium Swartzii.
Docidium crenulatum.
“ rectum.
“ bacculum.
“ Archerii.
Euastrum urnaforme.
“ humerosum.
“ verucosum.
“ “ var. elatum.
“ ansatum.
“ pinnatum.
Hyalotheca dissilliens.
“ dubia.
Micrasterias rotata.
“ radiosa.
“ Americana.
“ brachyptera.
“ apiculata.
Mesotænium Braunii.
Penium Brebisonii.
“ interuptum.

Penium interuptum, large form.
" lamellosum.
" crassa.
" closterioides.
" naviculum.
" truncatum.
" oblongum.
Spirotœnia condensata.
" obscura.

Staurastrum punctulatum.
" cornutum.
" (minus) muticum.
" hirsutum.
" aculeatum.
" echinatum.
Xanthidium Columbianum.
" fasiculat var Hexag.
" " var subalpin.

DIATOMS.

Baccilis paradoxa.
Cymbella gastroides.
Diatom vulgare.
" tenue.
Fragillaria Capucina.
" entomen.
Gomphonema dichotomum.
" acuminatum.
Himantidium pectinale.
Meridion circulare.
Navicula cuspidata.
" radiosa.

Navicula viridis.
" Boeckii.
" dactylus.
" " var subgigas.
" tabellaria.
" aspera.
Pleurosigma delicatulum.
Stauroneus Baileyii.
" pteroidea.
" phœnecenteron.
Surirella splendida.

INFUSORIA.

Vorticella, Astasiæa, Euglenia (different species), Chilomonas, Epistylis, Stylonychia, Carchesium Chilodon, Loxodes, Stentor igneus, Cothurnia.

ROTIFERS.

Rotifer vulgare Megalotrocha, Pterodina patina, Amœba villosa.

RHIZOPODS.

Clathrulina elegans.
Centropyxis aculeata.
Trinema enchelys.

Difflugia pyraformis.
" corona.
" globosa.

VARIOUS FORMS.

Chironomus larvæ, Hydra viridis, Nais worms, Anguillulæ, Canthocamptus, Hydradephegæ, Cyclops, Chætonotus acanthodes, Pristina worms, Dendrocœlum lacteum, Alonopsis, Cyprids, Chætonotus loricus and larus, Oligochætæ, Camptocercus, Chydorus, Tubellaria worms.

PNEUMOBRANCHIATA.

Limnea culumella.
Physa heterostropha.
Planorbis deflectus.

These are the principal forms that have been found here as yet, but the ground has just been broken.

There is an excellent field here for the study, as we have fresh, brackish and salt water all within easy distarce.

Not only can a great many varieties be found, but we have commenced by establishing several small aquaria, in connection with the Association, where opportunity will be had to study the life habits of these minute forms. A journal is being kept, stating where the specimens were found,the appearance, number of species found, and other notes. This is a very necessary proceeding, and marginal notes are made so one can see at a glance what you have and where it was found.

It does not do always to stick too closely to the books, as, for instance, you will always find it said that there is no use looking for desmids in a swift-flowing stream, and this is in general true; but yet, passing one day by the bank of a swift-running brook, during a spring freshet, a bunch of algæ was noticed sticking to a stone in the middle of the swift current, which, being taken gently off and placed in a bottle, yielded, when brought home and placed under the microscope, the first and finest clusters of closterium Venus ever met with so far, and the brook was followed up and explored and proved a perfect bonanza for desmids of very many varieties. So, also, from a horse trough on one of the principal streets were obtained most elegant festoons of Diatom vulgare in endless numbers.

Look for yourself, don't take anybody's word, and don't despise the humblest sources as you may and probably will find in some horse track specimens which you may look in vain for elsewhere.

You will find also matter for thought and speculation, in your own experience, that you may never see mentioned in books. For instance, two specimens of the cyclops have been found here that were covered with a species of parasite that looked like the epistylus infusoria, as they drew in and expelled each a current of water. In both cases the animal appeared to be sick or suffering, or at least annoyed, as they were trying vigorously to shake them off, and seemed also sluggish. They were both large specimens of the cyclops. Was it because they were large and consequently sluggish that they became infested? And what was the parasite anyway? We have no book here that mentions it at all.

There seems also to be a remarkable dearth of books that give anything like a connected account of the life history of these small forms of life. This leaves, of course, much to be desired, but it also leaves a hiatus to be filled up by any energetic, ambitious, painstaking student.

The manner in which these forms pass over our severe winters is another subject for study, but if all is true that some authors assert, the tenacity of life in some of them is remarkable, and I would like here to quote from a German author a striking passage in that respect. After speaking of the vitality of seeds he says: "If then seeds that have been deprived entirely of air for 16 years, through their own inherent vitality are enabled to revive and flourish, so we shall also see that thoroughly dried bodies of the simpler formed animals can also undergo such an interruption of all visible vitality without injury. It seems to be simply this, that thorough drying or cold holds in check chemical affinities that in the breathing animal tend to bodily disintegration.

"This seems to be exemplified by experiments lately tried by the distinguished scientist, Raoul Pictet of Genf., who caused animals of different species to be frozen in blocks of ice, and reduced the temperature far below that of Siberia, and yet when they were thawed out they came to life again. Fish bore without injury a temperature –8 to 15 deg. (Centigrade), snakes –25 to 28 deg., snails endured for a number of days a temperature of –110 to 120 deg. Frog's spawn, infusoria rotifers, etc., resisted for hours –60 deg. Microbes, baccilli and their spores were apparently unchanged even for a length of time in a temperature of –200 deg. or even more when placed in liquid air.

"As all chemical change without exception ceases at –100 deg. (Centigrade), so must, in an animal or spawn that resists for a length of time this tremendous reduction of temperature be brought to a standstill all life's processes long before -200 deg. is reached.

"Yet they will revive and continue to live as though nothing had occurred.

"Life must be a force like gravity, or weight, a force that is ever present and never dies, but which requires an existing body or organization, so as to manifest its activity.

"This once admitted, one requires only to furnish moisture and light to awaken and develop life, just as one applies heat to start a steam engine."

THE SNAKES
OF THE
MARITIME PROVINCES
OF
CANADA.

By Philip Cox, Ph. D.

THE number of well-defined species to be found in this section of Canada does not exceed five, but some vary to such a degree as would enable herpetologists to recognize two or more subspecies, or strongly marked varieties, within the limits of one. Were an effort made, however, to assign geographical limits or a peculiar habitat or range to any of them, it must end in failure, for the variations are largely individual, not sectional; and, although the varietal characters may exist in many, they shade off into, or are found mingled with, others to such an extent as to make a separation seemingly impossible. This is especially true of the Garter and Black Snakes, which furnish North America with such an abundance of closely related species.

Yet in one respect three or four of our snakes, which have a wide range south and west, differ strikingly from the type there; I refer to the marked reduction in the number of ventral scutes. These plates, in the case of the Ring-neck, *D. punctatus* Linnæus, average here *one hundred and twenty-two*; in the Eastern United States, according to Baird & Girard (Cat. N. Amer. Rept., 1853) verified by Professor Cope, they average *one hundred and fifty-three.* In our section, the Green Snake, *Liopeltis vernalis* De Kay, has on the average *one hundred and twenty-three* ; but the authorities mentioned above assign it *one hundred and thirty-four.* Fifteen specimens of the Garter Snake, *Eutænia sirtalis* Linnæus, collected between Maine and Mississippi, furnished Baird and

Girard with an average of *one hundred and fifty* gastrosteges (ventral scutes), and *sixty-eight* urosteges (caudal scutes); nine from different parts of the maritime provinces of Canada gave the writer an average of *one hundred and forty-six* gastrosteges, and *fifty-eight* urosteges.

There are two features of this divergence which are worthy of notice, namely, the marked degree of the variation, and its general character. It is not confined to one species, but pervades nearly the whole class, thus suggesting the operation of some general cause, the nature of which it would be intensely interesting to ascertain.

A study of certain fishes widely distributed in North America would seem to lead to the conclusion that a cooler or more northern habitat is correlated with a decrease in the size but an increase in the number of scales; and so numerous, indeed, are the verifications met with, that many naturalists accept the principle as a general law. It meets with no support from our snakes, for the very opposite is the fact; but while the scales of fishes and serpents are homologous, in function they are not altogether analogous, as the latter's, besides being an epidermic covering, serve also for locomotive purposes. The dorsal and lateral scales would, functionally, be analogous to those of fishes, but the writer has no data for a full comparison in this respect; but, judging from the fact of little or no change in the number of the longitudinal series of scales being apparent, it would seem as if the principle referred to did not apply to snakes. The reduction may have some occult relation to the generally softer and moister surface on which they move and the longer period of hibernation.

None of our snakes can be said to be very common, for though in suitable localities a species may be fairly well represented, in the maritime provinces as a whole they are sparingly distributed: indeed some kinds may be regarded as rare. All are not only perfectly harmless but very useful. Being carnivorous, their chief food consists of grubs, cut-worms, caterpillars, mice, shrews, etc., most of which are injurious to the interests of the farmer and gardener. The belief in their bite being poisonous is wholly erroneous, but is, in part, the cause of the dread with which they are popularly regarded. Many, too, would feel their success and happiness for the year placed in great peril, if the first snake of the season were not ruthlessly killed. Between, then, the millstones of popular ignorance and superstition these poor creatures are being wantonly crushed. It matters not that the objects of their dread and cruelty are among the most artistic attractions of the field and forest; that in beauty of form, brilliancy and harmony of hues and colour, grace of pose and ease of movement, they excel other creatures: the impulse to kill, born of inheritance and ignorance, blunts the feelings and closes the heart to all considerations of pity and mercy. There is, then, urgent need of embodying in our school readers some literature on the subject, for whether we view it from the standpoint of utility and interest, morality or personal comfort, our people are suffering, as well as their helpless and innocent victims, from this ill-grounded prejudice and lack of knowledge.

Diadophis punctatus Linnæus.

Ring-neck Snake.

The genus *Diadophis* is confined to North America; and though three species and five or more subspecies have been described, they all appear to be but geographical varieties of one well defined form. This is quite natural. The frequency with which serpents shed their epidermis, as well as the innate tendency to harmonize with the salient coloration of their habitat and be affected by its dryness or humidity, causes certain regional varieties to vary more or less uniformly, and present naturalists with what seem good specific characters; but the border stock of two such faunal provinces will be found sharing the characters of both and incapable of separation as species or even varieties. With the exception of *E. sirtalis*, *D. punctatus* is the most variable of all our snakes. Indeed it is hard to find two specimens agreeing in all the characters deemed distinctive of the type of one particular section even. Such instability is hard to explain, and may be due to the comparatively recent origin of the species, if not of the genus itself.

The head is moderate in size, and distinct by reason of the constricted neck. The teeth are weak, small, regular, and nearly equal. Superior labials, *six* or *seven*; inferior, *seven*. American authors place both at *eight*. Scales in fifteen longitudinal rows or series. Gastrosteges one hundred and twenty-two, urosteges forty-eight. As stated above, Baird and Girard make this species in Pennsylvania average one hundred and fifty-three, and forty-six. In the labial plates and ventral scutes, the Ring-neck of the maritime provinces could be readily separated from this type; a separation marked too by the increased length of the tail as compared with the body, but not to the extent the reduced number of ventral scutes might imply, for the latter are, in our form, wider. It averages about twelve inches in length, and is of slender proportions.

The color above is olive brown, sometimes nearly black, with a bluish suffusion: beneath lemon yellow, punctuated with small dark spots on the exterior parts of the ventral scutes; often clouding them more or less. A whitish yellow ring behind the occipit, often very narrow and interrupted on the median line.

The species is rather rare in New Brunswick, and in the other maritime provinces the writer found it also sparingly represented, an experience confirmed by that of Harry Piers of Halifax, a gentleman who has given some attention to the subject in Nova Scotia. It may, however, be more common than it seems, for its habit of spending most of its time beneath logs, stones, and other objects, principally, too, in the forest, would render it difficult of observation.

The Rink-neck is perfectly harmless, very timid, and never seems to coil and elevate the head to strike as the other species do.

Liopeltis vernalis De Kay.

Green Snake.

As now understood *L. vernalis* is exceptional among the snakes of North America in being the only one of its genus found on the continent. According to Schlegel and Gunther, the generic home is Eastern Asia and India, where three or four species occur; yet it is a remarkable fact, taken in connection with the present range of the genus, to find our sole American species excluded from the Pacific slope of the Rocky Mountains. It seems to be essentially a denizen of the plains, meadows, swamps, and moist forest country. It often takes to the water in brooks and streams where it falls a victim to the voracious trout, *S. fontinalis*; for the writer has many times seen it disgorged by its captor, struggling on the line. After the Black Snake, *B. constrictor*, it is the most aquatic of our serpents, and like the former's, too, its scales are perfectly smooth, resembling in this respect fish scales, being devoid of carinæ, the ridges or keels, characteristic of all the others.

Form slender; head elliptical. neck not much constricted; tail attenuate; anal plate, as in *D. punctatus*, divided; superior labials seven, inferior labials eight. In all these characters *L. vernalis* is uniform throughout its extensive range, but like *D. punctatus* it shows fewer gastrosteges than to the south and west, for while they average with us about *one hundred and twenty-two or three*, Baird and Girard found them balancing at *one hundred and thirty-four*. Scales in fifteen longitudinal rows.

Colour above uniformly green, deep or light; beneath yellowish white. In spirits it becomes nearly blue.

It is fairly common throughout the maritime provinces in the neighborhood of brooks, ponds, marshes, and springs, and its beautiful colour, flashing in the sunlight and ever changing with the undulations of the body, causing it often to seem transparent, renders it always an attractive object. Like the last species, it is perfectly harmless, but not so timid; for large specimens will gracefully coil up and assume a striking attitude.

Bascanium constrictor Linnæus.

Black Snake.

This serpent is more frequently designated *Coluber constrictor* by authors, but Boulenger divided the cosmopolitan genus *Coluber* into two on dental characters, forming a new one, *Zamenis*, from which latter Baird and Girard separated all the North American Colubridæ, placing them in the group *Bascanium*, which, according to Cope, is lacking in definiteness and includes forms which may be generically different.

B. constrictor has an immense range, extending from the Atlantic to the Pacific, and from Mexico to British Columbia, and like all widely distributed species varying greatly within its range. In the east and with us, it is known as the Black Snake, though seldom met with of that colour, the prevailing one being a dull brown, when it is not easily distinguished at sight from many of our Garter Snakes. For some time after shedding the epidermis it may be nearly black, but the colours soon fade.

Body long and robust; head well defined by the constricted neck. Superior labials seven, inferior labials eight; gastrosteges about one hundred and eighty, urosteges ninety; scales in seventeen longitudinal series, smooth and thin, without carinæ; maximum length about five feet.

It is rare in Eastern Canada. The writer did not find it on Prince Edward Island, though popularly reputed to occur, nor in southern Nova Scotia, but Harry Piers reports two or three specimens known from the vicinity of Halifax. In New Brunswick, the writer has found it only on the shores of certain lakes in the valley of the upper St. John, where it attains a length of five feet. In other parts of the province he has often heard farmers and others speak of seeing the Black Snake, but industrious search failed to find any though Garters were seen. He is, therefore, convinced that *sirtalis* is often mistaken for *constrictor*, and that the latter is very rare. This species, like *L. vernalis*, should be sought for in the vicinity of water, and especially on the shores of lakes, where it may be seen coiled on a log or other object lodged near the bank, or around a bush or small tree overhanging the water. When disturbed it plunges in, dives, and comes up in a safe place. From its fondness for the vicinity of water and the readiness with which it plunges into that element, it would seem as if it derived much of its food from that source. Mice, shrews, moles, and bird's eggs and young are its chief diet, but fish and batrachians also are likely consumed.

When irritated or handled *constrictor* emits a fetid odor from the skin, which is very difficult to remove. Garters have the same habit, but in a less degree. This odor is most perceptible when the creature has wound itself about the wrist or arm and is exerting its constricting power, which in the case of a five-foot specimen is very considerable.

Though the Black Snake will assume a menacing attitude, and advance as if to attack a person, holding the head quite high, it soon turns and makes off if one refuses to retire. It is quite harmless.

Storeria occipitomaculata Storer.

Red-bellied Snake.

This pretty little snake is distributed sparingly in all the maritime provinces, but in New Brunswick seems more abundant near the coast. It is quite common in Nova Scotia, at least in that section of the province examined by the writer, and Harry Piers reports it fairly common near Halifax. It frequents dry ground whether in the forest or open country, preferring sandy, gravelly, or broken hillsides with a southern exposure.

Head small, well defined by reason of the very slender neck. Superior labials six; inferior, seven; scales in fifteen longitudinal series; gastrosteges one hundred and twenty-six, urosteges fifty-four. The anal plate is divided, but the first two or three caudal scutes behind the anus are often undivided. Dorsal scales carinated. Body tapering rapidly towards the tail, which is very slender. Size small, rarely reaching twelve inches in length.

The coloration is fairly uniform throughout its range here. The superior surface varies from chestnut-brown to olivaceous, with small spots of darker. A central blotch of pale red on the nape, with a smaller one on each side of it; sometimes all are blended into a ring, recalling *Diadophis*. Chin and throat white, dusted with black; ventral surface brick red.

This snake is said to be ovoviviparous, but the writer has never found it containing fully developed embryos, and, like those of most serpents, the young are very seldom seen until they have attained a length of about six inches. It is quite inoffensive.

Eutænia Sirtalis Linnæus.

Garter Snake.

The genus *Eutænia* is but one of the many genera into which the cosmopolitan *Coluber* has been divided by modern herpotologists, and owes its origin to Baird and Girard, who, however, included under it some North American snakes also previously assigned to the genus *Tropidonotus*. Some twenty-five species and a large number of varieties have been described, but many are so closely related as to scarcely deserve specific rank, while more are merely regional varieties. Indeed the species of this genus are the most prone to variation of all the snakes of North America. Our form, *sirtalis*, might be said to be more or less common in North America from Guatemala to the boreal region, and from the Atlantic to the Rocky Mountains, perhaps to the Pacific coast, though Prof. Cope doubted the specific identity of the so-called *sirtalis* of that slope with the ordinary one.

As might be inferred from the very extensive and varied character of its range, this species is extremely variable. Fully a dozen subspecies have been described by authors, but many of them rest on characters largely individual and of little value, therefore, as grounds of differentiation. Still the fact remains that a species so prone to variation in different sections of its range, and in a limited area so prolific in individual differences, must furnish the naturalist with more or less well-defined subspecies, originating in certain geographical regions wherein the physical conditions of life and environments are somewhat dissimilar. Even in the maritime provinces of Canada, the colour variations are considerable, but the writer's investigations fail to connect any of them with any particular habitat. It seems to be due to individualism, or a singular commingling of characters peculiar in other parts of North America to distinct species, or at least subspecies. For instance, a type colour often met with is distinguished by a lateral series of more or less distinct brick red spots alternating with the ordinary dark ones, reminding one of *E. sirtalis parietalis* Say of the central region, and *E. s. concinna* Hallowell of the Pacific slope. Then again there is a wide difference in the character of the vertebral stripe, from an almost entire absence as in *E. s. ordinata* Linnæus, to a very conspicuous greenish-yellow one distinctive of *parietalis*. The colour of the dorsal surface and the size and pattern of spots on the ventral scutes take a wide range, and may be said to typify half a dozen or more species in this respect.

Head distinct; neck moderately constricted. Superior labials *seven*. Inferior labials about ten, a few having less, due perhaps to fusion. Gastrosteges one hundred and forty-six; urosteges fifty-eight. This species averages one hundred and fifty and sixty-eight in the Eastern United States. Anal plate undivided.

Colour: superior surface varying from light olivaceous to dark brown; inferior surface from yellowish-white to pale blue, often orange on the chin, throat, and anterior half of the belly. Three series of darker spots on each side of the dorsal surface, the spots of the upper one often coalescing with those on the opposite side of the vertebral line. Spaces between those of the lowest series often brick red. A vertebral stripe, more or less distinct, and varying from greenish-yellow to pale brown or gray—often wanting—extends from the nape to opposite the anus; sometimes visible on the tail. There is a pale lateral stripe of the colour of the abdomen confined to the second and third exterior rows of dorsal scales. In some of the lighter coloured individuals it is pale orange, when the same colour marks the cheeks, chin, and throat. The superior labials of the darker forms are sometimes clouded, at others bordered with black; recalling *E. s. ordinata*. This feature seems constant in specimens from Nova Scotia. The round black spot near the extremity of each ventral scute occurs very regularly in some; in others it may be almost wanting, or fused with the usually darkened end of the scute. The small pale-brown parietal marking is fairly constant. Length seldom exceeding thirty inches.

The following description of a number of Garters collected here may prove of some interest to the reader, for it illustrates some features of variation fairly constant in this section :

LOCALITY.	GASTRO-TEGES.	UROS-TEGES.	LENGTH. (inches)	TAIL. (inches)	SUP. LABS.	INF. LABS.
Tobique, N. B.,	147	62	21	4¼	7	10
" "	139	61	20	4¼	7	10
Sunbury, "	143	56	24	5	7	10
Portage Is."	156	63	25¾	5¼	7	10
Frederict'n"	144	55	24	5	7	10
Middleton, N.S.,	145		24	4½	7	10
Mir., N. B.,	144	53	15½	3	7	10
Rest., "	148	55	10	2	7	10
Mir., "	146		21	4	7	7 & 8

The nine examples give an average, as before stated, of one hundred and forty-six gastrosteges and fifty-eight urosteges, a material reduction of the average of this species further south. The tail too is relatively shorter.

The Garter Snake is ovoviviparous, from fifteen to eighty being produced at a birth; but the writer has never found more than twenty-five embryos, even in very large specimens. They are pale-bluish, beautifully spotted with brown, and from five to seven inches long at birth. It is said they take refuge from danger in the throat and gullet of the parent, but the writer has never observed them doing so. The young seem to be born late in summer, for undeveloped ones were found by the writer in specimens collected early in August.

LAKE FITZGERALD, ST. JOHN, N. B.

THERE is no doubt of a fact that is becoming every day more patent to everybody, and that is that our Dominion (New Brunswick in particular) has not been half explored, and that we are walking over sources of wealth every day of our lives.

Lake Fitzgerald, within seven miles of St. John, is one example of this fact. As nearly as I can learn the following are the facts :

This lake was drained off about twenty years ago by its present owner, Wm. Murdoch, Esq., Engineer and Superintendent of Water and Sewerage, St. John. It is situated near the summit of the southern side of a valley, seventy feet deep and fully a mile wide. There is no rock formation near this minor lake, but around the summits of the elevation, which has evidently been the border of quite a large post glacial lake, filling the whole valley fully a mile wide and extending its whole length, there is rock deposit showing out. This valley is over seventy feet in depth, so it has evidently at one time been a considerable lake.

This valley now drains down westward seven miles into Courtney Bay.

In draining off the smaller lake (Lake Fitzgerald) there was left an area of about fifty acres of a dark gray or brown deposit which became whiter on drying, and this deposit was of a maximum depth of thirty feet and extending over its whole bed.

Through the kindness of Mr. G. Stead. of the Dominion Government Engineer Staff, the writer received a sample of this deposit last September, and, examining it under the microscope, found that it consisted almost entirely of diatoms, a list of which is given below. On submitting it to an expert in Philadelphia he pronounced it to "be remarkably free from grit" and that "it would make an excellent polishing powder." If in sufficient quantity it has a commercial value for that purpose. In the

19th Annual Report of the Geological Survey (U. S.) 1899, the value of infusorial earth, referring there particularly to that of Virginia, is stated to "vary from $6.50 to $20.00 a ton."

Here, then, we have a deposit of about 20,000,000 cubic feet, which at 15 lbs. per c. foot would amount to 150,000 tons; and that would, even at the lowest figure, if sufficient market could be found, net the owner a fortune.

There is said to be another such deposit near Amherst, Nova Scotia.

These deposits, found at the bottom of old glacial lakes, are formed by the piling up during ages of the shells of diatoms that have lived and died in the waters, and are found throughout the Northern States and Canada.

The forms in this case were considerably broken, showing them to be probably old. There are many Trachelomonas scattered through the deposit; a form allied to the Euglenidæ but having a siliceous covering, which, consequently, has been preserved.

The following are some of the most prominent forms in the deposit :

Navicula viridis	*Kutz.*
" nobilis	*Ehr.*
" gigas	*Kutz.*
" brebisonii	"
" dactylus	"
Cocconema parvum.	
Cymbella cuspidata.	
Cymbella (Encyonema) gracile	*Rab.*
" cistula	*Hep.*
Epithemia zebra	*Kutz.*
Gomphonema acuminata, var. coronata,	*Ehr.*
Eunotia monodon	"
" " var. depressa	"
" major	*Rab.*
Surrirella Splendida	*Ehr.*
Stauroneus pheneocenteron	"
Navicula iridis sev. var.	"
" elliptica	*Kutz.*
" Semen	
" rotæana, var. oblongella, an Alpine form.	

In the spring, probably a further examination of this deposit will be made at different depths, so as to determine all the species, but perhaps the present article may not be without interest to some.

SPECIMENS OF BIRDS IN MIRAMICHI NATURAL HISTORY ASSOCIATION MUSEUM.

Great Blue Heron	*Ardea herodias*, two specimens.
American Bittern	*Botaurus lentigmosus.*
American Long-eared Owl	*Asio Wilsonianus*, two specimens.
Cormorant	*Phalacrocorax carbo.*
Night Heron	*Nycticorax nyc. nævius.*
Herring Gull	*Larus argentatus.*
Tailless Cock	*Gallus domesticus acaudatus.*
Snowy Owl	*Nyctea nyctea.*
Great Blackbacked Gull	*Larus marinus.*
Great Northern Diver	*Urinator imber.*
Red-throated Loon	*Alrinator lumme.*
Amerian Osprey	*Pandion haliaetus carolinensis.*
2 young "	" " "
Turkey Buzzard	*Cathartes aura.*
Bald Eagle	*Haliaetus leucocephalus.*
Immature "	" "
Ivory-billed Woodpecker	*Campephilus principalis.*
2 American Scoter	*Oidemia americana.*
American Goshawk	*Accipiter atricapillus.*
Cooper's Hawk	*Accipiter cooperi.*
Canada Wild Goose	*Branta canadensis.*
" Brant	" *bernicula.*
White-fronted Goose	*Anser albifrons gambeli.*
Black Duck	*Anas obscura.*
Bonaparte's Gull	*Larus philadelphia.*
American Merganser	*Merganser americanus*, 2 spec.
Red-breasted "	" *serrator.*
Domestic Duck (crested)	
Pintail Duck	*Dafila acuta.*
Eider Duck	*Somateria mollisima*, 2 males,
" "	" " 1 female.
Murre	*Uria troile*, 2 specimens.
Brunnich's "	" *lomvia.*
English Pheasant	*Phasianus colchicus.*
Savannah Sparrow	*Ammodramus Sandwichensis Savana.*
Pine Grosbeak	*Pinicola enucleator.*
Sora	*Porzana carolina.*
Vesper Sparrow	*Poccaetas gramineus.*
Oven-bird	*Seiurus aurocapillus.*
Winter Wren	*Troglodytes hiemalis.*
Cerulean Warbler	*Dendroica caerulea.*

Black-capped Chickadee .... *Parus atricapillus.*
Hudsonian Chickadee .... *Parus Hudsonicus.*
Least Auk .... *Symorhynchus pusillus.*
Purple Finch .... *Carpodacus purpureus.*
" " .... " female.
Humming-bird .... *Trochilus colubris*, 2 specimens.
Least Sandpiper .... *Tringa minutilla.*
Red-breasted Nuthatch .... *Sitta canadensis.*
White-eyed Vireo .... *Vireo noveboraeensis.*
White-winged Crossbill .... *Loxia leucoptera.*
" " " .... " female.
Wilson's Snipe .... *Gallinago delicata.*
American Woodcock .... *Philohela minor.*
Golden Plover .... *Charadrius apricarius.*
Robin Snipe or Knot .... *Tringa canutus.*
Mourning Dove .... *Zenaidura macroura.*
Junco .... *Junco hiemalis.*
Ring-necked Snipe .... *Algialitis meloda.*
Black-poll Warbler .... *Dendroica striata.*
Fox-sparrow .... *Passerella iliaca.*
Tree Swallow .... *Tachycineta bicolor.*
Shore Lark .... *Otocoris alpestris.*
Solitary Sandpiper .... *Totanus solitarius.*
Blue-bird .... *Sialia sialis.*
English Sparrow .... *Passer domesticus.*
Snow Bunting .... *Plectrophenax nivalis.*
Water Ousel (from B. C.) .... *Cinclus Mexicanus.*
Great Northern Flycatcher .... *Sayornis phœbe.*
American Cross-bill .... *Loxia curvirostra minor.*
Short-eared Owl .... *Asio accipitrinus.*
Surf Scoter .... *Oidemia perspicillata.*
White Winged Scoter .... *Oidemia deglandi.*
Ruffled Grouse .... *Bonasa umbellus togata.*
Water Hen .... -
Bronze Grackle .... *Quiscalus quiscula aeneus.*
Redwinged Blackbird .... *Agelaius phœniceus.*
" " .... " " female.
Shoveller .... *Spatula clypeata.*
Lesser Bluebill .... *Aythya affinis.*
Harlequin .... *Histrionicus histrionicus.*
Old Squaw .... *Clangula hyemalis.*
Buffle-head .... *Charitonetta albeola.*
Green-winged Teal .... *Anas carolinensis.*
Blue-winged Teal .... *Anas discors.*
American Robin .... *Merula migratoria.*
Black-backed Woodpecker .... *Picoides articus.*
Banded-back Woodpecker .... *Picoides americanus.*
Common Tern .... *Sterna hirundo.*

Yellow-bellied Sapsucker.................... *Sphyrapicus varius.*
Hairy Woodpecker.............................. *Dryobates villosus.*
White Rumped Shrike........ *Lanius ludovicianus excubitorides.*
Kingfisher.. *Ceryle alcyon.*
Arctic Tern..................................... *Sterna paradisaea.*
Sharp-shinned Hawk............................ *Accipiter velox.*
Bluejay.. *Cyanocitta cristata.*
Marbled Godwit.................................. *Limosa Fedoa.*
Sawwhet Owl.................................... *Nyctala acadica.*
Richardson's Owl............... *Nyctala tengmalmi rickardsonio.*
Spruce Partridge......................... *Dendragapus canadensis.*
Whip-poor-will........................... *Antrostomus vociferus.*
Downy Woodpecker........................ *Dryobates pubescens.*
Bohemian Waxwing............................ *Ampelis garrulus.*
Brown Creeper................... *Certhia familiarus americana.*
Mourning Dove.......................... *Zenaidura macroura.*
Cowbird... *Molothrus ater.*
Roseate Tern............................ *Sterna Dougalli* (Bermuda).
Cuckoo Maniac.......................... *Coccyzus minor* (W. E. I.)
Striped Warbler................................ *Dendroica Striata.*
Tourterelle .... *Zenaida Martinicana* (W. E. I.)
Greater Yellowlegs.......................... *Totanus melanoleucus,*
Wood Duck.. *Aix sponsa.*
Snow Goose .... *Chen hyperborea nivalis.*
Mourning Warbler........................ *Geothlypis philadelphia*
White-crowned Sparrow................. *Zonotrichia leucophrys.*
Tennessee Warbler.................. *Helminthophila peregrina.*
Blue-headed Vireo.............................. *Vireo solitarius.*
Evening Grosbeak..................... *Coccothraustes vespertinna.*
Ruby-crowned Kinglet........................ *Regulus calendula.*
Brown Thrasher............................. *Harporynchus rufus*
Cinereous Thrush............... *Harporynchus cinereus* (W .E. I.)
Californian Thrush.............. *Harporynchus redivivus* (W.E.I.)

MAMMALS.

Bay Lynx...................................... *Lynx rufus* Guld.
Red Fox .... *Vulpes fulvus* Desm.
Sable................................. *Mustela americana* Turton.
Little Ermine........................ *Putcrius richardsoni* Bon.
Least Ermine...................... " *fuscus* Aud.&Bach.
Skunk.............................. *Mustela mephitica* Shaw.
Harbour Seal................................ *Phoca vitulina* Lin.
Raccoon..................................... *Procyon lotor* Storr.
Moose (female)........................ *Alce americanus* Jard.
Caribou.. *Rangifer caribou.*
Red Deer.................................... *Cervus virginianus.*
Brown Bat................................. *Vespertilio subulatus.*

Star-nosed Mole........................*Condylura cristata* Desm.
Shrew............. ....*Sorex richardsoni* Bach.
" ....*S. fumeus* Miller.
" ....*S personatus* G. St. Hilaire.
Flying Squirrel.... ....*Sciuropterus volucella* Pallas.
Red Squirrel.......................*Sciurus hudsonius* Pallas.
Wood-chuck ....*Arctomys monax* Gmel.
Jumping Mouse.............................*Jaculus hudsonius*.
House Mouse..............................*Mus musculus* Linn.
Deer Mouse..........................*Hesperomys leucopus* Le Conte.
Red-backed Mouse.......................*Evotomys gapperi* Vig.
Long-eared Red-backed Mouse..................*E. g. var. rutilis*.
Meadow Mouse...*E. riparius*.
Muskrat.......................................*Fiber zibethicus* Cuv.
Porcupine ....*Erethizon dorsatus* F. Cuv.
Northern Hare...........................*Lepus americanus* Erxl.
Porpoise.................................*Phocaena communis* Cuv.

REPTILES.

Alligator........................*Crocodilus americanus* Laurenti.
Horned Toad.......................*Phrynosoma cornutum* Harlan
Tortoise.....................................*Glyptemys insculpta* Ag.
Garter Snake ....*Eutaenia sirtalis* Linn.
Western Garter Snake.......................*Eutaenia s. parietalis*.
Garter snake ....*Eutaenia elegans* Brd. & Girard.
Black Snake ....*Bascanium constrictor* Linn.
Ring-neck Snake...........................*Diadophis punctatus* Linn.
Green Snake................................*Liopeltis vernalis* De Kay.
Red-bellied Snake..............*Storeria occipitomaculata* Storer.
..................*Elaps* ———?
Great Spotted Salamander...............*Amblystoma punctatum* Linn.
Western Salamander................................*A. tigrinum* Green.
Black Salamander...............................*A. Jeffersonianum* Green.
Northern Black Salamander..........*A. J.* var. *laterale* Hallowell.
Red-backed Salamander......................*Plethedon cinereus* Green.
" " " ....*P. c.* var. *erythronotus* Green.
Long-tailed Salamander.....................*Spelerpes bilineatus* Green.
Painted Salamander.......*Desmognathus fusca ochrophaea* Cope.
" " ....*D. fusca* Raf.
Newt.......................................*Diemyctylus viridescens* Raf.
Columbian Toad......................*Bufo columbiensis* Bd & Gird.
Common Toad...................................*B. lentiginosus* Shaw.
Tree Toad................................*Corophilus triseriatus* Wied.
" " ....*Hyla pickerengii* Storer.
Green Frog.......................................*Rana virescens* Kalm.
Western Green Frog............*R. v.* var. *brachycephala* Cope.
Marsh Frog.....................................*Rana palustris* Le Conte.

Mink Frog	*R. septentrionalis* Baird.
Spring Frog	*R. clamata* Daudin.
Bull Frog	*R. catesbiana* Shaw.
Western Frog	*R. temporaria* Linn.
Northern Wood Frog	*R. cantabrigensis* Baird.
Wood Frog	*R. silvatica* Lec.

FISHES.

Lancelet	*Branchiostoma lanceolatum.*
Sea Lamprey	*Petromyzon marinus* L.
Dog-fish	*Squalus acanthias* L.
Porbeagle	*Lamna cornubica* Gmelin.
Barn-door Skate	*Raix laevis* Mitchill.
Sturgeon	*Acipenser oxÿrhynchus* Mitchill.
Cat-fish	*Amiurus catus* L.
Long-nosed Sucker	*Catostomus longirostris* LeSueur.
Common Sucker	" *commersoni Lacepide.*
Red-bellied Dace	*Chrosomus erythrogaster* Ag.
Black-head Minnow	*Pimephales promelas* Raf.
Red-fin	*Minnilus cornutus* Mitchill.
Long-nosed Dace	*Rhinichthys cataractae* Cuv.
Black-nosed Dace	" *atronasus* Mitchill.
	Couesius plumbeus Ag.
	C. p. var. *rubilateralis* Cox.
Horned Chub	*Semotilus atromaculatus* Mitchill.
Silver Chub	" *bullaris* Raf.
Minnow	*Phoxinus neogaeus* Cope.
Golden Shiner	*Notemigonus chrysoleucus* Mitch.
Argentine	*Maurolicus borealis* Nilss.
Smelt	*Osmerus mordax* Gill.
Rocky Mountain White-fish	*Coregonus Williamsoni* Girard.
Columbia Trout	*Salmo purpuratus* Pallas.
Dolly-Varden Trout	*Salvelinus malma* Walbaum.
Speckled Trout	" *fontinalis* Mitch.
Spring Minnow	*Fundulus diaphanus* LeS.
Common Killifish	*Fundulus heteroclitus* Gunther.
Mud Minnow	*Umbra limi* Gthr.
Common Eel	*Anguilla rostrata* DeKay.
Bill-fish	*Scomberesox saura* Fleming.
Sea Horse	*Hippocampus heptagonus* Raf.
Nine-spined Stickleback	*Gasterosteus pungitius* L.
Brook Stickleback	" *inconstans* Kirt.
	Gasterosteus microcephalus Grd.
Two-spined Stickleback	*Gasterosteus aculeatus* L.
Shieldless Stickleback	*Apeltes quadracus* Brevoort.
Silverside	*Menidia notata* Mitch.
Sand Eel	*Ammodytes americanus* DeKay.

Horse Mackerel	*Orcynus thynnus* Poey·
Yellow Perch	*Perca americana* Schranck.
Striped Bass	*Roccus lineatus* Blach.
White Perch	" *awericanus* Gml.
Hog-fish	*Pomadasys fulvomaculatus* Mitch.
Drum	*Pogonias chromis* L.
Blue Perch	*Ctenolabrus adspersus* Goode.
Miller's Thumb	*Uranidea richardsoni* Agas.
" "	" *gracilis* Putn
Sculpin	*Cottus scorpius* L.
Greenland Sculpin	*Cottus groelandicus* Cuv.
Alligator-fish	*Aspidophoroides monopterygius* Storer.
Lump-Sucker	*Cyclopterus lumpus* L.
Wry-mouth	*Cryptacanthodes maculatus* Storer
Hake	*Merlucius bilinearis* Gill.
Sand-flounder	*Bothus maculatus* Mitch.
Sand Dab	*Pleuronectes ferrugineus* Storer,
Smooth Flounder	" - *glaber* Gill.
Winter Flounder	" *americanus* Walb.
Bat-fish	*Ogcocephalus vespertilio* Linn.

COLEOPTERA.

Additional list of insects in the collection of the Miramichi Natural History Association. The following include, in most cases, the male and female:

CIRCINDELIDÆ.

CICINDELA.
- longilabris *Say.*
- limbalis *Kl.*
- purpurea *Oliv.*
- vulgaris *Say.*
- repanda *Dej.*
- hirticolis *Say.*
- punctulata *Fab.*
- formosa.
- b-guttata *Fab.*

CYCHRUS Fabr.
- Leconti *Dej.*
- libellus.
- asilus.
- blaptinus.
- rodatus.
- Sperata.
- lepido.
- pamphila.
- viridistiata.
- fumaus.
- similas.

OMOPHRON.
- calidum *Fab.*

GALERITA.
- janus *Fabr*

CHLÆNIUS.
- tricolor *Dig.*

CARABUS.
- limbatus *Say.*
- serratus *Say.*

PTEROSTICHUS.
- lachrymosus *Newn.*
- stygicus *Say.*
- patruelis *Dej.*
- validus.
- viconus.

Hageni.
cuperasceus.
ater.
serripes.
tarsalis.

CHÆNIUS.
tricolor *Dej.*

DYTISCIDÆ.

CYBISTER.
fimbriolatus *Say.*

HYDROPORUS.
elipticus.
Oliveri.
explanatis.

HYDROPHILIDÆ.

HYDROCHARIS.
obtusatus *Say.*

HYDROPHILUS
triangularis *Say.*

SILPHIDÆ.

NECROPHORUS.
marginata *Fab.*
obscura *Kirby.*
cristata.
longicornes.

SILPHA.
Surinamensis *Fab.*
lapponica *Hb.*
ramosa *Say.*
americana *Linn.*
noveboracensis *Forst.*
inæqualis *Fab.*
Parvula.
bitubensa.
cristata.
lapponica.

DERMESTIDÆ

DERMESTES.
marmoratus *Say.*
lardarius *Linn.*

ANTHRENUS.
scropolaria.

COCCINELLIDÆ.

HIPPODAMIA,
glaciatio *Fab.*
parenthesis *Say.*

CYCLONEDA.
sanguinæ *Linn.*

CHILOCORUS.
bivulnerus *Muls.*

COCCINELLA.
sanguinea
affinis.

HISTERIDÆ.

HISTER.
lucida.

AELETES.
politus.

LUCANIDÆ.

LUCANUS.
dama *Thumb.*

SCARABÆIDÆ.

PHANÆUS.
carnifex *Linn.*
lustcanus.

CANTHON.
Lævis.

APHODUS.
fossor *Linn.*
fimetarius *Linn.*
ruricola *Mels.*
pectoralis *Lec*
bicolor *Say.*
oblongus *Say.*
ursinus *Lec.*
cimtur.

bidens.
sparsus.
hieropos.

DICHELONYCHA
elongata *Schon*
subvittula *Lec.*

LACHNOSTERNA.
fusa *Frohl.*
fusa niger *Frohl.*
tristis *Fabr.*
brevicollis
anxia.
futilis.

PUNCTATA.
punctatus *Linn.*
pelidnota.

EUPHORIA.
fulgida *Fabr.*
vulpina.

TRICHIUS.
affinis *Gory.*

OSMODERMA.
scabra *Beaur.*

BUPRESTIDÆ.

BUPRESTIS.
lineata *Fab.*
rusticorum *Kirby.*
fasciata *Fabr.*

ELATERIDÆ.

ELATER.
protervus *Lec.*
fastus.
partitus.
grisens.
melinus.
fusculus.
Sayi.

LAMPYRIDÆ.

CALYPTOCEPHALUS.
bifarius *Say.*

CHAULIOGNATHUS.
pennsylvanicus.

CERAMBYCIDÆ.

LEPTURA.
lineola *Say.*
cordifera *Oliv.*
canadensis *Fab.*
vittata *Germ.*

MONOHAMMUS.
titillator *Oliv.*
" niger *Oliv.*
scutellatus *Say.*

CHRYSOMELIDÆ.

DONACIA.
lucida *Lac.*
piscatrix *Lac.*
torosa *Lec.*
emarginata *Kirby.*
cuprea *Kirby.*
rugifrous.

CHRYSOMELA.
clivicollis *Kirby.*
10-lineata *Say.*
conjuncta *Rog.*
multipuncta *Say.*
scaluris.
festida.

GALERUCA.
rufosanguinæ *Say.*

TENEBRIONIDÆ.

UPIS
cerambvides *Linn.*

SCOTOBATES.
calcaratus *Fab.*
cateratus.
ruficephalus.
nervins.
ricinus.
faustus.
caleoratus.

MELOIDÆ.

EPICAUTA.
scinerea.
pennsylvanica.

CURCULIONIDÆ.

LEPTOPS.
macula.

CONOTRACHELUS.
nenuphar *Hbst.*

HYMENOPTERA.

APIDÆ.

APIS.
(worker) mellifica *Drury.*
(drone) mellifica *Drury.*

APIARIÆ.

BOMBUS.
americana.
silvester.
campestris.
maculata.
hortensis.
negleata.
macularia.
perantis.

FORMICIDÆ.

FORMICA.
nigra *Fab.*
rubra *Fab.*
minuta *Fab.*

OPHIONIDÆ.

OPHION.
macrurum *Linn.*
purgatus *Say,*

PIMPLIDÆ.

PIMPLA.
inquisitor *Say.*
conquisitor *Say.*

UROCERIDÆ.

UROCEROS.
vulgaris *Fab.*

VESPIDÆ.

VESPA.
maculata *Fab.*
vulgaris *Linn.*
crabro *Linn.*

DIPTERA.

TIPULIDÆ.

CECIDOMYIA.
destructor *Say.*

BOMBYLIARIDÆ.

BOMBYLIUS.
aequalis *Fab.*
americana *Say.*
nigricaus *Say.*
thoracica *Fab.*

SYRPHICIDÆ.

MELESIA.
excentrica *Har.*

ERISTALIS.
tenax (larva) *Linn.*

STOMOXIDÆ.

STOMOXYS.
chelsica *Say.*
nigra *Say.*

OESTRIDÆ.

HYPODERMA.
bovis *Fab.*

GASTROPHILUS.
equi *Linn.*

MUSCIDÆ.

TACHINA.
- longipennis *Say.*
- Harrissi.
- americana *Kirby.*
- farina *Harr.*
- vivida *Harr.*

SARCOPHAGA.
- Georgina *Weid.*

ANTHOMYIA.
- seelaris *Say.*

MUSCA.
- domestica *Say.*
- longipennis *Say.*
- viridis *Say.*
- atratus *Say.*
- vespera *Say.*
- nigra *Say.*
- lucilva *Word.*
- parasitica *Say.*

NEUROPTERA.

LIBELLULIDÆ.

LIBULLULA.
- pulshella *Say.*
- plutimea *Say.*
- trimaculata *Linn.*
- immaculata *Linn.*
- quadrimaculata *Linn.*
- hagena *Linn.*
- brumosa *Linn.*

DIPLAX.
- rubicundula *Say.*
- semiciusta *Say.*

THE PEAT BOGS OF NEW BRUNSWICK.

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THE largest peat bogs of New Brunswick were explored and studied during the investigation of the surface geology of the province between 1882 and 1900, and the area, thickness, and elevation of each ascertained as accurately as possible, while the quality of the moss and its possible economic value were also noted. Nearly all these bogs are shown on the maps of the surface geology published by the Geological Survey, and are briefly described in the accompanying reports. As numerous enquiries are, however, made concerning them of late years, it has been considered advisable to put on record in a short paper such facts as are in my possession as an answer to these. The following notes are, therefore, intended to furnish information as to the location of the peat bogs, the facilities for draining them, their accessibility or distance from a railway or other route of transportation, together with such details as may be of value to those desirous of utilizing the peat mosses for the manufacture of peat fuel, moss litter or other purposes. Considerable attention is now being devoted to the exploitation of peat bogs in different countries, and various experiments made as regards the preparation of fuel, coke, etc., therefrom. It has been found that the moss can be dried and pressed into small blocks or "briquettes" of a convenient size to handle, and thus converted from the crude bulky state into a clean, portable article of fuel, which may eventually take a place along with coal and wood in the fuel markets, at a very moderate cost. Already a good deal of progress has been made in developing this industry in the province of Ontario. The methods devised by the manufacturers there might be advantageously employed in some parts of New Brunswick and Prince Edward Island where peat mosses are so abundant and wood is becoming scarcer. The peat beds of the first-mentioned province are large, easy of access and the mosses of excellent quality. They are as yet untouched, but, in the near future, it is certain they will become valuable, and form an important asset in the natural wealth of the province.

Peat mosses occur in all parts of New Brunswick, but the largest and thickest are near the coasts of Northumberland Strait and the Bay of Fundy. In these localities they all contain the living, growing mosses, while in Ontario and elsewhere most of the bogs are dead. In most turbaries of any extent or depth the peat occurs in different layers, the upper part consisting of the yellow or green living moss; while below this a dark brown fibrous, coherent moss is found. Underlying the latter again there is a bed of blackish peat, in which the fibre has already undergone some decomposition, but which is still sufficiently tenacious to form turf when cut. Beneath this again there is usually a black layer of variable thickness containing roots and stumps of trees and shrubs, and consisting largely of humus. The peat most suitable for either fuel or litter is that immediately below the living moss, in which the peaty fibres are still in a good state of preservation; though that of the third stratum referred to above is also used for these purposes.

The particular localities in which peat mosses occur in New Brunswick, in sufficient extent and thickness to be wrought with advantage, will now be enumerated, commencing in the northern part of the province.

RESTIGOUCHE COUNTY.

1. South of Charlo river, a peat bog from one and a half to two miles long and about half a mile wide stretches along the coast of the Baie des Chaleurs. Certain portions of it contain peat of economic value, and the facilities for draining it are very good. The Intercolonial railway runs through the margin of this bog.

GLOUCESTER COUNTY.

2. East of Belledune Point, on the south shore of the Baie des Chaleurs, there is a small peat bog. It is about half a mile long and three or four hundred yards wide. This peat moss rests on

a bed of shell-marl and could be drained easily, though covered by a scrubby growth of wood. The highway is about a quarter of a mile distant, and the Intercolonial railway a mile.

3. At the head of the northeast branch of Portage brook, an affluent of the Nepisiquit river, near the portage route between it and Upsalquitch Lake, a peat bog was observed. It is probably a mile long in a north-east and south-west direction, and from a quarter to half a mile wide, occupying apparently a former lake basin. The height above sea level is about 800 feet. This bog seemed to contain good living peat and to be deep. Situated away in the heart of the country as it is, without road or railway near it, its value for economic purposes is at present *nil.*

4. Two and a half to three miles north of Bartibog station, Intercolonial railway, a peat bog occurs, which is probably a mile or more in length, and fully half a mile wide but of irregular form. The central parts are without trees, but small black spruce and hacmatac grow in the marginal or thinner portions of the bog.

5. Just north of Bartibog station, Intercolonial railway, another peat bog was noted. It is also of an irregular form, especially where the railway crosses it, but expands towards the east. Its surface features are of course precisely similar to those of the last mentioned bog, both being level and treeless in the centre. The depth is unknown, but it is not supposed to be great, as depressions in the Carboniferous plain are generally shallow. These bogs, nevertheless, contain workable peat and their proximity to railway communication enhances their value.

6. The neck of land (isthmus) between St. Simon Inlet and Pokemouche harbour is formed entirely of peat. Like most of the large bogs of New Brunswick the central part is raised 10 to 15 feet higher than the margin. This bog covers an area of nearly 1000 acres, and having the sea on two sides could easily be drained. The peat is remarkably clean and free from dirt. It lies about three miles from Caraquet village and is crossed by the Caraquet railway.

7. Another bog or "cranberry barren" a mile, or a mile and a

half long, and of variable width, not exceeding half a mile in the widest part, occurs at the southern end of Pokemouche harbour. This peat is also composed of good clean moss. The highway along the coast passes through it, and it is only about three or four miles from the Caraquet railway.

8. About four miles north-east of Shippegan Gully, on the east side of Shippegan Island, a bog about three miles and a half long and a mile or more in width was noted. The surface rises from ten to twenty feet above the sea. In the bank the peat was seen to be about ten feet thick, and clean and free from other material. The chances for draining this peat are excellent, as it borders the coast. It is, however, difficult of access except by water.

9. South of Pigeon Hill, Shippegan Island, another bog was observed, between two lagoons, a mile and a half long or more, and from a quarter to half a mile wide. It also contains moss of good quality.

10. The largest peat bog of New Brunswick is that of Miscou Island, which covers more than half of its superficies. The greatest length of this peat area is about six miles and its extreme width not less than from three and a half to four miles, comprising nearly 10,000 acres. The surface of the central part is from 20 to 25 feet above sea level, and as the bottom of the peat is seen in some places to be in the littoral, it is probable the extreme thickness is not less than from 25 to 30 feet. The central part is as usual the highest, the surface of the bog having a gentle slope thence to the periphery. The lower part of the peat, wherever exposed, is crowded with the roots of shrubs and small trees and rests on sand and gravel. This bog seems to occupy a shallow basin in the flat-lying Carboniferous sandstones portions of the rim of which, as well as of the sand banks and peat, are now undergoing erosion by the sea. The moss is still growing and the surface is treeless and dotted with small ponds which serve as favourite resting places for wild geese and brant in their spring and autumn migrations. The quality of the moss of this bog is excellent, and the facilities for draining it are of the best description, surrounded as it is by the sea. Its inaccessibil-

ity, especially in winter, is against the utilization of the peat for economic purposes, there being no other way of reaching the island except by water.

The inhabitants of the island and the fishermen and sportsmen who visit it obtain their supply of fresh water from springs which issue from the peat banks, and this water, though somewhat discoloured, is perfectly wholesome. These springs around the border of the bog show that there would be no difficulty in draining it.

11. Near Barreau Point a peat bog of some extent was observed on the west side of a lake or lagoon, but the area and thickness were not ascertained.

NORTHUMBERLAND COUNTY.

12. An extensive moor known as the "Blacklands", about three miles long and two miles wide, lies on the south side of the mouth of Tabusintac river, just west of the gully of the same name. In some places on the eastern side it is washed by the sea. Its general features are the same as those of the Miscou and St. Simon bogs, that is, it is treeless and raised in the centre, or part which is least drained, where the mosses grow most rapidly. Small fresh water ponds also occur on its surface. The quality of the moss is good and the bog could easily be drained into the sea. In summer it is readily accessible from Northumberland Strait and a highway runs along the coast.

13. Crossing to the south side of Miramichi Bay and proceeding eastward to Point Cheval we meet with one of the most interesting peat bogs in the region, from a scientific point of view, though economically it is not at all important. The details regarding this moss bed are given in the Annual Report, Vol. III. Geol. Surv. 1887–88, Part N. It is nearly altogether a dead bog and is comparatively thin, resting on sand; but it contains considerable quantities of peat which might be utilized for fuel or other purposes. It could be readily drained. Settlements and roads are not far distant.

14. A splendid peat bog is found at Point Escuminac, referred to by Dr. Ells in one of his reports. It is about four

miles in length and not less than two in width, and the thickness in the centre is upwards of twenty feet. This moor likewise occupies a shallow basin in the Carboniferous rocks, the bottom of which must be below high tide level. Like other bogs just described it is nearly destitute of trees, but in many places is occupied with heath plants. It is still growing and large portions of the moss were found to be well adapted to the manufacture of peat fuel, while the chances for draining it are very good, the peat being open to the sea on three sides. The road from Chatham to the Escuminac Light House passes through it, and water communication is of course available in summer.

KENT COUNTY.

15. The north side of Kouchibouguac harbour is skirted by peat for about two miles, having a width of a quarter of a mile to half a mile. The road from Kouchibouguac village to Point Sapin passes near it, otherwise it is only accessible from the harbour.

16. South of the mouth of Kouchibouguac river two peat bogs were observed. The northernmost one faces the lagoon, or gully so-called, and is about half a mile in diameter, and as broad as it is long. The southernmost bog lies between an arm of Aldoane river and the lagoon mentioned and is just opposite Big Cove. This bog is about a mile long and fully half a mile wide in the widest part. It is raised in the centre, without trees, and contains a large quantity of fine moss.

17. On the north side of Little Gully at Richibucto Head, inside of the sand beaches, there is a bog of considerable extent. Its length is about two miles and its width three quarters of a mile. This bog contains a good supply of peat, and the drainage facilities are good; the nearest road is two or three miles distant.

18. Two well developed peat bogs lie on the north side of the Kent Northern railway, from three to five or six miles west of Kingston. The one nearest this place is approximately two miles long by a quarter or half a mile wide; the other is smaller.

Their depth is unknown, but they are raised in the middle and apparently composed of clean, sphagnous moss. The land has sufficient slope to afford the necessary drainage of these mosses for economic purposes and their proximity to a railway makes them valuable. They are very conveniently situated for the manufacture of peat fuel, etc.

WESTMORLAND COUNTY.

19. From two to three miles south of Canaan station, Intercolonial railway, a peat bed of some extent is crossed by the track. This bog expands towards the east, and so far as examined, contains good peat. It is also devoid of trees and appears to be of economic value.

ST. JOHN COUNTY.

20. Going along the Shore Line railway westward from St. John we cross several peat bogs, the first of any note being the Musquash bog. This turbary lies on the north side of Musquash harbour, and occupies apparently the old valley of discharge, or outlet, of Ludgate and Spruce lakes. It covers an area of about 450 acres and its greatest depth is reported to be 20 feet. Its surface is nearly on the same level as the lakes just mentioned, that is, 207 feet above mean sea level, but it rises in the centre, and has bosses or low rocky ridges protruding through the moss in places. Attempts were made some years ago to work this bog for moss litter, but they were not successful.

CHARLOTTE COUNTY.

21. At the Little Popelogan river the Shore Line railway crosses a peat bog which is fully two miles long and half a mile wide, but which really occupies several small basins more or less connected. The moss seems of good quality and is ready of access, and the conditions are favourable for its utilization.

22. On the road from Pennfield Ridge to Seeley's Cove a bog was observed about a mile distant from the last mentioned place. Though small it is composed of excellent moss, and is conveniently situated for the preparation of those products obtained from peat.

23. A mile and a half east of Riordan's Corner a small peat bed occurs which is also crossed by the railway and road. It likewise appears to be a workable moss and very conveniently situated for exploitation.

24. A great number of smaller bogs occur in Charlotte county, many of them containing good workable beds of peat; but the only economic value they seem to have yet is in the production of cranberries.

YORK COUNTY, ETC.

25. Bogs of considerable size are found in some parts of York county. A fine large one occurs north of Millville, or Howland Ridge, near the head waters of the Nackawic and Becaguimic rivers, and just east of the source of Indian brook, a branch of the latter.

26. A bog lies at the head of Mactaquac Stream which is traversed by kames or gravel ridges. Numerous small ones were observed in other parts of the county.

Large moors are known to exist in the interior of the province, especially in York, Sunbury, Queens, Northumberland and Gloucester counties, which are usually called 'moose' or 'caribou' barrens. But the foregoing list will suffice for the present to show those desirous of exploiting the peat mosses of the province, the quantities of these materials which are available in localities easy of access.

REDUCTION IN THE NUMBER OF FIN-RAYS OF CERTAIN FLAT-FISHES.

By Philip Cox, Ph. D.

SEVERAL species of two or three genera of *Pleuronectidæ* are more or less common in the coast waters of Northern New Brunswick, and the writer has, from time to time, carefully examined many with the object of ascertaining if the type here differs in any respect from what it is farther south along the Atlantic. These fishes are among the best for a study of this kind, as they are largely stationary and local, performing no migrations or ocean journeys of any extent. Hence the overlapping and commingling of stock of adjoining regions, which has a tendency to preserve a uniform type, cannot, in their case, take place on a large scale, so that variation due to temperature, food, and environment is liable to be preserved and intensified from age to age.

The climatal character of the Gulf of St. Lawrence and adjoining bays is peculiar in some respects. In summer the temperature of the water of this land-locked gulf, and especially of the Miramichi Bay and Bay des Chaleurs rises higher than that of the coast waters several hundred miles farther south; while in winter the opposite is the case, for the cold is more intense. Fishes frequenting these bays the greater part of the year, and the adjacent gulf waters the remainder, are subjected to extremes of temperature and all it involves to a greater degree than the local fauna of more southern coasts. If then physical and biological conditions of habitat react upon the animal organism and induce modification of primitive structure and habit to be transmitted to descendants, some deviation from more southern type features ought to be found characterising the flat-fishes of this coast. When, however, he began the investigation, the writer is free to admit, he looked for a divergence, if such existed, of a nature the very opposite of what he found. Increase in the number of like parts, such as scales, fin-rays, and vertebræ, was alleged to be peculiar to, if not the direct result of, the influence of an alpine or northern habitat; and so many apparent verifications of the hypothesis had been observed among species and closely related genera of wide distribution, that he had almost accepted it as a law of nature. Conversely, a warm, or southern, habitat was thought to promote the reduction of the number of scales and fin-rays, and lead to a shortening of the vertebral axis.

The writer's investigation will be directed to but one of these, namely, the fin-supports; and for this purpose, and so that the results may not be regarded as exceptional or due to individualism in a few specimens, he will present for examination a large number, selected at random from fish taken at different times and places. It may be further added that scores of others were examined from time to time, which furnished exactly the same evidence as the thirty or more of the following lists.

The Winter Flounder, *Pleuronectes americanus* Walbaum, is the most abundant of the flat-fishes found in these waters. Eleven are herein tabulated with the number of dorsal and anal fin-rays :

No.	Dorsal rays	Anal rays	No.	Dorsal rays	Anal rays
1	62	45	7	62	46
2	61	45	8	60	45
3	62	46	9	62	46
4	60	45	10	61	44
5	58	47	11	62	45
6	62	48			

The average of these eleven specimens, fairly representative of the whole species here, is:—Dorsal rays 61, Anal rays 45½. The writer regrets the lack of personal knowledge of this, and the other species referred to, as found in a more southern range; but for purposes of comparison, he avails himself of the data furnished by Drs. Jordan, Gilbert, and Evermann, whose names are a sufficient guarantee of the scientific accuracy of their statements. In "Fishes of North America, by David S.

Jordan and Charles H. Gilbert, Washington, 1882;" and "Fishes of Northern and Middle America, by David S. Jordan and Barton Warren Evermann, Part III, Washington, 1898," the dorsal rays of this species are given as 65, and the anal, 48. In the latter publication, the authors state that: "The specimens examined by us are from Labrador, Cape Breton, Anticosti, Grand Manan, Boston, Princetown, Woods Hole, New Bedford, and Somer's Point, New Jersey." This is an extensive range, and, though more uniformly arctic, includes ours, yet the determinations are conflicting. A careful examination of the figures in the table shows how all the specimens oscillate between dorsal 60—62, and anal 45—46. Not one presents the authors' count, nor has the writer met an instance of it among the numerous examinations he has made. It is well known that in such points of structure there is always a considerable limit of variation, but no naturalist would give the maximum or minimum as specific; hence we infer that the authors referred to must have met with individuals whose dorsal and anal rays exceeded 65 and 48. To the mind of one more or less familiar with the degree of specific variation at a certain place, such individuals would appear as anomalies among those in the table; even the average laid down by these writers would be more likely attributed to individualism, than to specific variation.

The next species to be considered is the Rusty Dab, *limanda ferruginea* Storer, taken from the Miramichi Bay.

No.	Dorsal rays	Anal rays	No.	Dorsal rays	Anal rays
1	77	59	3	78	59
2	76	56	4	79	59

The average of these four, which represents that of all the writer has examined is:—Dorsal 77½; Anal 58. The authorities cited assign to this species an average of 85 dorsal and 62 anal, and add that all their specimens came from the coast of Massachusetts. The reduction is certainly quite marked. Any ichthyologist, describing the type as represented in our waters, would assign as specific the average given above; and the higher one, characteristic of the Massachusetts fish, would here be regarded as aberrant or abnormal.

Three specimens of the Window Pane, or Sand Flounder, *Bothus maculatus* Mitchell, a rare species from the Shippegan coast, and of rather small size, had the following average:—Dorsal rays 60, anal 49. Drs. Jordan, Gilbert, and Evermann give 65 and 52. Though the number of specimens was few, and insufficient to furnish reliable data for a specific average, the decrease is in about the same proportion as obtained in the other species, and points to some general principle affecting them all alike.

The last species to be discussed is the Smooth Flounder, *Pleuronectes glaber* Gill; and the table will be found to contain twelve specimens collected in the Miramichi Bay and Baie des Chaleurs. This flat-fish is less common than *P. americanus*, and averages small, seldom exceeding a pound and a half in weight.

No.	Dorsal rays	Anal rays	No.	Dorsal rays	Anal rays
1	49	37	7	53	37
2	50	37	8	53	37
3	53	36	9	52	36
4	54	37	10	54	36
5	51	36	11	54	37
6	55	37	12	57	41

No. 12 can be looked upon as an example of individual variation, but the whole twelve average about 53 dorsal and 37 anal rays. By reference to the authorities already cited the average is seen to be 55 and 40; and though the decrease is less than in the other species, it makes for the existence of some occult influence modifying the type either here or in its more southern habitat, or in both.

If the reduction were seen in one species only, it might be referred to something peculiar to the life-history of that form now or in the past; but such is not the case. It is general, affecting all alike; and as they are fishes of similar range, life-habits and nature, the cause must be general. Were the ancestral forms of these species known, the character and tendency of the variation might the better be ascertained and referred to their probable causes, but as the descent cannot, with any degree of certainty, be traced, we are obliged to seek some explanation in the life-history of the species here as compared with that elsewhere.

As before observed, it seems to be a law of nature among closely allied genera and species of fish, that denizens of a warm southern range have fewer vertebræ and fin-supports than their representatives in colder or more northern regions. In the order to which these flat-fishes belong, the halibuts of high latitudes have, as a rule, the fin-rays in greater number than more southern species; and the same seems true of the flat-fishes themselves. To the naturalist species are only divergent varieties; and wherever natural influences have conspired to produce species, the same to a greater or less extent, may be, and probably are, operating to produce varieties within the species. The localities from which the authorities cited drew their material, especially in the case of *P. americanus*, namely Labrador, Cape Breton, Grand Manan, Boston, New Bedford, &c., are fairly well within the influence of the arctic currents, and the summer degree of heat is below what obtains in the western bays of the Gulf of St. Lawrence; while the difference in the winter temperature of the two ranges must be small. The colder and more uniform temperature and all it implies in the life history of the creature, may tend to greater stability of type characters, while an opposite set of conditions may disturb the equilibrium, and promote variation. It will, however, be clear that this tendency to variation may arise from either of two different sources, namely, the inequality between the winter and summer temperature of the water, or the greater heat of the latter affecting the young which pass the first few months of their lives in the warm shore waters. The latter would seem the more important. In the growth of the creature from the larval to the adult stage, it seems probable that the biological and climatic conditions of its environment would react with greater effect on the system at the immature and more plastic stage of life. The peculiar adjustment of the eyes in these fishes, at first normal as regards position, to one side of the head is made very early in life, and many similar facts in nature are known. Doubtless this transformation has long ago become a matter of inheritance; but the fact that it is acquired at a very early age, argues that the ancestral variation which resulted in the production of this character, must have also begun early in the life of the animal. The young flat-fishes of our coast frequent shallow areas, where the water becomes quite warm, and there, in accordance with the general fact noticed above, may arise the conditions which, seconded by inheritance, have modified them in this manner.

LAND AND FRESH WATER SHELLS

COLLECTED NEAR ST. JOHN, N. B.

By W. D. Matthew and G. Stead.

LAND SHELLS.

HELIX hortensis. The banded variety found near I. C. R. in two or three locaities, on stalks of grass in the open. Not common. The variety without bands very abundant at Lawlor's Lake on I. C. R. Probably introduced.

alternata. Common everywhere under stones and dead wood. Very abundant at Lawlor's Lake.

monodon. Very abundant at Lawlor's Lake. Not uncommon elsewhere, under dead wood.

———. Near Coldbrook.

Sayii. Two or three specimens at Lawlor's Lake.

albolabris. Two dead specimens from near St. John. Two or three near Fredericton, N. B.

cellaria. In yard adjoining Mission Chapel, St. John, N. B. Probably introduced.

arborea. Abundant everywhere in dead wood and under leaves. Several hundred in a small piece of decayed wood near Fredericton.

striatella. Abundant everywhere under decayed wood and bark.

labyrinthica. Abundant under leaves and dead wood.

chersina. Rather common, associated with H. labyrinthica.

lineata. In decayed wood, not uncommon.

exigua. In decayed wood, not common.

minutissima. Under leaves, not easily noticed.

VITRINA limpida. Quite common in autumn, especially in orchards.

SUCCINEA obliqua. Very abundant everywhere, often seen on roads after showers.

ovalis. In wet places and on water grasses, not common.

avara. Under decaying bark, not common.

BULIMUS lubricus. Common under stones and dead wood.

Also three minute species not determined.

FRESH WATER SHELLS.

LIMNÆA elodes. In streams and brooks, not very common.

desidiosa. Abundant in most ditches and ponds

humilis. Common in still water.
catascopium. In St John R. and branches, abundant.
PHYSA ancillaria. In St. John River, abundant.
heterostropha. Abundant in brooks and in dead water.
cf Lordi. In Harrigan's Lake near St. John.
PLANORBIS campanulatus. Abundant in St. John River, common elsewhere.
bicarinatus Common everywhere.
deflectus. Common in Kennebeccasis River and elsewhere Some specimens show the mouth turned at a right angle to plane of shell for about ¼ a volution.
parvus. Common in muddy ditches and streams.
———. In Kennebeccasis and elsewhere.
ANCYLUS fluviatilis. Not uncommon, especially in St. John R.
PALUDINA decisa.
ANNICOLA granum.
UNIO complanatus. Abundant everywhere.
cariosus. Grand Lake and elsewhere.
radiatus. Abundant.
? . Washademoak Lake.
MARGARITANA arcuata. Swift streams.
undulata.
ANODON fluviatilis.
(*undulatus.*)

This list was prepared, with the exception of a few corrections now made, several years ago, but through incompleteness and uncertainty of the determination of some of the species it was never published.

In regard to the land snails a very complete and carefully determined list is being published this year by Mr. G. W. Bailey in the Bulletin of the Nat. Hist. Soc. of N. B., in which there are several additions to the above list, and in which the shells have been given their latest nomenclature, the old genus *Helix* being divided into several genera. Except perhaps in the species of *Succinea*, this list, so far as it goes, will be found to be correct.

In regard to the fresh water shells this is offered as a preliminary list for New Brunswick, no other having been published so far as I know The determinations are not to be considered as final. GEOFFREY STEAD, 2nd April, 1903.

THIRD REPORT OF THE COUNCIL OF THE NATURAL HISTORY ASSOCIATION OF MIRAMICHI.

In presenting its third biennial report of the proceedings and condition of the Association, the Council would refer to the irreparable loss that, in common with other scientific institutions in Canada and elsewhere, it sustained in the early and lamented death of its distinguished patron Dr. G. W. Dawson, late Director of the Geological Survey of Canada. The honor he conferred on the Association by accepting the position was even exceeded by the warm, helpful interest he took in its welfare and progress; and hence the loss is more direct and personal than that of most institutions. He was one of Canada's most distinguished sons, into the short span of whose life was crowded a wealth of scientific research and labour, a harvest of patient investigation and discovery which would have done honour to the longest life. While the Association then mourns the death of its patron and will miss his guiding, inspiring, and generous spirit, it finds some consolation and no little pride in enrolling among its early friends and supporters one whose memory will be ever dear to the scientific heart of Canada.

It is gratifying to report that His Honour Governor Snowball has kindly accepted the position of patron, and already shown a warm interest in the Association. A resident of the town, a gentleman of broad public spirit and generous culture, Governor Snowball will prove an efficient patron.

The annual reports of the Association to the Royal Society of Canada were duly presented at its meetings by the late patron in 1901, and by Hon. J. V. Ellis in 1902.

In regard to our standing at present we wish to state that although our membership has been slightly reduced by death and removals we have more working material among us than ever and hope to give good evidence of it this season. To this end we are being stimulated by the increased interest the public, both at home and abroad, are taking in our proceedings.

Membership.

Honorary members.	3
Members.	38
Associate members,	32
Corresponding members,	11
Total,	84

Financial Standing.

Balance on hand February, 1901,		$ 54 33
Government Grant 1901 and 1902,		200 00
Membership fees, &c.,		103 40
		$ 357 73

EXPENDITURE.

Cases, fittings and repairs,	$ 197 69	
Current expenditure &c., and printing bulletin,	136 11	333 80
Balance on hand,		$ 23 93

Museum.

Botany.

A large number of plants were collected and added to the herbarium since the issue of the last Bulletin. There are still many unmounted specimens on hand.

Ornithology.

The material in this department is increasing and more cabinet space is required. In addition to the mounted specimens several skins of native and foreign birds, and a few sets of eggs were procured, and steps taken to extend the collection in oology the coming season.

Mammology.

A few small mammals were also procured. The following were mounted and added to the museum:—Cow Moose, *Alces americanus;* Caribou, *Rangifer caribou;* Red Deer, *Cervus virginianus;* Seal, *Phoca vitulina;* Porpoise, *Phocæna communis.*

Ichthyology.

The following mounted specimens are to be noted:—Shark, *Lamna cornubica* (9 feet long); Picked Dog-fish, *Squalus acanthias;*

Barndoor Skate, *Raia lævis;* Window-pane Flounder, *B. maculatus* (2 specimens). Several alcoholic specimens of native and foreign species were also obtained.

Herpetology.

A mounted Horned Toad, a few snakes (alcoholic) native and foreign, and some salamanders comprise the addition made to this department.

Invertebrate Zoology.

A monster lobster was mounted; and some specimens of cuttle-fish, several species of shellfish, and various representatives of mollusca and radiata were received from donors and collectors.

Archæology.

A complete set of the Standard Weights and Measures of New Brunswick previous to Confederation was donated by the Municipal Council of Northumberland, and is now neatly arranged in a fine cabinet built for the purpose. About a dozen stone axes, a score or more of stone scrapers, gouges, &c., a hundred or more stone lance and spear-heads, knives, &c., and nearly two hundred arrow heads have been bought and collected since the last biennial report. The whole collection is now exhibited in a neat cabinet. Several relics of the early French occupation of this country were also obtained.

Meetings, Papers, Lectures.

The meetings held, subjects discussed &c., are seen below.

1901.

Feb. 12. Anniversary Address. Dr. Baxter.
Feb. 19. Magic Lantern Views. J. D. B. F. Mackenzie.
Feb. 24. Circulation of the Blood. Dr. Baxter.
Mar. 5. Circulation of the Blood. Dr. Baxter.
Mar. 12. The Blood in Health. Dr. Baxter.
Mar. 19. A year with Buller in South Africa. Sergt. Major Cox.
Mar. 26. Outlines of the Solar System. James Nicol.
Apl. 2. The Blood in Health. Dr. Baxter.
Apl. 9. The Blood in Disease. Dr. Baxter.
Apl. 16. Anœmia. Dr. Baxter.

Apl. 23. Bacilli. Dr. Baxter.
Apl. 30. Instinct, Its Origin and Nature. Dr. Cox.
May 7. Instinct, The Borderland of Reason. Dr. Cox.
May 14. Certain Fishes. Dr. Cox.
Oct. 24. Old Roman Coins. R. W. McLachlan.
Nov. 12. The Migration of Birds. J. Hughes Samuels.
1902.
Jan. 14. The Snakes of New Brunswick. Dr. Cox.
Jan. 21. Insect Architecture. J. D. B. F. Mackenzie.
Jan. 28. Insect Architecture. J. D. B. F. Mackenzie.
Feb. 4. The Anatomy of the Teeth. Dr. H. G. Vaughan.
Feb. 11. Anniversary Address. Dr. Baxter.
Feb. 18. Fresh Water Algæ. Dr. Baxter.
Feb. 20. The Truth about South Africa. Capt. Carey.
Feb. 25. Fresh Water Algæ. Dr. Baxter.
Mar. 11. Fresh Water Algæ. Dr. Baxter.
Mar. 25. Early Arctic Navigators. Dr. Cox.
Apl. 1. Nansen's Farthest North. Dr. Cox.
Apl. 8. Readings from Shakespeare. Geo. B. Williams.
Apl. 15. Scientific Results of Nansen's Expedition. Dr. Cox.
Apl. 22. Habits of Brant and Geese. Anthony Adams.
Apl. 29. Astronomy. James Nicol.
June 10. Geology and the History of Mankind. Dr. Bailey.
Oct. 14. Atmospheric Air. Dr. Baxter.
Nov. 11. Evolution of the Vertebral Axis. Dr. Cox.
Dec. 9. Peat Bogs of New Brunswick (paper). R. Chalmers, LL. D.
1903.
Jan. 13. The Vertebral Axis of Cartilaginous Fishes. Dr. Cox.
Jan. 20. On Climate. Dr. Baxter.
Feb. 3. The Vertebral Axis of Bony Fishes. Dr. Cox.

Donations to the Museum and Library,

The Sword of a Swordfish. H. Brobecker.
A Goshawk. A. Brideau, New Jersey.
16 Nos. of Bulletin of the Natural History Society of New Brunswick.
A Horned Toad, Sea Horse, Tarantula, Scorpion, specimen of

Sisal Plant and Rope, Star-fish, Centipede, a bunch of Nictor Beans, a bunch of Whistling Beans, Horned Oyster, specimen of Sea Bean, specimen of Castor Oil Bean, specimen of Prickly Pear, specimen of the Royal Ponciana Bean, the Rattle of a Rattle Snake, from Florida and the Bahama Islands. A Friend.

Specimen of Lignite. George Watt.

Specimens of Shells. Dr. Cox.

2 Specimens of Copper Ore from Albert County. T. W. McLean, St. John.

Specimen of Pig Iron, the first made at the Dominion Steel Works, Sydney, C. B. Z. Tingley.

Bay Lynx (Lynx Rufus). Walter Gilbert.

Pintail Duck (Dafila Acuta). George Morrison.

Stone Gouge, Six Mile Brook, Cain's River. Lieutenant Donald.

Ruffed Grouse. Dr. Cox.

Drum Fish (Pogonias Chromis), Sailor's Choice (Pomadasys fulvomaculatus), Texas. T. A. Cox.

Moth. Miss Perley, Chatham.

White-winged Cross Bill. Dr. Cox.

Specimens of Fishes collected in Algonquin Park, Ontario: River Chub, Red Fin, Horned Dace, Black-headed Minnow, Red-bellied Dace. Professor Macoun.

Musk Rat, Japanese Rope, French Ventilating Brick, Cedar Burl, a piece of Petrified Tree. A Friend.

Stone Chisel. Henry Gerrish.

Stone Gouge. John Jardine.

Piece of Petrified Wood. Captain Robert McLean.

Old French Axe, Tracadie. John Young, M. P. P.

A number of Stone Arrow Heads, Stone Axe, Stone Scraper, Nest and Eggs of Song Sparrow, Nest of Mason Bee, Dr. Cox.

Horse Shoe, French Axe, piece of Spear Head (iron), Musket Ball, Gunflint, Piece of Battery, from Louisburg, C. B. Alexander Brown.

Shark. James Davidson, Church Point.

Red-throated Loon. Walter Gilbert.

Pressed Plants, Primula Mistassinica and Lychnis Flos cuculli. I. F.

Fifty pressed Plants. Dr. Cox.

Picked Dog-fish (shark). Wm. Tait.

Stone Axe. Wm. McLaggan, Blackville.

Petrified Wood. Chester Mowatt.

Cocoa Pod with seeds, Dominica, W. I.; Wild Pimento or Cannon Ball Plant, Georgetown, British Guiana; Silver Ore, from Colorado and New Mexico. D. W. Ward.

Nutmegs with Mace. Mrs. P. A. Noonan.

Nut of an unknown species, from an Austrian ship. S. J. Doyle.

Porcelain Clay, from Demerara. P. A. Noonan.

Native Sponges and Lichens from our own Rivers and Forests. Mrs. Simpson.

Military Woodpecker. Miss Jane Wishart, Tabusintac.

Piece of Petrified Juniper, from sewerage cutting on Queen st., Chatham. Robert Murray.

Pin Cushion and Cuff Buttons, made from the Big Tree, California. Dr. Baxter.

A Squid. Pilot Capt. Nowlan.

A Shark. Ernest Haviland.

Spotted Salamander. James Allen.

Dovekie. Anthony Adams.

A piece of Petrified Juniper from the digging for the sewerage. George Stothart.

A piece of Plank eaten by the Teredo Worm, cut from a plank of a scow, after lying six weeks at Black Brook. John Johnston.

Six specimens of as many different Birds, from the West Indies. P. A. Noonan.

A Complete Set of Standard Weights and Measures of New Brunswick, anterior to Confederation. Municipal Council of Northumberland.

Gold Quartz and other Mineral Specimens from a gold mine in Lunenburg, N. S. Hon. J. B. Snowball and R. A. Snowball.

Specimens of Coal and Stalactites from Bermuda. Miss Maggie Connors.

Piece of Petrified Lepidodendron, Bay du Vin. A. G. Williston.

Specimen of Copper Ore from Restigouche, N. B.; specimen of Gold Quartz, Colorado. D. W. Ward.

A French Urn, Miscou; a Stone Axe. Mrs. McDougall, Oak Point.

Marine Worm. W. Tait.

Piece of Wood bored by Teredo Worm from Bermuda. D. W. Ward.

Specimens of Quartz Crystals, Copper Ore, Gold Ore, Silver Ore, Graphite, from Colorado. Mrs. John Marquis.

Box, made of Olive Wood, from Jerusalem. Alex. Morrison.

French Claw Hammer, dug up at Gardener's Point, Northumberland. A. Hay.

Sea Mouse. James Johnston.

Tube of Teredo Worm, Shippegan. H. Burbridge.

Shell from Bermuda. D. W. Ward.

3 Snowy Owls from Tracadie. Dr. Smith.

Old Fashioned Dental Instrument. Theo. DesBrisay.

Eggs of Crow, Eggs of golden-winged Woodpecker, Stone Axe, 2 Stone Scrapers, Broken Drill (stone), 22 Stone Knives, Spear, Spear and Arrow Heads, points, &c., Red Deer. Dr. Cox.

Lobster. Frank Loggie.

Caribou. M. R. Benn.

Ship's Log glass. Arthur Flemming.

Duckling. Harrie Hutchison.

Lumpsucker. A Friend.

Piece of Wood bored by Teredo Worm. W. Gilbert.

Photographs of Salmon Fishing, British Columbia. Moore Letson.

Abnormal Egg (hen's). H. Pallen.

Humming Bird. R. St. Clair Jellett.

A box, containing Specific Gravity Beads. Dr. J. B. Benson.

2 specimens of Belladonna Plants. Johnson & Johnson.

Piece of Albertite. Miss Mary Williston.

Piece of Nickel Ore. Henry Burbridge.

Box, containing Silk Worm from China, Lava from Vesuvius, Stone from the top of the Great Pyramid. Capt. H. Letson.

Tortoise Shell. Charles Bernard.

Burl from a tree. Sandy Mitchell.

Zircon, from North Carolina. Miss K. Loggie.

Jumping Mouse. Dr. Cox.

Pair of Pelvic Bones. Capt. Jas. McCullam.

Specimen of Molybdenum Ore from S. W. Miramichi. R. Attridge.

Specimen of Copper made by Electrolysis, from Dorchester; and Gold Quartz, Waverley, N S. G. Stead.

Shells of Young Oysters. Mrs. W. Johnston.

Spanish Silver Dollar (1725). W. J. Miller.

Stalked Barnacles from Marble Bay, Mass. Miss B. Reid.

Wild Goose. J. R. Lawlor.

Ashes from Martinique. H. C. Creighton.

Cannon Ball and piece of Shell from Louisburg, C. B. L. W. Lehule, St. John.

A Seal. Pilot Capt. J. Nowlan.

Specimen of Copper Ore, from Dorchester, N. B. G. Stead.

Old Shoe for an Ox. James Davidson, Church Point.

About 25 fine specimens of Fossil Plants of different species, Sydney Mines, N. S. J. Henry Sutherland, per Joseph Salter,

Water Snake. Elaps———? P. C. Johnson.

Porcupine and portion of Gnawed Tree. Anthony Adams.

Library.

16 Nos. of the Bulletin of the Natural History Society of New Brunswick.

Geological Report, 1898, with Maps, Geological Survey Department for year 1900, Annual Report, 1900, Early Rose Culture, Transaction No. 57, Notes and Observations of Travel on Athabasca and Slave Lake Region, Transaction No. 58, Early Icelandic Settlements in

Canada, Transaction No. 59. Historical and Scientific Society of Manitoba.

Several Scientific Papers from the Bibliographica Physicologica of Paris and Brussels.

Annual Reports American Museum of Natural History.

The Polychæma of Puget Sound Region. Boston Society of Natural History, 1900.

Vol. 4. No 1., Records of Australiar Museum, Sydney, 1901; Proceedings of Boston Society Natural History Vol. 29, No. 17, Phalnological Observations, Canada 1898, and Descriptions of Fresh Water Sponge from Sable Island. A. H. McKay, Nova Scotia.

Vols. IX. and X. 1899–1900. Proceedings and Transactions of Nova Scotia Institute of Natural Science.

12 Numbers of Ontario Naturalist 1900.

Vol. III. Nos. 1–4 1901 Canadian.

2 Nos. Antiquarian and Numismatic Journal.

Proceedings of Linnean Society, New York.

Contributions to Canadian Biology.

Botanical Bibliography of Canada. A. H. McKay, 1900.

The Ottawa Naturalist, February, 1902.

The Ottawa Naturalist, Vol. 16, No. 1.

Ottawa Field Naturalist.

2 Nos. of the Bulletin of Lloyd's Library, Cincinnati.

Bulletin of the Botanical Garden, Bronx Park, New York.

3 Nos. Reports of Lloyd's Library Smithsonian Institute.

Reports of American Museum of Natural History.

Memorandum or Day Book (100 years old) of Elijah Fowler. G. Stead.

5 Copies of Reports Australian Museum, Sydney, N. S. W.

Book, The Compendius Measurer (over 100 years old)—Arithmetic. Wm. J. Smith.

Mercantile Arithmetic (107 years old). John Flanagan.

Cooney's History (original edition). Rev. E. Bannon.

Views taken in British Columbia. Miss B. M. Creighton.

Part VIII. Canadian Plants.

Report of the Australian Museum, New South Wales.

G. B. Fraser, Secretary.

Patron.

His Honour Lieut.-Governor Snowball.

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THE RAISED SHORE LINES OF THE PROVINCE OF NEW BRUNSWICK.

By R. Chalmers, LL. D.,
of the Geological Survey of Canada.

THE ever-changing forms of our coast lines due to the wearing away of the banks, or the accumulation of shifting sands, have long been a subject of interest to the geologist and student of nature. These variable features in the condition of our shores are sometimes attributed to changes in the level of the land, or of the sea, but for the most part they are merely the result of the seasonal or periodic modifications which the materials referred to have undergone. Nevertheless, it is pretty well known that our coast lines are not absolutely stationary, or immovable, for long periods of time. Some of the facts which tend to support this view may be briefly stated:—The estuaries of most of our larger rivers are occupied by sand, gravel and stones to depths of one to two hundred feet below sea level, showing that the land formerly stood that much higher than at present. At that period the rivers flowed along their rocky floors one to two hundred feet below the present sea level. Following this elevation of the coast border, or depression of the ocean, as the case may have been, the greatest in the Post-Tertiary period, there was a subsidence equal at least to the present altitude of the highest shore line plus the difference between sea level and the rock floors of the estuaries referred to. At the time of the maximum subsidence of the land, or rise of the sea level, the raised shore lines around the coast of New Brunswick were formed, the highest of which it is proposed to describe in this paper. Another uplift of the land followed, and this in turn seems to have been succeeded by a slow subsidence in some areas, as shown by drowned peat bogs and the erosion of banks. It will thus be seen that the crust of the earth, in coastal areas at least, is in a state of continual though slow oscillation, greater in some parts than in others. Unceasing change seems to be the rule.

An observer starting from the present sea level and proceeding up an ascending surface (say at St. John, Hillsborough, Moncton, Newcastle, Bathurst, or Dalhousie Junction), will find horizontal benches and terraces, more or less resembling the existing beaches. An examination and study of these will convince him that they too must have been formed at the margin of the sea, though long ago deserted by it. Continuing upward he will reach a limit beyond which the general aspect and contour of the slope changes, the materials constituting the deposits being likewise different, and he will, therefore, find he has reached the highest mark of a former encroachment of the sea upon the land. This is known as the uppermost shore line of the Post-Tertiary subsidence. For a number of years the writer has been tracing this shore line and has located it with a good deal of accuracy in New Brunswick from the St. Croix to the Restigouche river. In examining and levelling it some very interesting features were brought to light. Having been formed at sea level, as just stated, we would naturally expect that it would be horizontal, and throughout its whole length would be at an equal height above the present shore line, or ocean's surface; and, indeed, from a casual glance such appears to be the case. But when we apply the spirit level or a good aneroid to the measurement of its altitude in different places, it is found to vary from a horizontal position in the most unaccountable manner, exhibiting local irregularities and a more or less wavy outline in profile. The following table of the altitudes will afford an idea of its present altitude with reference to mean sea level. Commencing at the St. Croix river, or the international boundary between New Brunswick and the United States, and proceeding eastward and northward the heights, at a number of the levelled points, are as follows:—

1.	St. Croix river,	230 feet.
2.	Digdeguash river and west of it,	231 "
3.	West of Pennfield station, Shore Line railway,	243 "
4.	Pennfield station (railway levels),	228 "

5.	Near Spruce Lake, St. John Co. (railway levels),	175–180	"
6.	East of St. John harbour (spirit (level),	226	"
7.	Hillsborough, Albert Co. (")	222	"
8.	Petitcodiac valley (railway levels),	160	"
9.	Indian Mountain, north of Moncton (spirit level),	249	"
10.	East of Indian Mountain (spirit level),	160	"
11	Buctouche river (")	145	"
12.	Richibucto river (railway levels),	138	"
13.	Newcastle station I. C. R. (spirit level),	138	"
14.	Caraquet (railway levels),	138	"
15.	Bathurst, near I. C. R. (spirit level),	175	"
16.	Dunlop settlement (")	188	"
17.	Charlo river, Restigouche Co. (railway levels),	175	"
18.	Dalhousie Junct. I. C. R. (spirit level),	223	"

The inequalities in the level of this shore line at different points, it will be seen, range from 138 to 249 feet above mean tide. It is highest upon the crystalline rocks and lowest upon the unaltered carboniferous sediments. The problem as to the cause or causes of these unequal altitudes is a very complex one, and is not yet clearly understood. Some geologists suppose the post-glacial uplift of the coast border to have been unequal in different parts, others again hold that though the uplift may have been equal throughout in a certain area, say within the province, that there was unequal subsidence since which has produced deformation. It is not improbable that both may be partly right, that is, if we consider only the movements of the land. But we have also to take into account the possible movements of the ocean, or hydrosphere, whether or not it has undergone secular changes of level with reference to the earth's centre. Notwithstanding the view held by most people, even by geologists, that the sea level is constant, in other words, that the earth's radius in oceanic areas is always the same length, we must admit that if the level of the land changes in those parts adjacent to the sea shore, the ground beneath the ocean, at least in the coastal zone, must likewise be subject to the same change of level. Lyell says, "In every country the land is, in some parts, raised, and in others depressed in level, and so likewise is the bed of the sea." Sir A. Geikie maintains that "the balance of evidence at present seems decidedly adverse to any theory which would account for ancient and modern changes in the relative levels of sea and land by variations in the figure of the oceanic envelope, but to be in favour of regarding such changes as due to movements in the solid crust." Prof. Suess believes that "the limits of the dry land depend upon certain large indeterminate oscillations of the statical figure of the oceanic envelope; that not only are raised beaches to be thus explained," etc., etc. Prof. Shaler of Harvard has also written on the question. Our own observations tend to support the same view, though it is now recognized that the movements of the crust which cause a change of level in the ocean may be chiefly those occurring in the deeper parts of its bed. The fact that raised and tilted shore lines are found on the coast of nearly every country on the globe shows that their origin and present position are due to a general cause, or a series of causes. Since our knowledge regarding the depths and contours of the ocean's floor has been greatly extended of late years by deep sea explorations it has become known that the form of the bottom is not very different from that of the continents and, therefore, the movements of the crust in the abyssal parts may, to some extent, be similar. Such movements, even though local, would doubtless affect the entire oceanic envelope in relation to the land border, causing a rising of the sea sometimes, and a lowering at others.

From the foregoing observations it is evident that the origin of these raised shore lines is by no means a simple question, and that it is due as much, or more, to a lowering of the ocean as to a rising of the land. The coast of New Brunswick as well as of most countries seems to be undergoing changes of level, though scarcely appreciable in a lifetime; and the present attitude of the raised shore lines under consideration is only one of those positions which they have assumed since their original formation.

Ottawa, Ont., Jan. 20, 1905.

AVIAN MISTAKES.

By J. McG. Baxter, M. D.

So little is known in reference to the causes that lead up to and direct the gigantic migratory army of birds moving North and South in spring and fall that every incident that in anyway tends to explain or even to illustrate it, should be seized upon, noted down, and given to the world by every lover of the feathered tribe. Is it some venerable *Canis sparsus* that, Moses-like, proclaims the hejira? Is it a *sehnsucht* for sunshine or cool breezes that Nature has implanted in the heart that lies in each feathered little *panzetta* that simultaneously on a given day "*se leve*" and compels its host to seek for "fields new and pastures green?" Or is it merely a case of "supply and demand" of food and surroundings? *Quien sabe.* Put goose in the place of stork and we may ask with Pope,

"Who bids the stork, Columbus-like, explore
Heavens not his own and worlds unknown before?
Who calls the council, states the certain day,
Who forms the phalanx and who points the way?"

But whether it is a God-given instinct or a case of avian judgment arising from long experience, we may see that it is not inerrant from the following circumstance observed during the meridional demigration of our wild geese as they passed here in the autumn of 1903. As ornithologists well know, the wild goose seldom or never breeds here but much further north. The flocks, however, always stop here to feed on the way south, to fatten up and lay in a supply of energy in the way of stored-up fat, and probably also for a period of rest before taking their long flight south. I had not noted whether in this season (1903) the general bird migration wave was later than usual, but the season was rather later and the river remained open late, and consequently the wild geese stayed late, the last flocks to leave apparently having been overtaken by a northwest snowstorm that we had. The snow must have drifted under their feathers from behind (at least that is what we suppose); they turned about, however, to face the storm, or for some other reason, and came back, arriving here on December 18th loaded down with snow and ice. Those that arrived in the morning were comparatively fresh, but those that arrived in the evening were completely tired out and alighted wherever it came handiest—on barns, housetops, in the fields, near the railway, on the ice in the river, anywhere, everywhere. Then everybody that could procure a gun went for them, and a large number were killed, one man that happened to be on the river with a horse and sled asserting that if he had had his gun he could have filled his sled. After a day or so of rest they again left. They could get nothing to eat here, as the river was in the meantime frozen over, so they "stood not upon the order of their going but went at once."

Error here there evidently was, but whose was it? Had experience failed to teach *Anserem Canum* that our Canadian winter was not to be played with? Or had he taken weather predictions from Wiggins and consequently made a *fehlschlag* the first time he started off? Or was it merely an anserine lack of judgment that was "visited upon the three or four generations" that followed his lead, like the iniquities of the Jewish fathers? Who knows? But as one of our local celebrities says, "when we look away back into the dim vista of the future" we imagine we can see a "*brin de lumiere*" which may increase so as to chase away all shadows when science, like the sun in midday effulgence, shall inundate all the dark corners of doubt and uncertainty.

There is another allied question that arises in one's mind: What is the influence that circumscribes a bird's range?

We could understand it if it was a matter of food, or temperature, or the huntsman's gun, but there seems to be more than this. Why should the common crow be scattered over the whole world, and the different species of vultures be so limited in their range? The food is to a certain extent the same, and one appears to be about as well provided with winter clothes as the other, and yet the crow is found almost as far north as man can live while the range of the turkey buzzard is said to be only as far north as New Jersey and the carrion crow finds its limit with the Carolinas. Now this, although in the main it may be true, has exceptions. The turkey buzzard (Carthartes aura), for example, has been found in a few instances much further north. The Am. Nat. VII., 1873, page 693, says two were taken in Massachusetts and one in Calais, Maine. One was taken in a steel trap in Cumberland, Maine. Three were seen at Grand Manan, April, 1875. (See Coues' N. A. Bird Life.) That is the highest northern limit I have noticed in any books I have seen.

I wish to make a little addition to this record, but unfortunately neglected to take down the date and all the circumstances. We have, however, retained the most notable fact, and that is the bird itself, which is stuffed and in our museum. This bird was found entangled in a fishing net at Black Brook (now called Loggieville), a village 5 miles below Chatham on the Miramichi river, some five or six years ago. This can be verified by the man who found it, by Dr. Cox who stuffed it, and last, but not least, the bird is in the museum to speak for itself. I think this breaks the record for the northern limit in the case of the turkey buzzard, and I also think we can do the same in reference to the carrion crow (Catharista atrata). Coues gives the northern range as not extending beyond the Carolinas, but says one was taken in Swampscott, Mass., 1850, another at Gloucester, Mass., Sept. 28, 1863. (J. A. Allen.) G. A. Boardman speaks of one killed at Calais, Maine. Mr. Ruthven Deane gives another Maine record—Campobello, Aug., 1879. (Coues.)

Now for the Miramichi Natural History Association record. On Dec. 20th, 1903, Mr. E. Allan, of Escuminac, at the mouth of the Miramichi river, shot a bird and sent it up to us for the museum. He describes the circumstances in the following manner: "The bird when first seen was flying across Mr. John Nolan's farm; did not appear to be of a wild nature; was soaring about twenty yards above the ground when shot. It appeared to fly like an eagle about 50 yards, then soar about 100."

This bird when sent up proved to be the carrion crow (Catharista atrata). Dr. Cox stuffed it and set it up beside its cousin, the turkey buzzard, in the museum of the Association, where they can be examined by all doubting Thomases. Note particularly the latitude and the extreme lateness in the season.

FRESH WATER LIFE.

BY J. McG. BAXTER, M. D.

TO study life as it actually exists in fresh water, that is, to watch the minutiæ of everyday existence in the natural habitat and surroundings of the minute forms of fresh water life, seems, with the means that we have at our disposal, an impossibility. What scientist is able to closely inspect with the microscope the career of a closterium venus or a difflugia pyraformis in the midst of a raging stream at the time of a spring freshet? And yet I have found them both in such a situation. It is marvellous that such helpless forms can sustain life in such untoward circumstances. One would think that they must inevitably be swept away to an ocean grave, and no doubt many are, but others seem to thrive and obtain their nourishment even under such trying circumstances.

While thinking over these facts the thought arose that it might be a point of some interest to test how far these forms of life would offer resistance to untoward circumstances and still life be sustained. For instance, taking forms that are found in pure running water and keeping them in glass vessels, with or without food, with no change of water for different lengths of time, and then find out how many and what kinds would survive.

With this object in view a number of samples of fresh water containing different forms of life, animal and vegetable, were prepared under the following conditions and kept for examination at different times.

Specimen No. 1.

This was collected June 8th, 1903, and examined May 13th, 1904. It was not examined when taken to see what life there was in it then, but it can be compared to other specimens taken in the same place and examined at once in order to compare and see what forms persisted and what ones perished. The circumstances against which they had to contend are these. The specimen was contained in a pickle bottle and stood on the office table all that time, stagnant, no water being added except about four times to make up for evaporation, and there was no vegetable matter in it to sustain animal life. The following were found: Innumerable empty frustacles of different diatomaceæ.

We can now compare this with a specimen taken from the same place and examined while fresh, Aug. 8th, 1904.

Desmids.

Docidium rectum 4 specimens
Closterium Dianæ
" Parvulum
" Venus
" Acerosum
" Subcostatum
" Costatum
" Strigosum
" Macilentum
Micrasterias radiosa
Euastrum Verrucosum
Arithrodesmus Octocornis

Diatoms.

Navicula viridis,
" dactylus in plenty.

Numbers of Nais worms and several specimens of cyclops.

This shows quite a difference and points out fairly well the different forms that likely perished in the first specimen on account of the stringent conditions, such as impure water and lack of food.

Specimen No. 2.

Taken from a running brook Oct. 14, 1903, and examined May 13th, 1904, and subject meanwhile to the same conditions as No. 1. Result: 1 Closterium, green (not moving), 11 Pterodinæ patinæ, quite lively. Numerous frustules of different diatoms. Nothing more.

Compare fresh specimen from same place, September 18th,

1904.

2 or 3 specimens Docidium rectum,

2 specimens Surrirella splendida, and a number of chydori.

Specimen No. 3.

Taken from a running brook July 18th, 1903; examined May 10th, 1904, and subjected to the same conditions as Nos. 1 and 2, except that this specimen contained vegetation in abundance taken at the same time and place:

4 Micrasterae Americanæ, green and bright,
Closterium venus, some living, some dead,
2 Closter aceros, living, moving, green,
" Dianæ, some alive, some dead,
2 " costatum, living.

Diatoms.

Nav. dactyl Subgigas frustules,
" Viridis, alive, moving,
" Viridis frustules,
Stauroneus phœneocentron frustules.

Other forms.

A number of empty chydorus shells,
5 cyprids, one young one, all lively,
24 chydori, one young one, all lively,
6 cyclops, lively as ever.
A number of paramecia.
34 Pterodinæ patinæ, all lively,
1 " " dead.
17 Anguillulæ, lively as ever,
3 Rotifera vulgaria, lively and feeding,
5 Tubellaria worms, very lively,
1 water mite, lively,
1 Planorbus deflectus, dead,
1 Microbiotus Americanus, lively, busy feeding.

And I suppose I might have discovered many other forms if the examination had been more protracted and careful.

There is no need to compare a fresh sample with this as the quantity of life is fully up to the average.

In this specimen, although the conditions otherwise were the same as specimens 1 and 2, the addition of vegetation to the water seems to have made all the difference in the world.

Specimen No. 4.

Collected April, 1902; examined Dec. 13th, 1904.

This specimen was in a milk basin and stood on the office table two years and eight months, a little water (town water) being added each morning to add oxygen and supply the loss by evaporation. The specimen was put down as follows: Some sand and a few stones in the bottom; then the specimen water was added, nearly filling the basin; then some water grass from the same brook, I do not know the variety, was planted in the sand, as also some bunches of Dichelyma capellceum. Then on the surface were set afloat some Salvinia natans, Riccia natans and Riccia fluitans. Of the contained life nothing is known except that there was a large number of snails of two varieties, Planorbus deflectus and Limnea culumella. Watching this specimen with the naked eye I could follow the snails. To my surprise they did not appear to touch the water grass nor floating plants. I could not see if they fed on the Dichelyma or not, but a soft fluffy species of algæ formed on the sides of the basin under water and they mowed swaths through that, so that you could trace them in all directions. Some even came up out of the water and died on the edge of the basin. I also noticed cycles occurring in other aquatic life, probably cyprids or chydori, or both; it was impossible to tell with the naked eye. They would swarm in immense numbers for a week or so, and then you would hardly see one. On the day of examination, Dec. 13th, 1904, the appearance was as follows: The water grass had grown over the side of the basin and was hanging down one and a half feet over the edge of the table. The Dichelyma was growing fairly, but the Salvinia and both specimens of the Riccia had entirely disappeared. The microscopic examination showed the following:

Desmids.

None.

Diatoms.

2 Stauroneus phœneocentron, recent,
Innumerable Nav. Subgigae, both recent and frustules,
1 Fragillaria capucina,
1 Nav. cardinalis, shell,
Several Nav. Viridis, recent.

Other forms.

1 Daphnia pulex, lively,
1 Parameceum bursarium,
Many Parameceum vulgare,
Many chydori, living and active,
Many chydorus shells.

Quite a large number of Anguillulæ, tubelaria worms, Hydrachnæ belostomæ, rotifera vulgaria, vorticellæ and a species that I have never seen before, and that I can not find in any book I have on the subject. It evidently belongs to the Hydrachna family, but it is clear, transparent as glass, much broader than long, and runs sidewise, seemingly as well one way as the other, and is much more lively and rapid in its gait. Unfortunately an accident happened to the slide before I was able to examine more closely or put in a more powerful objective. I found also 1 actinophry sol.

Specimen No. 5.

Put up Sept., 1901; examined Dec. 17th, 1904.

This specimen was put up as follows: The bottom of a large milk basin was covered with about one inch of sand and a few stones placed in it. The water from a running stream was added to nearly fill the basin, and Dichelyma capeliceum planted in the sand. and the following plants floated on the water enough to cover the whole surface thickly—Lemna trisulcha, Vaucheria. Nitella, Lemna minor, Salvinia natans, Riccia natans and Riccia fluitans. The basin was placed on the table beside No. 4. The watergrass in No. 4 grew and ran over the edge into No. 5 and took root there. and after it had got well rooted I took the scissors and cut the two basins apart and separated them for fear that the snails would cross over. The grass did better in No. 5 than No. 4, growing to about three feet in length over the edge of the basin and table and sweeping the floor. I had to set a basin under the grass on the floor, as the water siphoned over on the grass at the rate of about half a wash-basin per day. General appearance to the naked eye: Immense numbers of animals swimming like cyprids or chydori, but varying in number in cycles like No. 4. At the end of three years and four months, viz., Dec. 17th, 1904, the following: Lemna trisulcha. Vaucheria, Nitella, Riccia natans and Riccia fluitans, all gone.

Salvinia natans, still living, but the leaves seemed smaller and there did not seem to be many new ones sprouting. Lemna minor, plenty of it, but about half of it seemed to have turned white and died; the rest seemed fairly healthy.

Dichelyma, flourishing.

Microscopic examination.

Desmids.

None.

Diatoms.

A few Fragillaria capucinæ,
" " Cymbella gastroides, recent and frustules,
" " Surrirella splendida, " " "
Navicula Subgigus shells.

Other forms.

Pterodinæ patinæ, a few plates.
A few Chydori, lively,
A large number of shells of chydorus everywhere.

Large numbers of hydrachne belostoma all over the Dichelyma everywhere, but none anywhere else. A large number of cyprid shells, none alive except one on Salvinia leaf. Vorticellæ plentiful, a few paremacea, and that was all after prolonged examination. I forgot to mention that some days after Nos. 4 and 5 were put up a large number of small flies were found dead and floating on the surface of the water, which I supposed were chironomous larvœ which had assumed the fly form, but the conditions were not favorable in some way and they were unable to progress further and so died by starvation or drowning.

During the Christmas holidays Nos. 4 and 5 were allowed to freeze solid, and after having been thawed out were again examined.

No. 4 was examined on January 26th, 1905.

All that was found were the following:

Nav. Subgigus, some recent and lots of frustules,
Nav. Viridis, " " " " " "

Many parameceidæ. Nothing more, and all vegetation gone except a little of the water grass and some Dicholymæ.

No. 5 was examined Feb. 7th, 1905—

Nav. Subgigas, frustules only,
" Viridis, " "
Cymbella gastroides, frustules only.
There were also many vorticellæ.
1 Cyprid, quite lively,
8 or 10 Rotifera vulgaria,
2 or 3 specimens of Hydrachne Belostoma.

Many chydori shells, but none recent; found one foot separate from its shell, showing spurs and terminal nail and outlines perfectly shown. I should say that there is a large bony plate in the leg of the chydorus, representing the skeleton in the higher animals. There was one animal also that came into the field but disappeared like a flash and could not be found again. I should imagine from the motion it might be a cyclops.

All vegetation had disappeared from the basin except water grass, which still seems to flourish, Dichelyma and Lemna minor.

HOW PLANTS USE ANIMALS.*

By Prof. James Fowler, Ph. D.

NITROGEN enters into the composition of proteid substances and is consequently a necessary element of plant-food. Experiments have proved that it is derived, not from the nitrogen of the air, but from compounds of ammonia and nitrates which are widely distributed in nature, and are furnished to the plant dissolved in soil-water. Plants, with few exceptions, have no power to assimilate the free nitogen of the atmosphere, and soon perish if the soil in which they grow contains no nitrogen compounds. When growing in positions where the necessary nitrogen cannot be obtained they are compelled to resort to other sources of supply. Some secure abundance for their needs from the bodies of animals which they entrap in various ways, and as the greater number of these are insects the plants have been called insectivorous plants.

About 460 plants are known which are more or less dependent upon this souree for their nitrogen, and are consequently provided with traps, pitfalls and other contrivances for capturing their prey. They belong to diflerent families or orders of both terrestrial and aquatic forms, and are furnished with widely different devices for securing the animals required for food.

Order I.—Among these insectivorous plants the most conspicuous belong to the order Sarraceniaceae, which embraces eight species, distributed between three genera, inhabiting North America and British Guiana.

I. The best known of these are:

The six species of pitcher plants (Sarracenia), of which one (S. purpurea) is common in Canada, and the other five in the Southern States. They abound in mossy bogs, and along the borders of lakes. They are perennial plants, with stems from a foot to eighteen inches in height, terminated by a single, large, nodding flower, of a deep purple or sometimes greenish-purple

* Republished by permission of Queen's Quarterly, 1899.

colour. The large leaves are arranged in a rosette around the base of the stem, and are eight to ten inches in length, hollow or trumpet-shaped, ascending, curved, broadly winged along one side from the base to the mouth of the pitcher, and terminating in a rounded, arched hood at the apex. The wing is bordered or edged by a purplish cord, which also runs around the mouth. An abundance of purple veins contributes to the beauty of the colouring. The pitcher is partly filled with water and drowned insects. The hood is ornamented with brilliant colours and clothed on its inner surface with stiff, polished bristles pointing downwards. Within, the surface of the tube is exceedingly smooth, rendering it impossible for an insect to crawl out after it has entered. The thickened smooth lip, surrounding the mouth, is rendered attractive by a sweet secretion which lures both winged and crawling insects to enter. In the southern species, the wing also secretes nectar along its whole length, and presents an irresistible attraction to ants and other wingless creatures. Mrs. Mary Treat informs us that she "noticed on some of the plants a line of small ants, extending from the base of the leaf to the summit, feeding on the secretion; so numerous were they that they crowded one another, but all steadily advancing to the opening, down which they disappeared."* She describes in graphic language the "very friendly and fraternal" manner in which they meet and pass each other, going to or returning from their feeding grounds on other plants. But "mark the difference when the ants are feeding on the sweet secretion of Sarracenia variolaris; now they crowd and jostle one another, and seem wild in their movements, and all are advancing in one line towards the summit of the leaf, on reaching which they disappear down the white throat of the insatiable Sarracenia. No return line here." On one occasion she placed a number of leaves in vases of water, in her study, to keep them fresh, and opened the windows to admit the insects swarming in the warm air outside. When a sufficient number had entered she closed the screens to the windows and watched the results. The flies were

* Home Studies in Nature, by Mary Treat, p. 189.

soon attracted to the plants, and as soon as they tasted the secretion, they began to act strangely as if intoxicated. If she touched one, it would fly a short distance and return immediately, and would soon be "buzzing inside of the tube, trying to walk up the dry, smooth surface, and ever falling back, until it was exhausted and still." If a leaf was taken from the vase, turned mouth down, and the flies shaken out, they soon returned again. "They would pass their legs over their wings, but they were unsteady on their feet, and seemed to be intoxicated. Every fly I liberated eventually returned to the open mouth and walked in, as if fascinated by some spell."

The room was soon "cleared of flies—all lured into the fatal traps." The windows were re-opened and a new swarm admitted, among which were two or three yellow-jackets—wasp insects. One of them soon lighted upon a leaf, tasted the sweet secretion on the edge of the wing, and proceeded hurriedly and wildly along the line of sweets until it reached the opening ....In a little more than a minute from the time it alighted it was a safe prisoner within, buzzing and fluttering and stirring up the imprisoned flies. It made frantic efforts to escape—tried to climb the smooth surface, ever falling back till exhausted and powerless to move. The experiments were repeated day after day for two months, both in the field and in the house, with the same results. Insects of every order were entrapped and their bodies digested by the plants. Pieces of raw beef were substituted for insects and were readily absorbed by the digestive organs.

2. The Darlingtonia of California, and (3) the Heliamphora of British Guiana, also bear pitchers partly filled with water, which entrap insects and absorb their juices.

Order II.—A second family of insectivorous plants is that of the Nepenthaceae which is represented by the single genus Nepenthes, containing about forty-five species. They occur principally in the Malay Archipelago, but extend to Ceylon, Australia, the Seychells and Madagascar. Most of them are climbing shrubs growing in swampy soil. Their leaves have foliaceous petioles which form, at their extremities, pitchers surmounted by a hinged lid. Inside the pitchers is secreted a watery, slightly acid fluid, partly filling the cavities. Upon the lips of the pitchers, as in the case of the Sarracenia, is produced a sweetish substance exceedingly attractive to winged insects which, falling into the fluid within, are soon dissolved by it, and their substance absorbed by the plant for its nourishment. Dr. Hooker found that although the fluid within the pitcher of Nepenthes possesses extraordinary power of digestion, yet when removed from the pitchers, before they have been excited, and placed in a vessel, it has no such power, although it is already acid. Darwin accounts for this fact by the supposition that the proper ferment is not secreted until some exciting matter is absorbed.*

Order III.—The Droseraceae is a large family of very remarkable plants, distributed throughout the world; and frequently abounding in bogs and marshy localities. It embraces six genera and about one hundred and ten species one hundred of these belonging to a single genus, Drosera. Owing to its adaptation for entrapping insects, the family has attracted a large share of attention, and several of its members have been subjected to numberless experiments.

1. In some respects the most wonderful species is the Venus' fly-trap (Dionaea muscipula), so named from the extreme irritability of its leaves, which quickly close like a steel-trap at the slightest touch. It is a native of the eastern part of North Carolina, where it flourishes in sandy bogs along rivers from the Neuse to the Santee. It adheres to the soil by one or two small roots, terminated by bulbous enlargements, which probably serve for the absorption of water. In conservatories it is often cultivated in a pot of bog material placed in a pan of water, proving that it is not dependent upon the soil for its food. The stem is from six to twelve inches high, and bears an umbel of eight to ten white flowers. Its leaves are all radical, forming a rosette, the blades are roundish and two-lobed, their margins fringed with long, sharp, rigid spines. The upper surface of each leaf has

*Darwin. Insectivorous Plants, p. 97.

three minute pointed filaments standing erect and forming a triangle on each side of the midrib. They are extremely sensitive and when touched by an insect the leaf suddenly closes on it.

The marginal spines are so placed that when the lobes close they interlock like the teeth of a rat-trap. The upper surface of the leaf is covered with small reddish glands, the remainder of it is colored green. The sensitive filaments are about one-twentieth of an inch long and taper to a point. A peculiarly formed articulation at the base unites them to the leaf and permits them to lie flat down when the lobes close together. Their extreme sensitiveness excites the astonishment of experimenters. Darwin fixed a piece of very delicate human hair into a handle, and cut it off so that one inch projected; the length being sufficient to support itself in a nearly horizontal line. The extremity was then brought by a slow movement laterally into contact with the tip of a filament, and the leaf instantly closed.* Though so sensitive to touch they are utterly indifferent to heavy showers of rain and gales of wind. "We thus see," says Darwin, "that the sensitiveness of the filaments is of a specialized nature, being related to a momentary touch rather than to a prolonged pressure; a touch must not be from fluids, such as air or water, but from some solid object."

The surface of the blade is very slightly sensitive, and bits of stone, glass, and other inorganic substances—also bits of organic substances not containing soluble nitrogenous matter, such as wood, cork, moss—or bodies containing soluble nitrogenous matter, if perfectly dry, as meat, gelatine, albumen, may be placed on the lobes and left for hours without producing any perceptible effect. If the nitrogenous bodies are slightly moistened, the lobes close over them with a slow and gradual motion, very different from that produced by touching filament.

The upper surface of the lobes is thickly covered with small, sessile glands, capable of secretion and absorption. When a bit of meat or an insect is enclosed, these glands pour out a copious secretion, which is almost colourless, slightly mucilagi-

*Darwin, Insectivorous Plants, p. 289.

nous and acid. Sometimes the secretion is so abundant that if a leaf be cut open, drops will roll off it. That it is possessed of digestive powers, like the gastric juice of animals, has been proved by many experiments, for the details of which the reader is referred to Darwin's interesting volume.

After enclosing an insect, or any nitrogen-yielding substance, the leaves do not open for many days, and after opening, frequently become torpid and wither. Vigorous leaves, however, will seize their prey more than once. Mrs. Treat informs us that among her plants "a considerable number of leaves took the third fly, but most of them were not able to wholly digest them. Five leaves digested three flies each, and opened apparently healthy, and were soon ready for another meal, but died soon after closing over the fourth fly. On the other hand, some leaves were not able to digest a single fly."* They did not restrict their diet to flies, but readily partook of bugs, beetles, spiders, millepeds, or other insects which were unfortunate enough to visit them The average time required to digest soft-bodied insects, such as spiders, flies, and small larvae, was seven days, but hard-shelled bugs and beetles took fourteen days, on account of the resistance furnished to the digestive secretion by their shelly covering.

2. Another plant of this insectivorous family is the Aldrovanda vesiculosa, which is distributed, in some of its varieties, in Europe, India and Australia. It is a rootless, little plant, floating freely in water. Its stem is about three inches in height, and is ornamented in the flowering season with a few small white flowers. The leaves are arranged in whorls about the stems, and, as in the case of Dionaea, are composed of two lobes united by a strong midrib. The lobes are folded up from the midrib so as to resemble a small clam-shell nearly closed. This position gives it a great advantage when it requires to close suddenly. From the inner surface of the lobes, and especially from the midrib, project numerous, long, finely pointed hairs, extremely sensitive to the touch. When irritated by any minute

*Home Studies in Nature, p. 185.

swimming creature, the lobes close suddenly and sharply, rendering escape impossible. A fluid is secreted from certain glands, which is said to dissolve and digest the nitrogenous materials contained in the bodies of the captured larvae or crustaceans. Several interesting arrangements for the capture of prey, and the absorption and assimilation of the portions suitable for food, can only be explained by the use of figures. but enough has been said to show that aquatic as well as land animals have vegetable foes which lie in wait for them and lure them to destruction.

3. The Cape of Good Hope furnishes another genus (Roridula) of these carnivorous plants, which embraces two species. These (R. dentata and R. gorgonias) have somewhat woody stems and branches. The leaves are long and narrow, tapering to a long point, and are concave on both the upper and lower surfaces. They are densely covered with tentacles, which differ greatly in length. The glands also vary much in size, and are supported by pedicels. In their native condition they secrete abundantly a viscid substance which adheres to insects and prevents their escape. When examined the leaves are often found to be covered with the remains of the captives.

4. A fourth genus (Byblis), containing three or four species, occurs in Western Australia. Its leaves resemble those of the preceding genus, being several inches in length, acuminate and somewhat flattened. Numerous glands cover the surface and the apex. which terminates in a small knob. The bodies of insects adhering to the glands show their use.

5. The best known, as well as the largest genus of insect-destroying plants is the Sundew (Drosera), which embraces fully one hundred species, scattered over the whole globe where-ever marshes are found. Six species occur between Hudson Bay and Florida. of which four—Drosera rotundifolia, D. Anglica, D. intermedia Americana and D. linearis—are abundant in Canada. The most common species is D. rotundifolia, L. which inhabits the peat bogs and marshes, from Newfoundland, Labrador and Nova Scotia westward to the Pacific and north to

and beyond the Arctic circle.*

As this is the species to which Darwin has devoted 277 pages of his interesting work on insectivorous plants, in which the reader can obtain a remarkable amount of information respecting its movements and digestive powers, a brief description will be sufficient here. It is a small herbaceous plant, five to eight inches high, growing generally (not always) in sphagnous bogs where its roots cannot reach the barren soil below; the mosses themselves depend upon the atmosphere and the rains for their nourishment. Its roots are few and small and seem only to absorb water. The leaves are reddish, and form a cluster around the base of the scape; they are nearly orbicular in form and taper abruptly into the petiole. In their young condition, they are rolled up from the apex to the base. Their whole upper surface is beset with glandular hairs or tentacles, which are usually tipped with a small drop of a viscid secretion, glistening like dew in the sunshine, whence it receives its name. The slender, naked scape bears the small, white flowers "in a one-sided, raceme-like inflorescence, which nods at the undeveloped apex, so that the fresh-blown flower, which opens only in the sunshine, is always highest." (Gray's Manual.)

Darwin counted the number of glandular hairs, or tentacles, on thirty-one leaves and found the average number was 192; the greatest number being 260, and the least 160. Those on the central part of the leaf or disc are short and stand erect; those on the extreme margin project on the same plane as the leaf, or are more commonly reflexed. When an insect, or any small object, comes in contact with the central tentacles, a motor impulse is transmitted to those around them and is gradually propagated to those placed on the margin. The nearer ones, being first affected, begin to bend toward the centre—then those farther off, until all become closely inflected over the object. A living insect is much more effective in producing movement than a dead one, as its struggles bring it into contact with a greater number of tentacles. The length of time required for complete

*Macoun, Catalogue of Canadian Plants.

inflection varies from one to four or five hours, according to the age and vigour of the leaf, the nature and size of the object, and the temperature of the atmosphere. The inflection takes place equally by day and night. An insect, as a fly with thin integuments, causes a longer inflection than an insect, like a beetle, with a thick covering. Strongly inciting substances, as drops of milk, produce also an incurvation of the leaf, so that it resembles a shallow cup. When tentacles, remote from an object caught on the centre of the leaf, have become considerably deflected towards it, they pour out an increased amount of secretion, which soon changes its nature and becomes acid. Like the gastric juice of the higher animals, the secretion possesses an antiseptic power. If a small piece of meat be placed on the tentacles, and another be enclosed in the moss beside it, the former will remain fresh and untainted long after the latter has become putrid and filled with infusoria. When the juices of the insect, or other object covered by the secretion, have been digested and absorbed, the tentacles gradually unbend and assume their natural position, awaiting the arrival of new and heedless visitors.

The extreme sensitiveness of the tentacles is worthy of notice. "It is an extraordinary fact," says Darwin, "that a little bit of soft thread, one-fiftieth of an inch in length, and weighing one eight thousand one hundred and ninety seventh of a grain, or of a human hair, eight one-thousandth of an inch in length and weighing only one seventy-eight thousand seven hundred and fortieth of a grain (.000822 milligramme), or particles of precipitated chalk, after resting for a short time on a gland, should induce some change in its cells, exciting them to transmit a motor impulse throughout the whole length of the pedicel, consisting of about twenty cells, to near its base, causing this part to bend and the tentacle to sweep through an angle of above 180 degrees." He proved by experiment that far less than the millionth of a grain of phosphate of ammonia in solution, when absorbed by a gland, acts on it and induces movement.

The number of insects allured to destruction by the untold millions of these living traps distributed over the globe is perfectly inconceivable. And when we remember that one hundred different species of this single genus of plants are continually lying in wait for the unwary insect, the results may well excite our astonishment.*

6. The only remaining genus of this family (Droseraceae) is Drosophyllum, represented by the single species D. Lusitanicum, a native of Spain, Portugal and Morocco. In the neighborhood of Oporto, where it abounds, it bears the name of "Fly-catcher", and is hung up in dwellings to rid them of flies. The roots are very small, as in the case of Drosera, showing that it is not dependent upon food derived from the soil. The leaves are long and linear, gradually tapering to the apex. "The upper surface is concave, the lower convex, with a narrow channel down the middle. Both surfaces, with the exception of the channel, are covered with long, irregular rows of glands, supported on pedicels of different lengths." The glands vary much in size and are conspicuous by their bright pink or purple color. Unlike those of Drosera they are incapable of movement, but resemble them by producing large drops of a viscid secretion in which insects become entangled. The drops adhere to the wings, feet, or body of the unfortunate visitor, and are drawn from the gland. It then crawls onwards and other drops adhere to it, till at length it is overwhelmed by the accumulating mass and sinks down under the burden to rise no more. The work of digestion and absorption begins immediately, and soon nothing remains but the wings and indigestible integuments of the body.†

ORDER IV.—The plant Cephalotus follicularis is regarded by some botanists as the sole representative of the family Cephalotaceae, but the majority describe it as an abnormal member of the Saxifragaceae. It is a perennial plant growing in wet marshes, and, so far as known, is confined in its distribution to

*According to recent experiments it is deemed probable that the insect-digesting ferment is secreted by bacteria which lie upon the plant.—Minnesota Bot. Studies, Vol. 1, p. 942.

†Darwin, Insectivorous Insects, p. 332.

King George's Sound in Western Australia. The leafless scape is from one to two feet high, and bears a narrow panicle of small white flowers. The leaves are all radicle and arranged in a rosette. They are from one-half to one inch in length, obovate-oblong in form, with entire margins and obtuse apex, and narrowing into a petiole often as long as the blade. Some of them are converted into ovoid or nearly globular pitchers of about one inch in diameter. The mouth of the pitcher is bordered by a plaited ring and the ovate lid is attached to the side next the leaf-stock.* Very little accessible information exists as to the plant's mode of procedure in attracting and trapping insects, but the very structure of the pitcher, the position of the lid and the peculiar border around the mouth, are sufficient proof that they are designed to prey upon the insect world.

ORDER V.—The fifth family of these life-destroying plants (Lentibulariaceae) embraces nearly 200 species, which are very unevenly distributed between four genera. The greater number are inhabitants of the temperate and cold regions of the globe. Some species are terrestrial, others aquatic; consequently very different adaptations are required for the capture of their prey. The former set their traps for winged or crawling animals, and the latter for those living in stagnant pools.

1. The largest genus is Utricularia (Bladder-wort), containing 150 species, of which eight occur in Canada. A few have been subjected to very careful observation and experiment.† The plants are often abundant in ditches and muddy pools along the roadsides, and can be easily procured for examination. Our Canadian species are all aquatic, having the stems and leaves immersed, and dissected into fine capillary divisions, bearing numerous little utricles or bladders which float the plant during the flowering season, which continues most of the summer. The leafless scapes rise from three to twelve inches above the water, and bear from one to ten peculiarly-shaped flowers of a yellow, or sometimes purple color. The bladders are furnished with a valvular lid, and usually with a few bristles at the entrance.

*Darwin devotes 50 pages to his experiments, and Mrs. Treat 24.
†Bentham, Flora Australiensis, vol. 11, 448.

Mrs. Treat, in New Jersey, experimented on Ultricularia clandestina, and gives many interesting details. "There is a depression," she says, "at the entrance of the utricle, a pretty vestibule that seems to attract the little animals into the inviting retreat, where just beyond is a fatal trap or valve, which, if touched, springs back and engulphs the unwary adventurers, never more to be released. I was very much amused in watching a water-bear (Tardigrada) entrapped. It slowly walked around the utricle, as if reconnoitring—very much like its larger namesake; finally it ventured into the vestibule and soon, heedlessly, touched the trap, when it was taken within so quickly that my eyes could not follow the motion. The utricle was transparent and quite empty, so that I could see the behavior of the little animal very distinctly. It seemed to look around as if surprised to find itself in so elegant a chamber; but it was soon quiet, and on the morning following it was entirely motionless, with its little feet and claws standing out stiff and rigid. The wicked plant had killed it very much quicker than it kills the snake-like larva." Mrs. Treat also describes how these plants entrap the larvae of the mosquito, an employment in which we wish it abundant success.

Darwin examined the bladders of a great many specimens of U. neglecta and found they contained four, five, eight, ten entomostracan crustaceans, and frequently other animals in the same bladder. One of our Canadian species (U. vulgaris), abundant in ditches, pools, lakes and slow streams from Newfoundland and Halifax to Vancouver, bears a bad reputation for trapping and destroying young fish. Young salmon, bred in hatcheries, when set free in the lakes are caught around the body in the mouth of the bladder and held fast till they perish. Five to ten crustaceans have been found in single utricles.

2. The genus Pinguicula (Butter-wort) contains about thirty species, of which three are credited to Canada. Of these only one (Pinguicula vulgaris) is of common occurrence, being distributed from Newfoundland and Labrador westward along the St. Lawrence and the Great Lakes, and onward across the continent

to the Alaskan Islands. It is a small, perennial plant, five to six inches in height, growing on wet rocks and thin, damp soil, to which it is fixed by very short, delicate roots. The slender scape is terminated by a single flower with a funnel-form tube and unequal lips of a violet colour. The base of the tube is provided with a straightish spur. The leaves (about eight in number) are ovate or elliptical, and clustered around the base into a rosette, from three to four inches in diameter. They are of a light green colour, rather thick, and have a soft, fleshy or greasy feel to the touch (whence their name). When full grown they are about 1½ inches long and ¾ inch in breadth. The young central leaves are concave, the margins curve upwards, and the upper surface is thickly studded with two sets of glandular hairs of different sizes, which all secrete a viscid colourless fluid. They are generally covered with insects entangled in the secretion—as many as thirty being counted on a single leaf. All kinds—diptera, hymenoptera, coleoptera, moths, ants and larvae—appear to be equally welcomed and subjected to the same treatment. When an insect is caught by the glands, the secretion is largely increased, the edge of the leaf begins to fold inwards, and after a time partly closes over the victim; the secretion becomes acid and acquires the power of digestion. The dissolved nitrogenous matter is absorbed by the glands, as is proved by the aggregation of their contents into slowly moving granular masses of protoplasm. The period required for absorption varies according to the nature and size of the object embraced by the leaf, but twenty-four hours are generally sufficient; it then begins again to expand, gradually assumes its previous form, and patiently awaits the arrival of another victim.

Mrs. Treat discovered that "the pinguiculas are not only carnivorous, but also vegetable feeders," and that they consume large amounts of pollen, which falls upon them from the pines which abound in the barren lands where these plants grow. Large quantities of pollen are often found on the leaves, mingled with small flies, and equally involved in the secretion from the glands. Careful experiments proved that "the pollen was gradually dissolved and disappeared with the secretion." The amount of secretion varied with the weather, being most copious in fine dry days—the time when insects are most abundant in the surrounding air. The number captured and consumed by these plants in every land must be very great.

3. The genus Polypompholax embraces four species, all confined to Western Australia. They bear a strong resemblance to Utricularia, and capture their prey in small bladders of somewhat similar construction.

4. The last genus demanding notice (Genlisea) inhabits marshy grounds in many countries, but does not occur in North America. Eleven species have been described. They are represented as remarkable plants, furnished with utricles of such peculiar structure that no intelligible description of them can be given without illustrations.

Some interesting questions might be asked respecting the origin of those carnivorous plants. What peculiarities of environment on dry land, or in marshes, bogs or pools, tended to develop these numerous contrivances for alluring and captivating prey? How did the plants acquire a taste for animal food contrary to the ordinary laws of nature? Were they driven by hunger to develope alluring sweets, and traps, and pitfalls, and stomach-like sacs, with digestive and absorbing apparatus, to seize upon unwary visitors and consume them for food? It is very true that many, perhaps all, of them grow in positions where nitrogenous food cannot be secured by the roots; and that the roots are very small and few, fitted only for the absorption of water. But this does not explain the production of the pitchers of Sarracenia—or the swift closing traps of Dionaea—or the long, sensitive, secreting glands of Drosera—or the infolding leaves of Pinguicula—or the stomach-like bladders of Utricularia—or the numerous other adaptations for luring animals to their death and consuming them for food.

LIFE OF MOSES HENRY PERLEY, WRITER AND SCIENTIST.

By Philip Cox Ph. D.

MOSES Henry Perley was born in the parish of Maugerville, County of Sunbury, New Brunswick, on the 31st of December, 1804. He was through his mother, a grandson of Israel Perley, leader of a band of colonists, who, emigrating from Massachusetts, then a British dependency, settled along the River St. John in 1762. He was also of the sixth generation in descent from Allen Perley, or Apperley, a native of Wales, who arrived at Charlestown, near Boston, July 12th, 1630, and from whom the Perleys in America are descended.

Israel Perley was accompanied to New Brunswick by his brother Oliver, whose son Moses married the former's daughter Mary, and had issue Charles, who died in infancy, and Moses, the subject of this sketch. From his mother he inherited much of that restless energy and love of nature which largely characterized his life, for she was a woman of strong, deep feelings and convictions, an admirer of the artistic side of nature, and the dignity of labour.

When he was only a boy the family left Maugerville and took up its residence in St. John, where Moses received a common school education, but the ordinary pleasures of city life, the dull routine of business, and the absence of those quiet charms of forest, lake, and river, which had found a response in the childish heart, soon caused the boy of sixteen or seventeen to long for the freer and more congenial life of the country, and in his bark canoe he is found every spring and early summer among the Indians of the interior, sharing with them the lean-to or the wigwam, purchasing their furs and other goods, for which he always paid in *coin*—never in firewater nor worthless trinkets as too many of the so-called traders of those days did. His youth, his honesty, his love of the wilderness, his sympathy for Indian life and the pleasure he took in their company; his earnest desire to promote their best interests, and save them from the rum curse soon won the confidence and love of the simple children of the forest. To be chosen for guide and canoeman by the young trader was regarded as a mark of honour, and wherever he went a warm welcome awaited him. Thus was laid the foundation of that extensive knowledge of the natural history and undeveloped resources of New Brunswick which in after years he elaborated and gave to the public with such good results.

Mainly to gratify the wishes of family and friends, he entered upon the study of the law and, in 1828, was admitted an attorney of the supreme court, and called to the bar in 1830. In 1829 he married Jane, daughter of Isaac Ketchum, a loyalist who had settled at Hampton Ferry, King's County, in 1783. The fruits of this union was a family of eight, the eldest and last survivor, Henry F., civil engineer, dying at Ottawa a few years ago.

Though he had adopted the legal profession and become engaged in mercantile affairs, his love of nature continued to grow. Every summer found him passing his holidays in company with an Indian, exploring the inland waters of the province, collecting information about its mines, minerals, forest wealth, fisheries, and the fertility of its lands. He was, without doubt, the best informed man on these subjects the province ever saw, and when later he became chief immigration commissioner for New Brunswick, his booklets and articles in the press popularized his native land, and promoted immigration from Great Britain. His popularity among the natives grew from year to year as their knowledge of the man increased, until about 1839 he was formally elected a chief by the Malicites of the St. John River and a *Sagamow* by the Micmacs of Northern New Brunswick. Whatever value people might attach to such honours, they were the greatest the native could confer, and mark a depth of respect, admiration, and confidence, seldom enjoyed by a white man. A priceless heirloom, commemorative of the event, is preserved by the family in the form of a silver medal, dated 1840, on which is engraved "From Her Most Gracious

Majesty to M. H. Perley, Chief Sachem of the Milicites, and Wunjeet Sagamow of the Micmac Nation." Shortly after he received his commission as "Wunjeet Sachem" of the whole Micmac Nation, dated Sept. 7th, 1841, and a similar one acknowledging him Chief Sachem of the Malicite tribe. They were no empty honours, but involved many responsibilities, among which being that of intermediary between the government and all the Indians of the province, whose business relations were many and often troublesome, growing out of the transfer of lands, the allotment of reservations, compensation for lost privileges, and complaints of encroachments of settlers. Chief Perley attended the tribal assemblies convoked to discuss Indian matters, and, clad in the picturesque native dress of a sachem, presided. The unbounded confidence of the red men in their "White Chief", his moderation, and extensive knowledge of their habits, temper, and the nature of their grievances enabled him to guide them to a conclusion by which matters could always be amicably adjusted. Indeed Indian affairs were at the time so important, that a government office was created to administer them, and "Chief Perley" was, in 1841, appointed "Special Commissioner for Indian Affairs," by Sir William Colebrook, Lt. Governor of the province.

Perley's extensive knowledge of the province and its resources, and his untiring efforts to promote its settlement and the development of its natural wealth, marked him out as the man best qualified to assume the direction of immigration, and in 1844 he was appointed Agent at the Port of St. John. Two years after he was selected by the governor of New Brunswick to make a special examination of the greater part of the province, with regard to its natural wealth and suitability for settlement. In 1847 he made his report, which is divided into two, the first dealing with the "trade, agriculture, fisheries, resources and capabilities;" the second, the "Forest Trees of New Brunswick."

Two years after and at the request of the government he submitted his "Report on the Sea and River Fisheries of New Brunswick, within the Gulf of St. Lawrence and Bay du Chaleur;"

and in 1851 a second "Report upon the Fisheries of the Bay of Fundy"—the latter containing a catalogue of the fishes of New Brunswick and Nova Scotia, systematically arranged.

For a long time he had been gathering information relative to trade and commerce, and for some years prior to the consideration of the Reciprocity Treaty of 1854, had been engaged with some American Commissioners, notably Daniel Webster, collecting statistics of trade between the British provinces and the United States, which largely tended to the adoption of the Reciprocity Treaty of 1854. So highly were the services he had rendered appreciated by Lord Elgin then Governor-General of Canada, and Her Majesty's Government, that immediately on its ratification, he was, in 1855, appointed Commissioner on behalf of Great Britain to carry out its terms, being among the first, if not the first, native-born colonist without imperial interest, or connexion, appointed to an office of such responsibility and distinction. Of the manner in which he discharged the important, and, at times, delicate duties of his office, the continued confidence of Her Majesty's Government, under succeeding administrations, is the best proof; and had he lived to complete his labours, he would, doubtless, have received a substantial reward.

At the time of his death he was engaged in the discharge of his imperial duties, and was on board H. M. S. Desperate, that vessel having been detailed for his use by H. M. Government. About the 1st of August, 1862, he was seized with gastric fever, and after some days of illness had apparently recovered; but a relapse occurred, closing with his death on the 17th. His remains were interred with naval honours in the Episcopal burial ground at Forteau, on the coast of Labrador, north of the strait of Belleisle, and just to the eastward of the eastern boundary of the province of Quebec.

Moses H. Perley was a man of many parts, not the least among them being his untiring energy. His pen, like himself, was always in motion and when it is remembered he was nearly always afield, travelling, exploring, and collecting, it is marvellous how much and varied were the products of his pen. Through all there run a clearness of conception, a lucidity of expression, a terseness of language, and a keen sense of the practical and important. With natural and material subjects ever before the mind, with numerous and important duties ever pressing upon him, it is surprising to find him engaged on works of fiction, especially reconstructing many old Indian traditions from fragments heard about their camp-fires. These were published in some London reviews and comprised the "Camp of the Owls," "Forest Fairies of the Malicites," "Ottowin and Lola," "The White Spectre of the Weepemaw," and "The Indian Regatta."

His better known works are the following:—Report on the Condition of the Indian Tribes in New Brunswick.

Report on the Fisheries of the Gulf of St. Lawrence.

Report on the Sea and River Fisheries of New Brunswick within the Gulf of St. Lawrence.

Report on the Fisheries of the Bay of Fundy.

Catalogue of Fishes of New Brunswick and Nova Scotia.

A handbook of Information for Emigrants to New Brunswick.

Eighty years' Progress of British North America.

As a lecturer he ranked high and was much sought after, for his addresses teemed with new and attractive information concerning his native province—her history, woods, rivers, fisheries, soils, mineral wealth and other resources. Nature had formed him to be a leader among men. Large and well-built, with an imposing presence, a remarkable memory, a perfect command of language, a power of expressing himself clearly and tersely, a mind both logical and strongly practical, and above all a strong, rich, sonorous voice, he was always as attractive as his discourses were pleasing and instructive.

In many ways he was in advance of his time. A quarter of a century before their inception he is found advocating the establishment of free schools, and the construction of a railway to develop the fishery wealth of northern New Brunswick; new methods of curing fish and making them more valuable as an article of export; new means of taking them in greater quantities; and the dissemination of knowledge of their food-habits, migrations, and general natural history, were themes that always found in him a strong and earnest advocate. To sum up:—Perley was doubtless the best informed man of his day in all matters pertaining to the industries and natural resources of the province, and those industrial conditions and improvements necessary to utilize its undeveloped wealth.

But it is with Perley, the naturalist, this article is most concerned, for in this department he also took high rank.

It was to be expected that one who, from boyhood, loved the woods, lakes and streams, and made them his almost constant companions, should develop a taste for the observation and study of their natural history. A devoted disciple of Isaak Walton, he thought it "a nice thing to catch a trout," and from the indulgence of the gentle sport there soon arose a greater pleasure—the study of fish-life in all its attractive phases, so that the angler rapidly became the ichthyologist; the rod, flies and landing-net were discarded for the seine, microscope, and handbook, and Perley was soon recognized as the leading ichthyologist of the Maritime Provinces, indeed of all British America.

"In 1852 he published the first systematic and descriptive list of New Brunswick fishes in a series of 'Reports on the Sea and River Fisheries of New Brunswick,' Fredericton, 1852. This list became the basis of all subsequent ones, not only for the province but for Nova Scotia as well. In it the author very modestly claims not to be a professed naturalist, but an *observer* of nature, and for this reason begs indulgence at the hands of critics. A careful examination, however, of the little volume must convince the reader that its author was a scholar of varied attainments, a close and accurate observer of nature, careful and cautious of statement, brief but lucid in narration. A power of condensation and ability to seize the most salient features of form, markings, structure, and habits of fishes, render his descriptions exceeding pleasing and instructive. If he were not a 'professed naturalist' it was due entirely to his modesty; for in the correctness of his determinations and general stability of his list, is found evidence of a high order of scientific knowledge.

That he included a few forms, now recognized as the young, or seasonal, or other stages in the life of another species, argues nothing. The general history of ichthyology in America and elsewhere scarcely contains the name of an author, however eminent, whose determinations have not, in many cases, proved incorrect; and it bears additional testimony to our author's scientific acumen that he recognized the minute distinctions on which these so-called species of Cuvier, Valenciennes, Storer, and DeKay were founded; for they were all regarded at that time as specific forms. Moreover, some of these he professes not to have seen, but admitted to his list on Dr. Storer's authority. Bearing this in mind, it may be said that after fifty years Perley's determinations are essentially unchallenged. He established no new species, it is true, for such an opportunity does not fall to every man, and Perley was not a disciple of the more modern school of species-manufacturers, who are flooding the fields of zoology with visionary genera and species; but, in identifying specific or transitional forms, already named by the above-mentioned authors, he exhibits an accurate acquaintance with the details of anatomy. It is therefore with more than ordinary pride the student turns to the labours of this pioneer ichthyologist, and follows the footprints of the man, the scholar, and naturalist who laid the foundation of the science in New Brunswick.

"Perley's list contains the names of sixty-two so-called species; but since his time the development of cyprinids has received more attention, and the 'Shining Dace,' *Leuciscus argenteus* Storer, has been shown to be the young of the 'River Chub,' *Semotilus bullaris* Rafinesque. Again, the 'Salmon Trout' or 'White Sea-trout,' *S. trutta*, of his catalogue, is undoubtedly the sea-run or anadromous representative of the common Speckled Trout, *S. fontinalis* Mitchell. Under the name of 'Britt,' *Clupea minima*, Storer, he includes, on the latter's authority, a small herring, which is now regarded as the young of the two ordinary herrings of our coast. The common codfish has, perhaps, the widest range of any, and must therefore be expected to exhibit much variation in size and coloration. One of these varieties is known as the 'Rock Cod,' which was elevated to specific rank by Storer Mitchell, and others; and, occurring on our coasts, was very naturally assigned a place in our author's list. Moreover Prof. Gill has shown that the little 'Sand Dab,' *Platessa pussilla*, is the young of the common flounder, *P. plana* Storer, and it must therefore be removed from the catalogue of provincial fishes. Discarding then these five forms, there remain fifty-seven well established species representing the ichthyological labours of Moses H. Perley."*

*Quoted from "History of the Ichthyology of New Brunswick" by the writer; Bull. XIII, Natural History Society, New Brunswick, 1895.

EXTENSION OF THE LIST OF NEW BRUNSWICK FISHES.

By Philip Cox Ph. D.

A CATALOGUE of the marine and fresh-water fishes of the province by the writer was published in Bulletin No. XIII, Natural History Society of New Brunswick, 1895, comprising the names of ninety species. The basis of the list was that of Moses H. Perley, published in 1852, and enlarged by the researches of Dr. A. Leith Adams, M. A., F. R. S., Staff-surgeon-major of Her Majesty's 22nd regiment, quartered at Fredericton, 1866–72, to which several were added by the writer. (Vide "History of the Ichthyology of New Brunswick," Bulletin XIII, Natural History Society New Brunswick, 1895.)

Since the publication of that catalogue some additional species have been collected in provincial waters, which are herein given with a few notes on their character and life-history.

1. Rhinichthys cataractae (Val.) Jordan. Long-nosed Dace.

This little minnow is not uncommon in the more boisterous streams of the province, and seems to intergrade with the more common form, *R. atronasus* Mitchill, for its scale formula and other features approximate the latter's.

2. Maurolicus borealis Gunther. Argentine.

In 1896, the writer identified this species among a few specimens of fishes collected by Mr. Moses of Grand Manan. It is a tiny oceanic fish, never exceeding 2½ inches in length, and lives at great depths. The name, Argentine, refers to the bright silvery pigment which the scaleless skin contains. The opercular covering is incomplete, the skeleton is scarcely ossified, and the air-bladder is rudimentary; indeed this little denizen of ocean's depths seems specially adapted to lead a dull life and feed on minute organisms for whose capture neither strong teeth nor a closely knitted and solid framework are required. To light up the darkness of its immediate surroundings and render its sombre abode less oppressive, nature has provided it with a hundred or more bright circular phosphorescent spots on the throat, sides, and ventral parts, which act like so many little lanterns.

Prof. Gill included it in his catalogue of 1872, as occurring off the coast of Massachusetts; J. M. Jones makes no mention of it in the list of Fishes of Nova Scotia (Vide N. S. Inst. Nat. Sc., Vol. V., Pt. I, 1879), but it is mentioned as an Atlantic species by Gunther, V. p. 389. As far as the writer can learn the Grand Manan specimen is the first reported from the eastern coast of Canada.

3. Siphostoma fuscum (Storer) J. and G. Pipe Fish.

A specimen taken in a small bag-net in the Miramichi Bay, February, 1898; and donated to the museum of the Miramichi Natural History Association by Mr. Frank P. Loggie of Loggieville.

4. Menidia notata (Mitchill) J. and G. Silverside.

It is a matter of some surprise that this little fish, which is really abundant in our littoral waters during midsummer, escaped the notice of previous observers and students of our provincial fishes. Possibly it was mistaken for the young of the common smelt, *O. mordax* Mitchill, to which it bears a general resemblance, especially when moving in its native element, the schooling habit being strongly marked.

It is abundant in the Miramichi Bay in July, when it seems to prefer the mouths of small rivers and streams, attracted thither doubtless for spawning purposes. It seldom exceeds five inches in length, and takes its name from the bright silvery band on the side.

5. Aspidophoroides monopterygius (Bloch) Storer. Alligator-fish.

Some three or four species of *Agonidae*, all boreal in distribution, are occasionally met with in the Arctic currents setting southward through the North Atlantic. They are deep-sea fishes of slender build, with the head and body encased in bony plates, and the fins and teeth small. The eyes are large and placed high in the head. They have no air bladder.

J. M. Jones reported specimens taken from the stomachs of codfish (N. S. Inst. Nat. Sc., Vol. V. 1879), and the writer saw one in the McGill museum, Montreal, from Metis, P. Q. In February, 1898, an alligator fish 5¼ inches long, was taken in a smelt bag-net in the Miramichi Bay and donated to the Miramichi Natural History Association by J. T. Jellett of Loggieville.

6. Liparis lineata (Lepechin) Kroyer. Sea Snail.

This is another denizen of high northern latitudes which strays southwards in the Arctic currents, and was found by Mr. Moses on the beach at North Head, Grand Manan, in 1896. The common name has reference to its sleek, slippery skin, which is very thin and loosely attached.

In some respects it is intermediate between the Lump-sucker (Cyclopterus) and the Sculpin (Cottus); having like the former the ventral fins thoracic and converted into a sucking disc, by means of which it can adhere to stones or floating bodies; while skeletally and in the character and disposition of the remaining fins it resembles the latter.

In his "Fishes of the Gulf of St. Lawrence and Bay of Fundy," 1865, Prof. Gill expressed his doubts regarding its occurrence in the Bay of Fundy, and eight years later in the "Catalogue of the Fishes of the East Coast of North America" he could only assign it a general range from the Polar regions to Cape Cod. J. M. Jones, in the publication referred to above, reported it as occurring on the coast of Nova Scotia. It never exceeds five inches in length.

7. Phycis tenuis Mitchill. White hake.

Small specimens of this species are taken in smelt bag-nets in the Miramichi Bay, along with the closely allied form, the "Squirrel Hake."

8. Pleuronectes glaber, Storer. Smooth Flounder.

This flat-fish is not uncommon in Miramichi Bay and Bay des Chaleurs in the winter, being taken in bag-nets with the more common and highly prized *P. americanus* Walbaum. It rarely exceeds eight inches in length; the scales are small, smooth and well embedded in the skin; and the general colour of the upper side is brownish-black with darker splotches.

9. Bothus maculatus Mitchill. Window Pane.

This flat-fish is more frequently referred to by writers as a "turbot." It differs from the last species in having the eyes and colour on the *left* side, the mouth larger, and the general outline more broadly ovate. It seems to be rare, and is only taken on the more exposed parts of the coast, as if it were a more oceanic form than the ordinary flat-fish.

In 1899 several specimens from Shippegan were donated to the Miramichi Natural History Association by Mr. Frank P. Loggie of Loggieville.

A PRELIMINARY CATALOGUE OF PLANTS

IN THE HERBARIUM OF THE MIRAMICHI NATURAL HISTORY ASSOCIATION.

1. RANUNCULACEÆ.

CLEMATIS, L.
1. viriginiana, *L.*,
2. verticillaris, *D. C.*

ANEMONE, Tourn.
3. parviflora, *Michx*,
4 multifida, *D. C.*,
5. cylindrica, *Gray*,
6 pennsylvanica, *L.*,
7. nemorosa, *L.*

HEPATICA, Dill.
8. triloba, *Chaix.*

THALICTRUM.
9. dioicum, *L.*

RANUNCULUS.
10. pennsylvanicus, *L.*,
11. fascicularis, *Muhl*,
12. aquatilis, *L.*,
13. abortivus, *L.*,
14. cymbalaria, *Pursh*,
15. sceleratus, *L.*,
16. repens, *L.*,
17. septentrionalis, *Poir*,
18. circinatus, *Sibth*,
19. flammula, *var reptans*, *E. Meyer.*
20. multifidus, *Pursh.*

CALTHA.
21. palustris, *L.*

COPTIS.
22. trifolia, *Salisb.*

ACTÆA.
23. spicata, *L* ,*var rubra ait.*,
24. alba, *Bigel.*

2. BERBERIDACEÆ.

CAULOPHYLLUM.
25. thalictroides, *Michx.*

3. NYMPHÆACEÆ.

NUPHAR.
26. advena, *Ait.*,
27. luteum, *Man.*

4. SARRACENIACEÆ.

SARRACENIA.
28. purpurea, *L.*

5. PAPAVERACEÆ.

SAGUINARIA.
29. canadensis, *L.*

6. FUMIARIACEÆ.

DICENTRA.
30. cucullaria, *D. C.*

7. CRUCIFERÆ.

ARABIS.
31. drummondii, *Man.*

DRABA.
32. incana, *L. var. arabisans*, *Watson.*

NASTURTIUM.
33. palustre, *D. C.*

ERYSIMUM.
34. cheiranthoides, *L.*

SISYMBRIUM.
35. sophia, *L.*

BRASSICA.
36. alba.

CAPSELLA.
37. bursa-pastoris, *Moench.*

LEPIDIUM.
38. intermedium, *Gray.*

SENEBIERA.
39. coronopus, *D. C.*

CAKILE.
40. americana, *Nutt.*

8. CISTACEÆ.

HUDSONIA.
41. tomentosa, *Nutt.*

LECHEA.
42. intermedia.

9. VIOLACEÆ.

VIOLA.
43. blanda, *Willd,*
44. cucullata, *Gray,*
45. pubescens, *Ait.,*
46. canina, *L.*

10. CARYOPHYLLACEÆ.

SILENE.
47. noctiflora, *L.,*
48. inflata, *Smith.*

LYCHNIS.
49. flos-cuculi, *L.*

ARENARIA.
50. lateriflora, *L.,*
51. peploides, L.

STELLARIA.
52. borealis, *Bigel,*
53. longipes, *Goldie,*
54. graminea, L.,
humifusa, *Rottb.*

CERASTIUM.
55. arvense, L.,
56. vulgatum, L.

SAGINA.
57. procumbens, L.,
58. nodosa, *Fenzl.*

SPERGULARIA.
59. rubra, *Presl.,*
60. salina, *Presl.,*
61 s. var. macrocarpa.

BUDA.
62. borealis, *Watson.*

SPERGULA.
63. arvensis, L.

11. PORTULACEÆ.

CLAYTONIA.
64. caroliniana, *Michx.*

12. HYPERICACEÆ.

HYPERICUM.
65. ellipticum, *Hook.*

ELODES.
66. virginica, *Nutt.*

13. GERANIACEÆ.

GERANIUM.
67. carolinanum, L.

ERODIUM.
68. cicutarium, L'*Her.*

OXALIS.
69. stricta.

IMPATIENS.
70. fulva, *Nutt.*

14. ILICINEÆ.

ILEX.
71. verticillata, *Gray.*

NEMOPANTHES.
72. fascicularis *Raf.*

15. RHAMNACEÆ.

RHAMNUS.

73. alnifolia, L'*Her*.

16. SAPINDACEÆ.

ACER.
74. spicatum, *Lam*.

17. LEGUMINOSÆ.

TRIFOLIUM.
75. arvense, L ,
76. pratense, L ,
77. repens, L.,
78. agrarium, L.

MELILOTIS.
79, officinalis. *Willd*,
80. alba, *Lam*.

ASTRAGALUS.
81. alpinus, L.,
82. cooperi, *Gray*.

HEDYSARUM.
83. boreale, *Nutt*.

DESMODIUM.
84. canadense, *D. C*.

VICIA.
85. Cracca, L.,
86. caroliniana, *Walt*.

LATHYRUS.
87. maritimus, *Bigelow*,
88. palustris, L.,
89. pratensis, L.

APIOS.
90. tuberosa, *Moench*.

AMPHICARPÆA.
91. monoica, *Nutt*.

OXYTROPIS.
92 campestris.

18. ROSACEÆ.

PRUNUS.
93. pensylvanica, L.,
94. maritima, *Wang*.
95. pumila, L.,
96. virginiana, L.

SPIRÆA.
97. salicifolia, L.,
98. tomentosa, L.

RUBUS.
99. chamæmorus, L.,
100. triflorus, *Richard*,
101. strigosus, *Michx*,
102. canadensis, L.

DALIBARDA.
103. repens, L.

GEUM.
104. album, *Gmelin*,
105. macrophyllum, *Willd*,
106. rivale, L.,
107. strictum, *Ait*.

DRYAS.
108. drummondii.

FRAGARIA.
109. virginiana, *Mill*,
110. vesca, L.

POTENTILLA.
111. arguta, *Pursh*,
112. norvegica, L.,
113. argentea, L.,
114. palustris, *Scop*,
115. fruticosa, L.,
116. tridentata, *Ait*.,
117. anserina, L.

AGRIMONIA.
118. eupatoria, L.

POTERIUM.
119. canadense.

ROSA.
120. carolina, L.

PRYRUS.
121. arbutifolia, L.

CRATÆGUS.
122. C.————?

AMELANCHIER.
123. canadensis, *Torrance and Gray.*

DEUTZIA.
124. scabra.

19. SAXIFRAGACEÆ.

TIARELLA.
125. cordifolia, L.

MITELLA.
126. nuda, L.

PARNASSIA.
127. parviflora, *D. C.*,
128. caroliniana, *Michx.*

RIBES.
129. lacustre, *Poir*,
130. hirtellum, *Michx*,
131. prostratum, L.

20. DROSERACEÆ.

DROSERA.
132. rotundifolia, L.,
133. longifolia, *Gray.*

21. HAMAMELIDEÆ.

HAMAMELIS.
134. virginiana, L.

22. HALORAGEÆ.

HIPPURIS.
135. vulgaris, L.

CALLITRICHE.
136. verna, L.

23. ONAGRACEÆ.

LUDWIGIA.
137. palustris, *Ell.*

EPILOBIUM.
138. angustifolium, L.,
139. palustre, *var. lineare*, L.,
140. coloratum, *Muhl.*,
141. alpinum, *Man.*,
142. latifolium.

OENOTHERA.
143. pumila, L.

CIRCÆA.
144. lutetiana, L.,
145. alpina, L.

24. UMBELLIFERÆ.

SIUM.
146. cicutæfolium, *Gmelin.*

CICUTA.
147. maculata, L.,
148. bulbifera, L.

OSMORRHIZA,
149. brevistylis, *D. C.*

HYDROCOTYLE.
150. americana, L.

SANICULA.
151. marylandica, L.

25. ARALIACEÆ.

ARALIA.
152. racemosa, L.,
153. hispida, *Vent.*,
154. trifolia, *Decsne. and Planch.*

26. CORNACEÆ.

CORNUS.
155. canadensis, L.,
156. stolonifera, *Michx*,
157. alternifolia, L.

27. CAPRIFOLIACEÆ.

SAMBUCUS.
158. racemosa, L.

VIBURNUM.
159. opulus.

160. pauciflorum, *Pylaie.*
161. cassinoides, L.

LINNÆA.
162. borealis, *Gronov.*

LONICERA.
163. ciliata, *Muhl,*
164. cærulea, L.,
165. oblongifolia, *Muhl.*

DIERVILLA.
166. trifida, *Moench.*

28. RUBIACEÆ.

MITCHELLA.
167. repens, L.

GALIUM.
168. trifidum, L.,
169. asprellum, *Michx,*
170. triflorum, *Michx.*

SHARARDIA.
171. arvensis, L.

29. COMPOSITÆ.

EUPATORIUM.
172. perfoliatum, L.,
173. ageratoides, L.

SOLIDAGO.
174. latifolia, L.,
175. virgaurea, L.,
176. lanceolata, L.,
177. speciosa, *Nutt,*
178. sempervirens, L.,
179. puberula, *Nutt,*
180. concolor, *Torr and Gray.*

ASTER.
181. novi-belgii, L.,
182. acuminatus, *Michx,*
183. tradiflorus, L.,
184. " *var. lancifolia.*
185. radula, *Ait.,*
186. cordifolius, L.,
187. graminifolius, *Pursh,*
188. junceus, *Ait.,*
189. ————?

ERIGERON.
190. strigosus, *Muhl,*
191. acris, *Pers.*

ANTENNARIA.
192. plantaginifolia, *Hook.*

GNAPHALIUM.
193. polycephalum, *Michx,*
194. decurrens, *Ives,*
195. uliginosum, L.,
196. sylvaticum.

AMBROSIA.
197. artemisiæfolia, L.

BIDENS.
198. frondosa, L.,
199. connata, *Muhl.*

ACHILLEA.
200. millefolium, L.,
201. ptarmica, L.

MATRICARIA.
202. inodora, L.,
203. discoidea, *D. C.*

LEUCANTHENUM.
204. vulgare, *Lam.*

ARTEMISIA.
205. biennis, *Willd,*
206. annua.

TUSSILAGO.
207. farfara, L.

PETASITES.
208. palmata, *Gray.*

ARNICA.
209. mollis, *Hook.*

SENECIO.
210. vulgaris, L.,
211. viscosus, L.,
212. aureus, L.,

213. jacobæus.

ERECHTITES.
214. hieracifolia, *Raff.*

CENTAUREA.
215. nigra, L.

LEONTODON.
216. autumnalis, L.

HIERACIUM.
217. præaltum, *Vill*,
218. canadense, L.,
219. scabrum, *Michx*,
220. cladanthum,
221 pilosellum,
222. p. var. peletorianum.

PRENANTHES.
223. serpentaria, *Pursh.*

SONCHUS.
224. oleraceus, L.,
225. asper, *Vill.*

CIRSIUM.
226. arvense, *Scop*,
227. muticum, *Michx.*

30. LOBELIACEÆ.

LOBELIA.
228. spicata, *Lam*,
229. kalmu, L.,
230. inflata, L.,
231. dortmanna, L.

31. CAMPANULACEÆ.

CAMPANULA.
232. rotundifolia, L.

32. ERICACEÆ.

VACCINIUM.
233. pensylvanicum, *Lambert*,
234. uliginosum, L.,
235. cæspitosum, *Michx*,
236. Vitis-Idæa, L.,
237. oxycoccus. L.,
238. macrocarpon, *Ait.*

ARCTOSTAPHYLOS.
239. uva-ursi, *Spreng.*

ANDROMEDA.
240. polifolia.

CALLUNA.
241. vulgaris, *Salib.*

KALMIA.
242. glauca, *Ait.*,
243. angustifolia, L.

RHODODENDRON.
244. rhodora, *Don.*

LEDUM.
245. lalifolium, *Ait.*

CHIMAPHILA.
246. umbellata, *Nutt.*

MONESES.
247. uniflora, *Gray.*

PYROLA.
248. secunda, L.,
249. pumula. *Gray.*
250. chlorantha, *Swarty*,
251. elliptica, *Nutt.*,
252. rotundifolia, L.,
253. r. var. asarifolia, *Hook.*

MONOTROPA.
254. uniflora, L.,
255. hypopitys, L.

33. PLUMBAGINACEÆ.

STATICE.
256. limonium, L.

34. PRIMULACEÆ.

PRIMULA.
257. farinosa, L.,
258. mistassinica, *Michx.*

TRIENTALIS.
259. americana, *Pursh.*

LYSIMACHIA.
260. stricta, *Ait.*,
261. ciliata, L.,
262. thyrsiflora, L.

GLAUX.
263. maritima, L.

SAMOLUS.
264. valerande, L.

35. APOCYNACEÆ.

APOCYNUM.
265. androsæmifolium, L.,
266. cannabinum, L.

36. GENTIANACEÆ.

GENTIANA.
267. amarella, L.,
268. saponaria, L

HALENIA.
269. deflexa, *Grisebach*.

MENYANTHES.
270. trifoliata, L.

37. BORRAGINACEÆ.

ECHINOSPERMUM.
271. lappula, *Lehm.*

MERTENSIA.
272. maritima, *Don.*

LITHOSPERMUM.
273. officinale, L.

LYCOPSIS.
274. arvensis, L.

38. CONVOLVULACEÆ.

CONVOLVULUS.
275. sepium, L.,
276. arvensis, L.

CUSCUTA.
277. gronovii, *Willd.*

39. SOLANACEÆ.

SOLANUM.
278. dulcanara, L.,
279. nigrum, L.

HYOSCYAMUS.
280. niger, L.

40. SCROPHULARIACEÆ.

CHELONE.
281. glabra, L.

MIMULUS.
282. ringens, L.,
283. moschatus.

VERONICA.
284. americana, *Schweinitz*,
285. scutellata, L.,
286. officinalis, L.,
287. serpyllifolia, L.,
288. agrestis, L.

GERARDIA.
289. purpurea, L.

EUPHRASIA.
290. offiicinalis, L.

RHINANTHUS.
291. crista-galli, L.

CASTILLEIA.
292. pallida, *Kunth*.

MELANPYRUM.
293. americanum, *Michx.*

41. LENTIBULARIACEÆ.

UTRICULARIA.
294. cornuta, *Michx.*

PINGUICULA.
295. vulgaris, L.

42. LABIATÆ.

TEUCRIUM.
296. canadense, L.

MENTHA.
297. canadensis, L.

LYCOPUS.
298. sinuatus, *Elliot.*

CALAMENTHA.
299. clinopodium, *Benth.*

HEDEOMA.
300. pulegioides, *Pers.*

SCUTELLARIA.
301. lateriflora, L.,
302. galericulata, L.

BRUNELLA.
303. vulgaris, L.

LAMIUM.
304. album, L.

GALEOPSIS.
305. tetrahit, L.

STACHYS.
306. palustris, L.

43. PLANTAGINACEÆ.

PLANTAGO.
307. major, L.,
308. lanceolata, L.,
309. maritima, L.

44. AMARANTACEÆ.

AMARANTUS.
310. retroflexus, L.

45. CHENOPODIACEÆ.

CHENOPODIUM.
311. bonus-henricus, L.,
312. capitatum, *Watson.*

ATRIPLEX.
313. patulum, L.

SALSOLA.
314. kali, L.

46. PHYTOLACCACEÆ.

PHYTOLACCA.
315. decandra, L.

47. POLYGONACEÆ.

POLYGONUM.
316. maritimum, L.,
317. amphibium, L.,
318. arifolium, L.,
319. sagittatum, L.,
320. dumetorum, L.,
321. ramosissimum, *Michx,*
322. viviparum, L.,
323. persicaria, L.

RUMEX.
324. sanguineus, L.,
325 acetosella, L.

48. SANTALACEÆ.

COMANDRA.
326. umbellata, *Nutt.*

49. URTICACEÆ.

URTICA.
327. urens, L.

LAPORTEA.
328. canadensis, *Gaudich'd.*

50. MYRICACEÆ.

MYRICA.
329. cerifera, L.,
330. gale, L.

51. CUPULIFERÆ.

BETULA.
331. pumula, L.

ALNUS.
332. viridis, *D. C.*

52. EMPETRACEÆ.

EMPETRUM.
333. nigrum, L.

53. CONIFERÆ.

JUNIPERUS.
334. sabina, L.

TAXUS.
335. baccata, *Willd.*

54. ORCHIDACEÆ.

HABENARIA.
336. dilatata, *Gray,*
337. obtusata, *Rich,*
338. psycodes, *Gray,*
339. orbiculata, *Torr.*

LIPARIS.
340. lœselii, *Rich.*

CORALLORHIZA
341. innata, *R. B.*
342. multiflora, *Nutt.*

LISTERA.
343. cordata, *R. B.*

SPIRANTHES.
344. romanzoffiana, *Chan.*
345. gracilis, *Big.*

GOODYERA.
346. menziesii, *Sind'l.*
347. repens, *R. B.*

CYPRIPEDIUM.
348. parviflorum, *Salisb,*
349. pubescens, *Willd,*
350. spectabile, *Swarty,*
351. acaule, *Ait.*

55. IRIDACEÆ.

SISYRINCHIUM.
352. angustifolium, *Mill.*

56. LILIACEÆ.

ALLIUM.
353. schœnoprasum, L.

POLYGONATUM.
354. biflorum, *Ell.*

SMILACINA.
355. racemosa, *Desf,*
356. stellata, *Desf,*
357. trifolia, *Desf,*
358. bifolia. *Desf.*

CLINTONIA.
359. borealis, *Raf.*

UVULARIA.
360. sessilifolia, L.

ERYTHRONIUM.
361. americanum, *Ker.*

MEDEOLA.
362. virginiana, L.

TRILLIUM.
363. cernunm, L.,
364. erythrocarpum, *Michx.*

TOFIELDIA.
365. glutinosa, *Willd.*

57. JUNCACEÆ.

JUNCUS.
366. filiformis, L.,
367. alpinus, *Villars,*
368. nodosus, L.,
369. tenuis, *Willd,*
370. balticus, *Dethard,*
371. articulatus, L.
372. ——————?
373. ——————?

LUZULA.
374. pilosa, *Willd,*
375. campestris, *D. C.*

58. ARACEÆ.

ARISÆMA.
376. triphyllum, *Torr.*

CALLA.
377. palustris, L.

59. ALISMACEÆ.

SAGITTARIA.

378. arifolia.

60. NAIADACEÆ.

SCHEUCHZERIA.
379. palustris, L.

POTAMOGETON.
380. heterophyllus, *Schrib.*

61. ERIOCAULEÆ.

ERIOCAULON
381. septangulare, *With.*

62. CYPERACEÆ.

CYPERUS.
382. aristatus, Rottb,
383. strigosus, L.

DULICHIUM.
384. spathaceum, *Pers.*

ELEOCHARIS.
385. tenuis, *Schultes,*
386. acicularis, *R. B.*
387. ——————?

SCRIPUS.
388. atrovirens, *Muhl.*
389. clintonii, *Gray,*
390. pungens, *Vahl,*
391. maritimus, L.

ERIOPHORUM.
392. alpinum, L.,
393. virginicum, L.,
394. vaginatum, L.,
395. gracile, *Koch,*
396. polystachyom, L.,
397. russeolum.

CAREX.
398. atrata, L.,
399. aurea, *Nutt,*
400. bicolor,
401. buxlaumii, *Wahl,*
402. canescens, L.,
403. capillaris, L.,
404. communis, *Bailey,*
405. comosa, *Boott,*
406. concinna, *R. B.,*
407. crinita, *Lan,*
408. deweyana, *Schwein,*
409. echinata, *Bailey,*
410. emmonsii, *Dewey,*
411. filiformis, L,
412 flava, L,
413. f. var. viridula, *Bailey,*
414. f. var. graminea, *Bailey,*
415. grisea, *Whl,*
416. gynocrates, *Wormsk,*
417. intumescens, *Rudge,*
418. laxiflora. *Lam,*
419. limosa, *Michx,*
420. maritima, *Muell,*
421. miliaris, *Michx,*
422. magellanica, *Lam,*
423. norvegica, *Willd,*
424. oligosperma, *Michx,*
425. polytrichioides, *Muhl,*
426. scoparia, *Schkuhr,*
427. silicea, *Olley,*
428. stricta, *Lam,*
429. tenella, *Schkuhr,*
430. tribuloides, var. reducta, *Bailey.*
431. utriculatta, *Boott,*
432. torta, *Boott,*
433. vulgaris, *Fries.*

63. GRAMINEÆ.

PANICUM.
434. crus-galli, L.

SETARIA.
435. glauca, *Beauv.*

HORDEUM.
436. jubatum, L.

MILIUM.
437. effusum, L.

TRICETUM.
438. subspicatum, *Beauv.*

PHALARIS.
439. canariensis, L.

ALOPECURUS.
440. geniculatus, L.

CYNOSURUS.
441. cristatus, L.

64. FILICES.

POLYPODIUM.
442. vulgare, L.

PELLÆA.
443. gracilis, *Hook.*

PHEGOPTERIS.
444. polypodioides, *Fee,*
445. dryopteris, *Fee.*

ASPIDIUM.
446. aculeatum, *Swarty,*
447. spinulosum, *Swarty.*

CYSTOPTERIS.
448. bulbifera, *Bernh.*

WOODSIA
449. ilvensis, *R. Br.*

OSMUNDA.
450. regalis, L.

65. OPHIOGLOSSACEÆ.

BOTRYCHIUM.
451. lunaria, *Swarty,*
452. ternatum, *Swarty,*
453. virginianum, *Swarty.*

66. LYCOPODIACEÆ.

LYCOPODIUM.
454. selago, L.,
455. lucidulum, *Michx,*
456. inundatum, L.,
457. annotinum, L.,
458. obscurum, L.,
459. o. var. dendroideum, *Michx,*
460. complanatum, L.,
461. c. var. chamæcyparissus, L.

67. SELAGINELLACEÆ.

SELAGINELLA.
462. spinosa, *Beauv.*

68. EQUISETACEÆ.

EQUISETUM.
463. arvense, L.,
464. sylvaticum, L.,
465. variegatum, *Schleicher.*

ADDENDA

466. Shepherdia canadensis, *Nutt,*
467. Collomia linearis, *Nutt,*
468. Mercurialis annua, L.,
469. Sparganium simplex, *Huds,*
470. Montia fontana,
471. Mollugo verticillata, L.,
472. Senebiera didyma, *Pers.*
473. Viola b. var. renifolia, *Gray.*

FOURTH REPORT OF THE COUNCIL OF THE MIRAMICHI NATURAL HISTORY ASSOCIATION.

Membership.

Honorary members,	3
Members,	32
Associate members,	28
Corresponding members,	11
Total,	74

Financial Standing.

Balance on hand February, 1903,		$ 23 93
Government Grant 1903 and 1904,		200 00
Membership fees,		73 60
		$ 297 53
Cases, shelving, &c.,	$ 90 00	
Mounting birds, animals,	52 38	
Current expenditure and printing bulletin,	105 46	247 84
Balance on hand,		$ 49 69

Museum.

Botany.

About 100 specimens were mounted and the whole herbarium numbered and classified since the last bulletin was issued.

Ornithology.

The growth in this department has not been as great as in former years, owing to the lack of space, but as a new cabinet, costing sixty dollars, was set up during the year, the Association is in a position to continue this work.

Ichthyology.

Several alcoholic specimens of rare and foreign fishes have been added.

Herpetology.

There have been additions to the material in department, notably a Crocodile from the Nile, donated by Captain H. F. Letson.

Invertebrate Zoology.

A large increase of the material classed under this head has taken place, but owing to lack of suitable cabinet space, it has not been classified and arranged to the best advantage.

Archæology.

About 100 articles were added since the last report, 40 being native Australian weapons and implements obtained by exchange with the Australian Museum, Sydney.

Meetings, Papers, Lectures.

1903.
Feb. 24. The Peat Bogs of N. B. (Paper.) Dr. Chalmers, Ottawa.
Mar. 3. Evaporation, rain, and winds. Dr. Baxter.
Mar. 10. Business Meeting.
Mar. 17. Okeanos and His Kingdom. Dr. Baxter.
Mar. 24. Depths of the Ocean. Dr. Baxter.
Mar. 31. Coal and its Products. J. D. B. F. Mackenzie.
Apl. 7. Coal and its Products. J. D. B. F. Mackenzie.
Apl. 14. Business Meeting.
Apl. 21. Chinese Peculiarities. Dr. Baxter.

1904.
Jan. 12. Business Meeting. (Reading, Dr. Baxter.)
Jan. 19. Unity of Nature. Dr. Baxter.
Jan. 26. Some Peculiarities of Nature's workings. Dr. Baxter.
Feb. 2. Electricity. E. W. Cameron.
Feb. 16. Birds (Elementary talk). Dr. Baxter.
Mar. 1. Some features of Radium. Dr. Baxter.
Mar. 8. Retiring President, Dr. Cox's, Address.
Mar. 15. Relation of Science and Philosophy. C. J. Mersereau.
Mar. 22. Observing phenomena of Radium.
Mar. 29. The Earth as a Planet. J. Nicol.

Apl. 5. A Naturalist in the Winter Wilderness. Dr. Cox.
Apl. 12. Business Meeting. (Electricity, E. W. Cameron.)
Apl. 19. Origin of British Nation (Ethnological). Revd. J. M. MacLean.
Apl. 26. Our Nearest Neighbour (Moon). J. Nicol.
May 3. Ethnology of British Nation. Revd. J. M. MacLean.
May 10. Business Meeting. (Alcohol, J. D. B. F. Mackenzie.)
May 17. Migration of Birds. (Discussion.)
Dec. 14. Moses H. Perley, Writer and Scientist. Dr. Cox.
1905.
Jan. 24. Barren Lands of Northern New Brunswick. Dr. Cox.
Jan. 31. Plant-life of Barren Lands. Dr. Cox.
Feb. 7. Animal-life of Barren Lands. Dr. Cox.
Feb. 14. Business Meeting. (Ancient shore-line of N.B. Paper. Dr. Chalmers, Ottawa.)

Donations: 1903 and 1904.

Striped Water Snake from South America. P. C. Johnson.
Emery Stone from Smyrna, Turkey; Chrome Iron Ore from Volo, Greece. Capt. H. F. Letson, Liverpool.
Cow-moose (mounted). Dr. Cox.
Cotton Ball. Samuel Ball.
2 pairs Ladies' Pattens, old Sandals. Col. S. U. McCulley.
Nest of Young Rats. Arch. Frackear.
Arrow Head from Earthen Mound in Ohio. Adam Hayes.
Walrus Jaw. H. Morrison, Church Point.
Old Sword, dug up in a cellar in Chatham. Jas. McCallum.
A number of Fossils. G. Stead.
Two water-washed Stones. D. Loggie, Church Point.
Agate from Lake Superior. R. S. Ward.
Concretion. Thos. Traer, Napan.
Whalebone. Anthony Adams.
Sea Coot. Michael Murray.
Canary from Grand Canaries. Mrs. M. S. Benson.
Caddis Worm. Thomas Traer.
Black Vulture. E. Allen, Escuminac.

Two specimens of Concretion. Thomas Traer.
Bones, Axe, and Iron Pot Handles from Tracadie. G. Stead.
Zulu Spear taken in the war with Cetewayo. Miss Habberly.
Saw Whet Owl. Miss E. Allen.
A small Jar dredged from the Miramichi River near Douglastown. Fred A. Fowlie.
Crude Petroleum from Petrolia, Ont. A. G. McCosh.
White-tailed Ptarmigan from the Rocky Mountains. John McKay.
Vertebra of a Whale. Mrs. E. W. Cameron.
Petrified Snail Shell. Col. McCulley.
Partially petrified Moose Horn from bottom of Black River. Herbert A. Fowlie.
Collection of Shells from Bahama Islands. E. Hutchison.
Carved Cane. George Ramsay.
Nutmegs in mace. Mrs. P. A. Noonan.
Pottery from Bay du Vin, Mason Bees' Nest. J.D.B.F. Mackenzie.
Stone from Orange River. Andrew Doyle.
Stone from Modder River. Andrew Doyle.
Fan Coral, Bermuda Coral, Rose Coral. Edmond Whitty.
Two specimens of Brain Coral. Edmond Whitty.
Specimen of Building Stone and Finger-Sponge Bermuda. Edmond Whitty.
West India Coral, Jamaica. Edmond Whitty.
Model of a Ship made from the wood of the tree under which Burns composed "Highland Mary". Major A. S. Templeton.
Specimens of Stone. Miss Kethro.
Pair of Seal Skin Gloves. K. K. White.
Specimen of Asbestos from Black Lake. P. Q. Dr. Baxter.
Sea Bean from Port Elizabeth, S. A. Capt. Burnley.
Iron Knee of Ship dug up at Newcastle Ferry, Bk. Peabody, burnt 1825. F. A. Fowlie, forwarded by Hon. L. J. Tweedie.
Piece of Steel Rod manufactured by Dominion Iron & Steel Works, Sydney, C. B. L. W. Leherle.
Eggs of Tent Caterpillar, on branch. J. Urquhart.
Crocodile (mounted) from the Nile. Capt. H. F. Letson.

Tom-Tom (drum) from West Coast of Africa. Capt. Burnley.
Tooth of Sperm Whale. L. W. Leherle.
Indian Baskets and Canoe (Nova Scotia). Dr. Baxter.
45 samples of the Woods of Northumberland County. J. W. Vanbuskirk.
Lithographed Card showing samples of polished woods of Nova Scotia. M. R. Benn.
Paper Knife and a large collection of Minerals from Scotland. Mrs. W. Sinclair.
Old Snuff Box. Dr. Baxter.
Cone from a Cedar Tree, Mount Lebanon. Mrs. J. Barnett.
Three Sea Beans. Kerr Loggie.
Piece of Wood from Admiral Dewey's Ship. John Bremner.
Piece of Wood from "Olympia," Admiral Dewey's Ship. John Bremner.
Mounted Black Bird, Garter Snake and Salamander. Miss Elkin.
Lava, Paving, and Building Stone from Pompeii. Dr. Baxter.
Piece of Stone from the Walls of the Coliseum, Rome. Dr. Baxter.
Plant from the Arena of the Coliseum. Dr. Baxter.
Plant from the Grave of St. Paul. Dr. Baxter.
Bloater Fish. J. D. B. F. Mackenzie.
Young Lobster. D. A. Baxter.
Provincial Grant, Reign of George III. M. S. Hocken.
Election Card of Mr. Rankine (Date?). J. D. B. F. Mackenzie.
Little Auk. E. L. O'Brien, Tracadie.

Library (Donations and Exchanges).

Ottawa Field Naturalist, 1903–4–5.
New York Botanical Gardens. Vol. III., No. 9.
Provincial Museum, N. S., Vol. II., No. 8., 1902.
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Transactions Natural History Society, Glasgow.
N. S. Inst. Science, Presidential Address. A. H. McKay, LL. D.
Labrador Plants. A. H. Motley, LL. D.
Botanical Club of Canada, 1902–3.
Maps of Canada (geological).
Canadian Birds. Vols. I. II. III. Prof. Macoun.

Systematic Study of Land Animals of N. A. (Natural History Society of Boston.)
Metamorphosis of the Land Crab. (Natural History Society of Boston.)
Records of the Australian Museum, Sydney.
Annual Report Historical and Scientific Society of Manitoba.
Insectivorous Birds of Manitoba.
Letters of a Pioneer of Manitoba. Alex. Ross.
Annual Report of Australian Museum.
Annual Report Boston Natural History Society.
Maps of the North-west. (Dept. of Interior, Ottawa.)
Records of Australian Museum. Vol. IV., No. 8.
Bulletin Boston Museum of Natural History.
"A Natural History", written A. D. 1677. W. Hughes.
Altitudes of Canada, Geological Survey.
Origin and Development of the Raised Shore-line of the St. Lawrence. Dr. Chalmers.
Proceedings of Boston Society Natural History, Vol. 31, Nos. 7, 8, 9. Vol. 32, No. 1.
Trans. N. S. Inst. Sci. 1904.
Dictionary of Altitudes of Canada, by Joseph White, F. R. S.
Among the Mound-builders' Remains. Historical and Scientific Society of Manitoba.
Report, 1902. and Records of the Australian Museum, Vol. V., Nos. 2, 3, 4.
Bulletin Natural History Society New Brunswick, 1904.
Rare Birds of Manitoba. G. E. Atkinson.
Annual Rept. Hist. and Sci. Soc. Man., 1903.
Report on Great Land-slide at Atlin, do.
Bulletin. No. 5, "Emmer and Spelt", Cen. Ex. Farm.
" " 6. "Alfalfa or Lucerne". do
" " 7. "Trees and Shrubs". do
Annual Report, Geological Survey, Vol. XIII, 1900.
Sermon by Dr. W. Henderson on the Death of Hon. Alex. Rankine. 1837.
Old Book on Natural History. W. Hughes.

G. B. FRASER, Secretary.

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PROCEEDINGS

OF

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NO. V.

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1907.

THE BARTIBOGUE FORT.

By J. McG. Baxter, M. D.

HEARING some wonderful stories about a fort out in the virgin forest, that had never been seen before, situated on top of a hill, enclosed by a stone wall, the stones having been carried for two or three miles, supposedly on men's backs, through the woods, etc., Col. S. U. McCulley and I proposed to ascertain for ourselves and others the actual facts.

We started on Nov. 23rd, 1905, and went by rail to Bartibogue Station on the Intercolonial Railway, arriving there about 3 p. m., and, walking back on the track for half a mile, entered the woods by a portage road. This road runs east southeast in a nearly straight line towards the Bathurst stage road, but, after following it for about three miles, we found a stake standing frozen in in the middle of the road. We rightly judged that we should leave the road there, and, finding a road that bends sharply to the right, and goes nearly due south, we followed it for two miles through a much better wooded district of clear straight young spruce, but small, being only on an average five or six inches diameter. After crossing three or four meadows, we at length struck heavy timber, and came across a logging party. Their camp was a short distance off the road, so we did not go to it. The party were working for Mr. Clem. Ryan of Newcastle.

One thing struck me on this trip, as on many others, viz., that men working in the woods have no idea of distance at all. At the I. C. R. station we asked three different parties how far it was to Damery's camp. One said four miles, one three, and the other less than three. Well, up to this time we had walked fast, on a fairly good track, and had covered, as nearly as we could tell, about six miles, as it was now 5 o'clock and dark.

The road was tending easterly again.

We enquired the distance, and were told that it was three miles, and it was now very dark. We stumbled along now for about one and a half miles, when we came to the conclusion that if we still had one and a half miles ahead of us we had better have some crackers and cheese to keep up steam.

After making a slight repast we started again. The road now made a sharp turn to the right, and we stumbled down a steep hill, and into the camp before we knew it, and when we thought we had still over a mile to go. We were most hospitably received and entertained with a good supper, pipes, yarns, and the Boss's bed.

What struck me forcibly on this day's tramp was the absence of life on our route. We saw only one chickadee, and one partridge, which we shot, and heard another after dark.

We turned out at 5:30 a. m. on the 24th. There are 26 men in this camp, and they require to get away so as to be on the ground for work at daybreak, or rather as soon as they can see.

After the men had got away we breakfasted and started, going first for one quarter of a mile in an easterly direction, and then turning into a tote road (road where they drag logs along the ground to the yard). We crossed the Bartibogue River on a pole bridge, went up a very steep bank, 140 or 150 ft. high, and then followed the tote road, winding in and out in an easterly direction generally, for perhaps two miles to the "fort", which is about 150 or 200 yards from the river, at the top of its bank slope.

The trees around are of large size, as there has not been an axe among them since the Miramichi fire of 1825. We measured one white pine at two feet from the ground. It was six feet in circumference. We found spruce, pine, fir, poplar, &c. The fire swept this ground clean, and all this growth has sprung up since that time.

I will now try to describe the "fort", and first take my stand at the southwest corner of the enclosure.

On the south side of this enclosure is a wall, or rather the remains of an old wall, two or three feet high and 278 feet long, with the remains of an old cellar about half way down its length, but on the inside of it, that is, within the enclosure. From the place where we stand there is another wall 72 ft. long and parallel to this one, but 17 ft. distant, outside of the enclosure; and outside of this again there are seven piles of stones irregularly placed and about three or four feet high. Now let us turn and follow along the west side of the enclosure, and we find sections of wall from two to four feet high, but not continuous, for 358 feet. Then the wall on the north side runs east from that, 102 feet; then from here there are four heaps of stone in a straight line right back to the south wall. Just east of the cellar and parallel to these, but 100 feet away, are scattering bunches of stones, that might have made part of the east wall. In the cellar we found an old pair of spike hinges, like gate hinges, ragged to prevent their coming out when driven into a post; a number of broken and partly fused glass bottles, and one perfect one of an old-fashioned mould, size 24 ounces; one old steel tea kettle, with cover, but the bottom broken out of it; with a few other trifles. There have since been found one long two-handled breast saw, almost rusted away, and a small cannon ball, one and a half inches diameter. Everything showed signs of having passed through a hot fire, even the stones of the walls.

Now, what is the history of these remains? The conclusion we came to was this: There is reason to believe that at one time there was a blazed path from Newcastle to Bathurst, and if so this would be a good site for a half-way house, as it is 17 miles from Newcastle and 23 from Bathurst, beautifully situated on a high bank looking over a small intervale and the river. The cyclopean walls (if we can use such a term, when the stones were two feet square and under to the size of your hand), dry built, might have been the enclosure of the orchard or garden, the two-fold object being attained of clearing the land of stones and fencing out intruders. This is all we could make out of it. We had taken a kodak along, but the exposures did not develop well.

1825.

While speaking of the great Miramichi fire, I may just give a few facts that I got from Mrs. S. Brown, whose father, Wm. Creighton, passed through that thrilling experience. I consider it the duty of every one to note down verified occurrences of this kind, and put them in black and white before they are forever lost.

The theatre of these events was on the north side of the river, from Douglastown down to Ferryville, opposite Chatham, and the narrator was Wm. Creighton, as said before. He at that time lived in Douglastown, and when they saw the tremendous fire approaching, he and his brother carried out a trunk that contained valuable papers and money and covered it over, down by the river, in what is now Hutchison's boom. They then got a scow to carry their household effects over the river to the Chatham side for safety. They carried off what they had time for, but while they were carrying out some books the fire overtook them and they threw down the books and fled to the scow. Others in the neighborhood took advantage of the scow and got away too, and they pushed out into the stream and started for Coulson's slip on the Chatham side. On the way over, one of the women had an infant in her arms. A large flying brand struck the child, knocking it out of her arms, and it was drowned. When they arrived at the slip the body was found, it having accompanied the scow in some way, probably being caught by some part of its clothing. On going back the next morning to see the ruins, Creighton found his books all safe, and his little dog sitting on them, the fire having burned all around them without injuring the books. Whether the dog had stayed fast by the books, or, as is more probable, had got into some place of safety and had returned after, he could not say. The house was burned and his descendants have the books now.

After the fire had passed over a committee, consisting of Mr. Rankine (of Gilmour & Rankine) and James Miller, both of Douglastown, were appointed to see about burying the dead.

I have been able to glean the following facts: Out on the Bathurst road, or rather what is now the Bathurst road, about two miles from the Miramichi River, there were a few families scattered about. Mrs. Murray and her two children were burned. The whole Scott family (number uncertain) were burned.

The Stothart family—father, mother and two girls—were burned. The brother, David, being in Douglastown on some business, escaped.

Simon Hamilton was away at work. His wife it seems had taken the children, or rather two of them, to an earthen bridge over a creek and in some way preserved them. The other one wandered away and was burned, and the poor woman was found the next day sitting in the remains of the old chimney of their house, demented.

All these bodies were found and buried in the cellar of the Scott house by this burying committee.

Peter Blacklock, wife and two children, had fled to the Miramichi River, but had been overtaken by the fire on what is now the Shay lot, and were buried where they were found, a palisade fence being put around their graves, which is still standing.

Wm. Kirkpatrick and son also fled for the river. The son was killed by a falling tree on the way. The father reached the river badly burned. The son was buried where he fell and a fence built around the grave, which is still kept up by those living in the neighborhood. Wm. Kirkpatrick was so badly burned that he died afterwards in Chatham. He had his will drawn up by Rev. Jas. Thompson, and witnessed by Robt. Johnson and Wm. Creighton, leaving his property to the church in Chatham and the school in Douglastown.

GEOLOGICAL NOTES.

By Geoffrey Stead, B. A., C. E.

IT may be of interest, after seeing so much in the daily papers of the last few weeks about the terrible disasters that have befallen our fellow men near Naples, Italy, and in San Francisco, to consider what movements of the Earth's crust may have occurred or be occurring in our own Provinces, and what evidences there are of volcanic action near at home.

Fortunately the traces we have of the latter phenomena belong to far distant periods of time. The regions of volcanic activity seem to shift from one part of the world to the other, in the different ages, and seem to be connected with and follow periods of great deposit and rock building.

Probably to some extent the course of events may be as follows:—The Earth, in giving up its heat, contracts, and the surface sinks over a certain area. This area becomes gradually a basin to which the drainage of the surrounding tracts flows, carrying sediment —sand, mud and even large stones. This sinking and deposit may go on for ages, until a great thickness of soft materials has formed.

The original hardened surface of the Earth is then in this area bowl-shaped, or in the form of an inverted arch. Its sides are easily bent by pressure from the surrounding crust, and its centre is probably fractured or rendered hot and plastic by the weight of the deposits.

Thus such an area of settlement and deposit becomes a weak spot on the Earth's crust, and is not able to resist the pressure on its sides.

The soft beds of sediment are gradually hardened by the pressure, and at the same time contorted and folded, and most probably are in part raised far above the general level.

This movement and pressure generate great heat, sufficient probably to melt parts of the lower strata. Fissures and cracks appear, especially near the centre of the basin, where the folding is greatest and the new-formed mountains are highest, and, following the course of these fissures, the molten material reaches the surface, to carry death and destruction to the surrounding country. Other and smaller rents may be the receptacles for precious metals and ores, and will then be sources of wealth for future ages.

In studying the great geological formations, the process described above seems to have very generally occurred, but it must be remembered that an area of settlement may embrace such a large tract of country as New Brunswick, Quebec, Northern Ontario, and Northern Manitoba, taken together.

The Laurentian formation—the oldest stratified body of rocks which is known—occupies this large area and is of great thickness.

After deposit, upheaval took place, and it is probable that in Eastern Canada mountains existed as high as the present Rockies, but ages of wear and dissolution have reduced them to the comparatively low Laurentian range of Quebec and the highlands of Manitoba and Ontario.

That volcanic action took place also is shown clearly near St. John, at Green's limestone quarry, where a black mass of igneous rock, called by geologists a trap dyke, rises through and in strong contrast with the surrounding limestone, which has been altered almost into marble by pressure and heat.

The great formations of the Palæozoic Age, especially the Silurian and Carboniferous, so strongly developed on the Atlantic seaboard of North America, resulted in the formation of the Alleghany range of mountains, and culminated in the great volcanic action which formed the palisades of New York and produced the immense lava field which, beginning in Cumberland County, Nova Scotia, forms the headlands of Blomidon and the entrance to Digby Gut, and extends the whole distance to Briar Island in the Atlantic.

A small example of about this period may be seen at Caraquet in Gloucester County, N. B., where a trap dyke ascends through beds of carboniferous sandstone. The sandstones near the black igneous rock are hard and burnt almost to tiles and clinkers.

showing the great heat that must have come from the ascending column of molten rock. And they remind me of the condition of the sandstones near a burnt coal seam at Glace Bay, Cape Breton. This seam is said to have been mined by the French and to have been set on fire by them on the subjugation of the island by the English, and at Burnt Head, where it crops out on the shore, the rocks have been altered for a distance of about 500 feet and from 15 to 25 feet in thickness above the seam. The latter being burnt away, the rocks have descended, distorted in all directions, the grey slates burnt to a bright red so hard as to ring when struck, and the coal beds and shales changed to a porous cinder and coke conglomerate, having numerous pieces of the bright red slates mixed up in the black matrix. Large boulders of this curious conglomerate are strewn about the shore, and the cliffs themselves are a fine sight from the brightness and variety of their color and the irregularity of their form.

It may be said that, as the trap rocks of Blomidon and the North Mountains of Nova Scotia belong to the Secondary or Mezozoic age and not to the Palæozoic, they should not be cited as a result of the great accumulation of deposits of Palæozoic time. They were produced, however, very early in the Secondary and mark the end of the rock-making formations in the Northern and Eastern part of this continent. It would appear, then, that after this eruption the Eastern Provinces and the North Eastern States became the solid and stable crust of the Earth which they are now. Their elevation has changed many times since then, and the conformation of their surface has also changed through erosion and deposit, but no lasting or extreme subsidence has occurred, and no great beds of deposits have been laid down, such as the older formations, which are often thousands of feet in thickness. To this we owe our freedom from danger from earthquake and volcano.

The Palæozoic age was of immense duration, probably lasting tens of millions of years, and volcanic disturbances were by no means confined to its close. The formation of the great beds of shales which underlie almost the whole northwestern corner of New Brunswick, and have produced the fertile lands of Carleton and Victoria Counties, was followed by volcanic disturbance. About this period arose such well-known features as Mount Royal in Quebec, Mars Hill, just over the Canadian border, in Maine, and in New Brunswick the Sugar Loaf and Dalhousie Mountain in Restigouche, Currie's Mountain near Fredericton, and Chamcook Mountain near St. Andrews—all of volcanic origin.

A map of New Brunswick, on which all the evidences of volcanic activity were marked, would show that far from being always the peaceful country we know, it has been many times, so to speak, a pretty hot place.

Our hemisphere is called the New World, and this term may be correctly applied to part of it, especially perhaps the part which Columbus discovered. But Eastern Canada and the North Eastern States is in reality the Old World, older far than the greater part of Europe.

Our Laurentian Hills were grand features when the Alps and Rockies formed the comparatively level bed of a shallow sea. In both Europe and America the formation of land began in the north, and the highlands of Scotland are supposed to be of equal age with our oldest rocks.

In Europe the formations of the Tertiary age are very much developed and have reached a great thickness. This resulted in the uplifting of the Alps and the mountains of Italy, and the heat engendered by these disturbances has not yet been dissipated, but even now creates havoc, as at Vesuvius, and is also very evident in Sicily. In Northern France are very perfect examples of volcanoes and evidence of their action, discontinued probably not very long ago in geological time, which, in the Tertiary age, is reckoned by tens and hundreds of thousands of years, instead of by millions as in the Palæozoic.

In the Post-Tertiary period it is figured by thousands of years, and since the advent of man, when speaking of time in a general way, centuries are our units—insignificant periods compared with the immense ages preceding. Such considerations may make man very humble or very proud. While thankful that it is given us to know immensely more of the beauty and variety of the works of the Great Designer than the millions of inferior creatures who preceded us, and who now inhabit the Earth with us, ever could, and to realize the greatness of His plans to a small extent, yet the fear of abusing our privileges, and the certainty of the infinite incompleteness of our knowledge, should preserve in us a due sense of our position in time and space.

While I do not know the geology of the Andes, the Sandwich Islands and the West Indies, I believe that the general principle will hold good, that the present active volcanoes are to be found in or near districts where the later formations are most largely developed.

Just before the advent of man, the Glacial period, or ice age, covered nearly the whole of the Northern part of both continents with a layer of gravel, sand and clay. The subsidence and elevation of the land was general, and not apparently confined to particular areas, probably because the crust of the Earth over this part had become solidified. The deposit was general but not deep, and the process was, for the most part, one of levelling, which prepared the great plains of the West, with their rich deep soil, and, in our more rugged land, rounded off and lowered the hills and filled the valleys, forming the best of our farm lands.

As would follow from our general theory, the characters of this formation being as I have just indicated, no volcanic action so far as I know has resulted from the ice age.

In North America, as in Europe, the older formations are in the North. The Southern Mississippi valley and the South Eastern States were about the last parts of the continent to rise from the sea, and it may be that volcanic activity in the West Indian Islands is connected with the lifting up of these lands, the formation of coral islands, and the growth of still later deposits, partly brought down by the Mississippi River, in the Gulf.

Passing to the subject of earthquakes, probably much could be said, were I better acquainted with the subject, even on those which have occurred in New Brunswick.

The recorded shocks have been slight, but their causes may be as interesting and complicated as of those which have occasioned great damage and loss of life.

Mr. S. W. Kain, of St. John, has made a list, printed in Bulletin No. 16 of the Natural History Society at St. John, of the earthquakes which have been felt in New Brunswick. They number 18 in the last 89 years.

I have heard people at Oak Point, on the St. John River, speak of an earthquake which occurred there many years ago and was very startling.

My only experience of an earthquake was in the Adirondacks in New York State. I was working at a drafting table when I felt the slight motion and looked up to ask a fellow engineer at the same table to be still. He also looked up apparently to make the same request of me, and on inquiring and finding that nobody had fallen down cellar, and that nothing else had occurred to explain such a motion, we concluded that it was an earthquake, and next day were sure of it when we saw that one had been reported the day previous at a place ten miles from our work.

Slow movements of the Earth's crust are occurring at many places, and perhaps over the whole of New Brunswick, but it is only here and there that evidences of them can be seen. The coast of New Brunswick appears to be sinking, though at such a slow rate that we need not trouble ourselves about it.

At Navy Island, in St. John Harbor, I have seen stumps of trees still rooted in the ground, and the remains of an old peat bog, all now below the level of high water.

At Baie Verte, on Northumberland Straits, there are clear evidences of the sinking of the land, and in many cases the dykes are neglected on this account, and where kept up they are very high. I was shown a piece of lowland between Baie Verte and Port Elgin where my informant said his father used to shoot partridges, perhaps forty years ago, in the thick spruce woods. Now there is nothing there but stumps, the land having sunk below the level of high tide, which killed the trees.

The sea is now attacking old Fort Moncton, celebrated in the history of the struggle between the French and English for the possession of Acadia, and has made a considerable breach in one angle, and the ditch inside the breastworks is now scarcely three or four feet above high water. And a great part of the old soldiers' cemetery (one tombstone in which records, or recorded, the fact that the occupant of the grave was scalped by Indians) is washed away and the bones scattered; and it is certain this spot would not have been chosen as a cemetery when scarcely above the level of high tide.

At Shippegan the dykes are now almost entirely neglected, and large stretches of meadow land are going to waste. As there also one sees stretches of woods where the trees have been killed by what are called unusually high tides, it is most probable that the sinking of the land is accountable for both these results.

When the land is so low and flat as it is generally along the eastern coast of New Brunswick, a slight change of elevation becomes noticeable, and a depression of 10 to 20 feet would change the outline of the shore considerably.

I found an interesting example of this during the course of a survey made in the winter of 1901, of the mouth of Gaspereaux River and the upper part of Baie Verte.

In taking borings about the mouth of the river, I discovered under the shallow muddy channel and mud flats an old channel cut in the rock, the sandstone ledges on each side being perhaps twenty-five feet high. Off Fort Moncton the ledge came nearest the surface, and there the channel was most marked, and was filled chiefly with soft mud, beneath which was stiff red clay. Further up stream the old channel was nearly filled with stiff red boulder clay, deposited probably about the end of the Glacial period.

About two miles above Port Elgin, the Gaspereau River is very pretty, winding through the farmlands with low but steep wooded banks, which would be rocky banks if it were not that the rock is a soft sandstone which has become worn down and concealed.

The buried or underground channel, as that below the mud of the bay may be called, could not have been worn by the tide or sea currents, and therefore I believe that before the depression took place the river followed its picturesque course about three miles further than at present, and entered the sea by a sudden bend and opening through the sandstone ledges.

The low sandy bars and islands, as for instance Portage, Fox, and Bay du Vin islands at the mouth of Miramichi Bay, are all wasting away.

They were formed by the sea, and if the conditions under which they were formed were constant, they would continue to grow.

It is probable that the sinking of the sea bottom brings them within the reach of heavier waves, and therefore they are being destroyed, and, the large amount of sand which composed them being scattered over the sea bottom, often more than offsets the increased depth of the sea which would result from the depression.

MICROSCOPIC FORMS IN FRESH WATER.

By J. McG. Baxter, M. D.

UNDER the above title a list of forms is given in Bulletin No. 3 of this Association. They were those which up to that time, 1903, had been discovered in the vicinity of Chatham, N. B., by the writer.

The following supplementary forms have since been found here:

DESMIDS.

Cosmarium.	conspersum.
"	punctulatum.
Desmidium.	aptogonium.
Docidium.	truncatum.
Euastrum.	ampullaceum
"	humerosum.
Micrasterias.	Americana var recta
"	denticulata.
"	mamillata.
"	papillifera.
"	Rotatata var simplex
"	Truncata.
Penium	margaritaceum.
Staurastrum.	muticum var minus
Tetmorus.	brebisonii
Xanthidium.	antilopæum.
"	cristatum.

DIATOMS.

Amphipleura pellucida.	
Asterionella formosa var Ralfsii minor	
Cocconema cistula (Smith.)	
Cymbella.	stomatophora.
Diatoma.	elongatum.
Eunotia.	pectinalis.
Epithemia.	hyndmanii.
"	turgida.
Gonophonema.	geminatum.
Navicula.	acrosphæria.
"	dariana.
"	divergens.
"	cardinalis.
"	gigas.
"	hemiptera.

"	parva.
"	nobilis.
"	tabellaria.
"	tumidula.
Pseudoeunotia.	flexuosa.
Stauroneus.	acuta.
Synedra.	fulgens.
"	pulchella.
"	ulna.

ROTIFER.

Scaridium.
Triarthra.

RIZOPODS.

Actinophys.	sol.
Cyphoderia.	ampulla.

VARIOUS FORMS.

Stylonchia, Paramecia, Macrobiotus americanus, Chaetonotus acanthopherus. Daphnia pulex. Euglinæ eyliais

These are about all the forms observed in addition to those mentioned in Bulletin No. 3.

In reading over notes taken at the time I find that the process of parturition was watched in a canthocamptus during half an hour, and twelve young escaped during that time; but, being called away, I did not see the whole process. There are other forms mentioned above that caused the writer a good deal of trouble—for instance, micrasterias denticulata. There is no author, to which I have access, that has a correct plate of this form. After sending it round to various experts I was directed to the late Dr. Bailey's work, and, applying to his son, Dr. Bailey of N. B. University, he kindly took the trouble to make me a very nice sketch of micrasterias denticulata from his father's work, that filled the bill and settled the point. I do not know whether this form is very generally dispersed or not, but I have found it in three or four places here. Dr. Bailey speaks of his father's having found it in the Southern States.

There is another form that I wish to call attention to, viz., the diatom Pseudoeunotia flex. Not being able to place it, a specimen was sent to Philadelphia and the following answer received:

"The slide you sent me contains what I believe to be a variety of Pseudoeunotia flexuosa (Breb) Grun equal to Eunotia flex Kutz. It is larger than any described and figured, and no figures are recorded as giving the outlines quite as flexuosa as in the specimens. De Toni thus describes it—Connective face elongate, long, straight, exactly linear, connective membrane delicately striate, valves linear, twice or three times lightly flexuosa with inflated capitate apices, rounded, obtuse and with delicate transverse striæ 11-12 in 10 $_{m}$ distinctly punctate. The var. bicapitata (Green). If the specimen is not this variety it is quite near it. The striæ are about 11 in 10 $_{m}$ and distinctly punctate. The valves are more robust and more curved than in the figures. The slide is of interest to me as I have never seen forms exactly like them before. The form is said to be common in Europe. Ehrenburg gives forms from Nova Scotia which resemble but do not quite correspond. I think, however, we are safe in saying that the specimens are a species of Pseudoeunotia flexuosa."

I will conclude this paper by a quotation from my notes of two years ago that may interest some.

Saw an alanopsis first entangled apparently among the algæ and struggling violently as if to free itself, which it at length did! Then it fluttered about for a while, then sat down, facing my eye, looking for all the world like an owl sitting on a branch and sighing, for it appeared to take a long breath like a sigh once in a while. Then at last it began to struggle steadily and then it took a slow gradual somersault over backwards and went entirely out of its shell, leaving it on the branch, and swam slowly away, very clear, pale, white and transparent.

LAKE DEPOSITS.

By J. McG. BAXTER, M. D.

Since writing the article on Lake Fitzgerald, in Bulletin No. 3, I have been endeavoring to obtain similar deposits from other localities for examination, and wish to report on the following:

Folleigh Lake, N. S.

In this deposit I have noted the following forms. The words common or rare, &c., refer to the frequency or rarity of the forms in the deposit.

Cymbella	gastroides		*Kutz*	common
"	cuspidata			rare
Eunotia	major		*Rab*	common
"	decadon		*Ehr*	rare
"	tridentula		*Ehr*	common
"	serrulata		*Ehr*	1 specimen
Gomphonema	acuminatum	var laticeps	*Ehr*	rare
"	"	var coronatum	*Ehr*	rare
"	capitatum			rare
Navicula	iridis		*Ehr*	common
Pinnularia	major		*Kutz*	common
"	nobilis		*Ehr*	
"	dactylus		*Ehr*	"
"	viridis		*Nitzsch*	"
"	lata		*Breb*	rare
Stauroneus	phœneocenteron		*Ehr*	common
"	acuta			not uncommon
Surirella	splendida			
Synedra	acus			

McIntosh's Lake, Colchester Co., N. S.

The large bulk of this deposit is made up of Pinnularia major and Synedra ulna, but I have noted the following forms:

Coscinodiscus	———? (broken)			1 specimen
Cymbella	gastroides		*Kutz*	common
Cymbella	turgidulus		*Schm*	not rare
Eunotia	major		*Rab*	not rare
"	monodon		*Ehrb*	not rare
"	robusta	var diadema	*Ehrb*	rare
"	"	var hendecadon	*Ehrb*	1 specimen

"	undenaria	*Ehrb*	1 specimen
Gomphonema	acuminatum var coronata	*Ehrb*	common
"	constrictum	*Ehrb*	not rare
"	capitatum	*Ehrb*	rare
Navicula	campylodiscus	*Grun*	1 specimen
"	oblonga	*Ehr*	not rare
"	dilata	*Schm*	1 specimen
Pinnularia	dactylus	*Ehr*	not rare
"	major	*Kutz*	very common
"	nobilis	*Ehr*	common
Stauroneus	phœneocenteron	*Ehr*	common
Synedra	ulna var longissima		very common

NOTES.

By J. McG. Baxter, M. D.

The southern migration of our wild geese, in the fall of 1905, was very late. I find the following notes taken at the time: "Two large flocks of wild geese seen Dec. 17th, flying down river. Howard Allan says he saw a flock flying north Dec. 22nd. The lighthouse keeper, K. McLennan, at Escuminac, reports a flock seen between 15th and 20th January but cannot be sure of exact day."

A Patriarchal Goose.

Wm. Stothart, Ferryville, opposite Chatham, has a goose 43 years of age last April, 1906, and still comparatively smart and healthy, although it finds difficulty in keeping up to the rest of the flock when walking quickly.

THE BEAVER IN ITS RELATION TO FORESTRY.

By Philip Cox, Ph. D.

Read Feb. 20, 1906.

At no period in the history of the province has there been so general a recognition by its people of the great value of its forests, both direct and indirect, as at present. This conviction has been forced upon them by several considerations, among which a few may be mentioned. The general decrease of productive forest-areas and consequent increase in the value of timber and wood products, have directed attention to the forest, and stimulated interest therein. The beneficial influence of forest-areas on the climatic conditions of a country, and their relation to the productions of the soil, are being better understood as more attention and study are given to the scientific principles involved. The agency of the forest in contributing to the water supply of a country, which of late years is being utilized for power purposes, has been fully established.

It requires only a superficial knowledge of these principles to enable one to draw the following inferences:—

1. The forest screens the land from the direct rays of the sun and retards evaporation of moisture.

2. It increases the average annual rainfall not only over its own floor but surrounding agricultural districts.

3. It exercises a cooling influence and renders the climate more humid.

4. Adding to the annual precipitation and reducing evaporation to a minimum, it conserves the water supply of a country, more especially if the water-sheds and sources of streams be forest-clad.

5. Local droughts in farming districts must decrease in frequency and severity according to the extent of surrounding forests.

6. It protects the adjacent agricultural sections from the force and severity of winds, which would otherwise often do serious damage to crops.

7. The volume of water in rivers, streams, lakes, and other catch-basins, will be in proportion to the extent and density of the forests along their margins and covering their sources.

8. Increase of humidity of soil and air, due to these various agencies, must render forest fires less frequent and destructive.

9. Under such conditions the growth of forest-trees would be more rapid, and decomposition of those waste products accelerated, whose presence are now a great danger to the forest.

As year after year adds its quota to the burnt areas of forest lands, and the annual out-put of timber decreases in size and quality, thoughtful people are beginning to compute the time, not far distant, when the forest must cease to be such an important asset and source of revenue and business as at present. unless measures be taken to preserve existing areas from deterioration by fire and wasteful cutting, and aid nature in the reforesting of large tracts that have been swept by fire. The question may be said to have already passed discussion; the best means to accomplish the end is pressing for solution, but with regard to it there is a great variety and wide divergence of opinion.

To assist in arriving at a correct conclusion, it would be well to pass in review and consider carefully the natural conditions of the forest in primitive times during the period of its greatest development. What were these conditions, how far have they been changed or completely destroyed, what can be restored in whole or in part, and what steps can science and art take to assist the natural agencies in the work?

A great change has come over the forest since the advent of Europeans. In early times the forest of New Brunswick exceeded any east of the Great Plains in the size and grandeur of its trees—especially the White Pine, whose majestic proportions have ever been a favorite theme for the pen of the poet and brush of the artist. Its floor was seamed by a net-work of rivers with their thousands of branches, ponds, and lakes, which, like a great system of veins and arteries, imparted vigor and stability to the whole. Everywhere the forest humus was moist; every brook and streamlet was noisy, rushing beneath the shading arms of giant trees, babbling over pebbly bottoms, or leaping down falls and over barriers of various kinds that nature or accident had interposed to retard its journey to the sea. The prolonged and copious supply of water from the snow, melting slowly on the densely shaded forest-floor, sank into its deep spongy mould, trickled through the earth enriching the soil with its fertilizing burden, and continued during the greater part of summer to issue forth along the slopes and in the valleys through countless springs and rivulets. Like conditions retained the summer rainfall which made good from time to time the diminution of moisture caused by a slow evaporation. Lakes and ponds innumerable dotted the forest-floor and dispensed their coolness and humidity on all sides.

Here were ideal, because natural, conditions of forest growth and permanence, but, as was implied above, the lumber business, settlement, and the waste and abuses attending both, have brought a great change over the face of the forest. From the water-ways have been removed all obstructions to the rapid drainage of the forest and depletion of the water supply. Streams, brooks, and rivers have had their channels cleared of every impediment to the easy, rapid, and uninterrupted flow of the water. The natural density of the forest, which in primitive times stood guard against a too rapid melting of the snows on the one hand and evaporation of moisture on the other, has disappeared before the thoughtless axe and destructive fire. Settlements have extended into the wilderness in all directions—veritable tongues of fire—which are fringed everywhere with ruin and desolation. Railroads have proved to be the forest's greatest enemy, whose paths through the province are everywhere marked by wide tracts, seared and blackened, and rendered unproductive for half a century or more. Watersheds have been stripped of their tree-growth and thus robbed of the power to contribute to the water supply. Everywhere the forest has been opened up by fire and axe to the parching effects of sun and winds.

What are some of the consequences which result from these untoward conditions? Whenever a few warm days occur in early spring, the snow is rapidly melted, and the surface, stripped of its deep spongy mould and hardened by exposure to the alternate heat and rain of summer serves but as a floor over which the freshet rushes to fall into the nearest brook and hasten unimpeded to the sea. A similar fate is in store for the summer rainfall. Thus under present conditions there is the minimum of water deposited and absorbed, and the maximum carried away in a few days, leaving the brooks and rivers comparatively empty and the surface dry before summer even begins. Is it to be wondered at that the forest is often parched in autumn and becomes a prey to devastating fires?

Foremost among the provisions of any wide measure of forest protection must stand the solution of the problem how to arrest and hold even this diminished water supply where it will do the most good. Various suggestions have been made. Some advocate the erection of dams on rivers and floatable streams, forming large catch-basins; but while the presence of such water areas must exercise an influence for good on the forest growth immediately adjoining, they must of necessity from their limited number and position be of little use to the forest as a whole. The maze of streams, brooks, and rivulets to be found on the forest floor would not have their supply sensibly increased by such means, and it is in the bosom of the forest country, in the region of the little water-ways, where the supply should be retained in order to have it contribute most to the growth and preservation of the forest.

Does the careful study of primitive conditions reveal the presence and operation of any special means to this end, other than those already mentioned? Explore the valley of some brook and note the little meadows, that occur one after another, sometimes six or seven in half a mile. At the lower margin of each, a dam of earth and decayed sticks may be made out, extending from one side of the little valley to the other. here and there worn away, but the course and outline can still be made out. These meadows, each only a few acres in extent, were once catch-basins, or beaver ponds. whose builders and tenants have long since been destroyed, but evidence of their busy and useful lives and labors survives. In primeval time and in the palmiest days of forest magnificence every brook and stream was dotted with ponds, which caught and retained a bountiful supply of water right in the heart of the wilderness, where its salutary presence was of the greatest value. Try to conceive how many of these forest-embowered lakelets were once to be found on the thousands of brooks and streamlets which thread every portion of the province. Take an imaginary stand on some hill-top, and, with the telescopic eye of the eagle, sweep the billowy sea of green around you, and note the glinting and flashing of light from innumerable silver points on the verdant surface—a second firmament with its glittering gems. You have beneath and around you a panorama of nature's beauties and utilities, an admirable illustration of how she conserves her productive energies and makes all her agencies mutually beneficial; a wealth of magnificent trees and forest grandeur encircling countless ponds and lakelets, every one the happy home of busy architects whose lives and labors are being expended in preserving their wood-land home in its wonted attractiveness and beauty.

It is easily understood that as the long winter wore away, the water in these ponds would diminish in volume, and the opening of spring must find them nearly empty. Then came the melting snow and freshet. and soon every pond was filled to its utmost capacity. Who can calculate the volume of water that was thus stored in the heart of the forest, and its beneficial effect on the soil, vegetation, and climate! The efforts of man, along even the wisest lines. must pale into insignificance, when compared with such agencies as these.

Though a century or more has elapsed since the beaver was nigh exterminated and the ponds made tenantless, the hand of time has not been able to obliterate the traces of their homes.

yet the sites now recognizable must only be a fraction of what were to be seen in primitive times. Available records are not at hand of the number of beaver skins annually exported from the province during the French regime, when the destruction must have been very great, for the fur was in high demand. Yet notwithstanding the immense annual drain made upon the stock for half a century or more before the province passed under the power of Britain in 1763, it is a matter of record that one merchant firm alone of St. John exported 60,000 skins or upwards annually for some years after 1783. Hence the conclusion is justified that in primitive times these animals were exceedingly numerous in this well-watered section of Canada, and as it is their habit to separate into small communities and establish homes more or less apart from one another, they must in time have penetrated every part and built their little catch-basins therein. That age was contemporaneous with the period of greatest forest development, while the destruction of the beaver marks the introduction of a series of changes in the natural conditions which ushered in the period of decline.

In the efforts about to be made to increase the extent and conserve the productiveness of forest areas, it is not possible to restore all ancient conditions, but the protection of the beaver by wise and stringent measures, well enforced, can easily be had without injury or loss to any interest. Moreover the animal is quite prolific; and as the otter, its worst enemy after man, has become rare, twenty-five years of protection must find it well represented on the brooks and streams of the forest, pushing forward with all its proverbial industry and skill those works that were largely the life and strength of forest growth.

It may be objected that the indefinite multiplication of these water-plots must reduce considerably the productive areas of the forest, and result in the loss of much timber owing to the drowning of the trees on these pond-sites, but a little consideration will show that it is the least valuable of the forest trees that grow in these little valleys, and can well be spared to furnish room for a prime necessity of luxuriant growth. Moreover the beaver does not use for food or building purposes any of the most valuable timber trees, but contents itself with the birch, willow, poplar, and alder, the least valuable. The loss from both these sources must prove trifling when compared with the gain to the forest and country as a whole.

Another objection is the annoyance so many dams may cause the lumberman who must break, or remove them from floatable streams. As pointed out above, the beaver, if unmolested, finds its favorite home on streams and brooks, which are generally too small for driving purposes, and it is only when relentlessly hunted and persecuted by man that its wonderful intelligence has driven it to occupy the larger streams where it can more readily circumvent the wiles of its enemies.

Every lover of nature and intelligence displayed in nature, must, apart from the mere question of utility, long to see the protecting hand of man extended to this wonderful architect of the forest, whose wisdom, skill, and industry have made it an attractive subject for the moralist and scientist. But when it is found, on probing the secrets of its busy life, that it is doing a mighty work, laying the foundation of forest greatness and wealth, contributing to the productive energies of nature on all sides; building up the rich intervales of valleys with material which must otherwise be lost in the sea; feeding the summer channels of rivers with a bountiful supply of cool, refreshing waters that invite inland the numerous finny tribes of the sea; and transforming what sad experience shows may become a barren, into all the glory of the primeval forest, then should the admirers of nature join with the votaries of science and business in demanding a perpetual close season for the beaver.

LEPIDOPTERA.

By J. D. B. F. Mackenzie.

Additional list of insects in the collection of the Miramichi Natural History Association. The following include, in most cases, the male and female:

PAPILIONIDÆ.

Papilio.
- philenor *L.*
- asterias *F.*
- troilus *L.*
- turnus *L.*

PIERINÆ.

Pieris.
- rapæ *L.*
- vernalis *Edw.*

Colias
- philodice *Godt.*
- Eurydice
- Cæsonia *Stoll.*
- eurytheme *Bd.*

Anthocharis.
- hyantis.

Terias.
- lisa *Bd. Lec.*

LYCÆNIDÆ.

LYCÆNINÆ.

Chrysophanus.
- Americana *D'Urban.*
- helloides *Bd.*
- thoe *Bd. Lec.*

Lycæna.
- violacea *Edw.*
- dædalus *Behr.*
- shasta *Edw.*
- clara *Edw.*
- marginata *Edw.*
- pseudargiolus *Bd. Lec.*
- sagittigera *Felder.*
- comyntas *Godt.*

THECLINÆ.

Thecla.
- calamus *Hüb.*
- humuli *Harr.*
- alcestis *Edw.*

NYMPHALIDÆ.

DANAINÆ.

DANAIS.
archippus *F.*

NYMPHALINÆ.

ARGYNNIS.
atalantis *Edw.*
myrina *Cran.*
cybele *F.*
bellona *F.*
adiante *Bd.*

MELITÆA.
anicia *D. & H.*
phæton *Drury.*
cooperi.
harrisi *Scud*

VANESSA.
antiopa *L*
milberti *Godt.*
atalanta.

PYRAMEIS.
atalanta *L.*
cardui *L.*
huntera *Drury*

LIMENITIS.
arthemis *Drury.*
disippus *Godt.*
eros.

GRAPTA.
J album *Bd.*
gracilis *Gr-Rob.*
comma *Harr.*
faunus *Edw.*
dryas *Edw.*
progne *Cram.*
interrogationis *F.*
satyrus *Edw.*

EUPTOIETA.
claudia *Cram.*

SATYRINÆ.

SATYRUS.
nephele *Kirby.*
alope *F.*
texana *Fab.*

NEONYMPHA.
eurytris *F.*
sosybius *Fab*
canthus *L.*

CHIONOBUS.
jutta *Hub.*

EREBIA.
nigra.
epipsodea.
callias *Edw.*

PHYCIODES.
nycteis *Doub.*
tharos *Drury.*
mylitta *Edw.*

HESPERIDÆ.

PAMPHILA
leonardus *Harr.*
sassacus *Scud.*
cernes.
peckius.

CARTEROCEPHALUS.
madan *Edw.*

EUDAMUS.
tityrus *F*
bathyllus *Sm. Abb.*

NEW THEORY OF THE ORIGIN OF THE EARTH.

By J. L. Stewart.

MANY definitions have been given of man, but most of them apply almost equally as well to some other animal. Permit me to add to the number one more, and call him the animal that asks questions and is discontented with his lot in life, for it is certain that he no sooner became conscious of existence than he began to inquire into the origin and purpose of things. Other animals are content with good living and comfortable quarters, but man is always seeking for something more. Man "never is, but always to be, blest." His possessions, whether of gold or knowledge, are only stepping stones to greater things. Give him wealth, power, perfect health, and a paradise to live in, and he will sigh for a sight of the North Pole, join an expedition to penetrate the polar regions, and live contentedly on dog meat, seals and whale blubber two or three years at a time. Yes, man is the animal that asks questions, and he began to ask them very soon after he originated. The primitive man looked around and asked: Who made this world, how and of what materials? Every savage tribe, every civilized people, has its own explanation. Most of them are very crude, all are very simple, and one of them at least is sublime in its simplicity and spirituality. Each race looks upon its own account of the origin of things as a revelation or an inspiration, and on the accounts of others as myths. But I may mention that all the ancients seem to have believed the earth to be flat, a notion that all of us, except a gentleman who was recently a member of our Town Council, have outgrown. We know to the contrary, know it to be a sphere that flies swiftly through space, revolving as it goes; but the old notion still influences our thought and speech, and we continue to speak of up in the sky, above the earth and below the earth, and of ascending and descending, just as though we believed the world to be a flat surface on a fixed foundation. We know that the ancients invented such phrases in ignorance, but we cling to the phrases and to the ideas that are involved in them. "Fables from the world's childhood," the lullabies that were sung at the rocking of the cradle of the race, are still potent influences in moulding the minds of men, and most of us talk as though we didn't know that there is no height nor depth, no up nor down, no ascending nor descending, in the boundless universe of God.

The origin of the earth! We can make conjectures and elaborate theories to explain the origin of the earth, but we cannot know, we cannot go back to the beginning. One thing, however, we do know. We know—we do not conjecture, but we know—that the earth, much less the heavens and the earth, was not made in six days, neither in six solar days nor in six geologic days, and we know that the World-builder has kept right on and is still at work—that his task is not completed—that he has not rested from his labors for a Sabbath or a second. The forces with which he has fashioned the earth are still ceaselessly shaping it. They never grow weary and never take a holiday. There is no cessation of activity in the universe. The recent outpouring from Vesuvius, and the earthquakes that destroyed San Francisco, and Kingston, Jamaica, show that the world builders are still doing business at the old stand, and that they are no respecters of man or his works. Instead of working for mankind, to make the earth a dwelling place for so excellent a creature as man, the builders take no notice of him, and crush him and the proudest monuments of his skill and energy, when they get in the way, as ruthlessly as we kill a mosquito or tread upon a worm.

The origin of the earth! The mind of man cannot conceive of a time when suns and planets were not, nor of a time when the constituents of the universe were not, nor of the creation of something, whether a solar system or a hairpin, out of nothing, and so we must leave the beginning out of the field of our inquiries and take our departure, as mariners say, from something visible—from something conceivable, let us say in this case.

Count the sands on the shores of every sea, and let each grain represent a million years of the past, and we may possibly get back to a time when our solar system did not exist. Other systems, countless millions of them, no doubt, were scattered throughout space, but ours had not taken shape. We may reasonably suppose that our system is one of the younger sons of the stellar family, because our sun is as a tallow candle to an arc light in comparison with others in the heavens.

Let us go back, on the wings of thought, to the time when he was the only member of our system, alone in his glory, say one thousand millions of years ago, shining in solitary state, and with no planetary train of dependents. We are not concerned with his origin. How he got there, so far away from his fellows in the firmament, is not what we are to consider to-night. He may, like the scriptural Prodigal Son, have gone forth from his father's house to spend his substance in a far country, or he may have grown into manhood where he is. Let us rest, on extended wings, about three thousand millions of miles from him, and make observations. The ether between us and him is robbed of some of its natural translucency by vast quantities of planetary seed, stellar dust, matter in a diffused state, without form and void, vaguely seen or altogether invisible to our eyes. And, even as we gaze, a dust cloud gathers within the field of vision, and grows ever larger and larger, and denser and denser, as it attracts the vagrant particles of matter to its bosom. We gaze upon it, greatly interested in its growth, and turn aside at times—once in a million years or so—to note that other dust clouds have formed and grown into revolving spheres. Now we hear loud explosions, and see mountain peaks of flame rising from them. They have grown so large that the pressure of gravity has caused internal heat, and the volcano has begun its work. But the internal fire does not consume them. The fuel that feeds it is indestructible. If we could invent a furnace that could be run on an equally economical basis our coal bills would be small. But our devices are defective and wasteful, and nature's are perfect and economical. There is no waste, no loss of energy, in the economy of nature—endless transitions and transformations, but no such thing as destruction.

And no such thing—at least since the time when we took our position as sightseers on the outer rim of the solar system—no such thing as creation, except in the sense of combining and organizing existing materials into new forms.

One of the whirling masses we have seen grow up, gradually, from a dust cloud to a globe, we name Earth and decide to take possession of it for ourselves and our descendants. It is not the largest of them, but it is large enough for us. We must wait, however, until it acquires an atmosphere, and becomes habitable for mankind, before we settle upon it.

But let us consider more particularly of the earth's origin.

The first plausible hypothesis—the nebular theory—was originated by Sir Wm. Herschell and developed by La Place, and has gained almost universal acceptance. According to this theory the earth was at first a fiery, rotating mass of vapor and molten matter, thrown into space by some great solar eruption, and gradually contracting and solidifying as it cooled off. The internal fire that finds vent in volcanic outbursts is the original state of the whole planet, and the outer crust is growing thicker as the internal heat grows less. The moon, according to this hypothesis, is a dead world, one whose fires have gone out:—a mass of lifeless matter, a planet without an atmosphere, or vegetation, or water, or any living thing on its surface—in short, a type of what the earth will be, according to this theory, when its internal fires grow cold.

And now we have another hypothesis of a very different character, the one I have already held up before your eyes as a vision of the past. Its author is Prof. Fairchild, and, like the nebular theory, it fits into most of the phenomena of nature. The embryo world, according to this hypothesis, instead of being a superheated mass of flaming gas, was a whirlwind of planetary dust flying through space, drawing to itself smaller particles that came within the influence of its attraction, and gradually growing denser and larger. This process still goes on, a great number of meteorites falling into the earth every year, but its growth from this source of supply is at present too slight to be perceptible.

How is this theory of formation from cold matter reconciled with the known facts in respect to the internal heat of the globe? The answer is that the earth's internal heat is due entirely to pressure, to the gravitation of the mass towards its centre.

The nebular hypothesis is that the embryo earth, when it was in the first stages of solidification, was surrounded by hot gases and vapor that had existed from the beginning of the earth's progress from chaos to a place among the spheres, and that these gases and vapors cooled and gave place to the earth's atmosphere.

How does the new hypothesis account for our water and atmosphere? It supposes that the gases from which the atmosphere, the ocean and the rivers were formed were contained in the particles of matter that united to form the planet,—just as the oak is contained in the acorn and the fruit in the seed—that, in fact, air and water were produced from the earth's solid substance by the internal heat caused by the pressure of gravitation. Nitrogen, oxygen, hydrogen, carbon, helium, argon, and the other elements of which the atmosphere is composed, were brought from the fiery chemical laboratory of the earth's interior to the surface by volcanic action. It is claimed as a fact that radium has the quality of dissipating itself into a gas, helium, and it is believed that other solids have the same quality, especially when subjected to the necessary amount of heat and pressure.

The gases that were, in this way, squeezed out of the bowels of the earth, did not at first begin to unite to form an atmosphere. They were too volatile to stay on the earth's surface. The earth was not large enough—its attraction was not strong enough—to retain them, and they passed out into space. But when the earth had grown, by the gathering in of wandering meteorites and planetary dust, somewhat larger than the moon is now, it began to retain at least a portion of these gases, and they united, and formed water and our atmosphere. The ocean and the atmosphere are merely such portions of the gaseous outbursts from the great internal laboratory of the earth as the earth's attraction has enabled her to hold upon her surface, less the considerable part which has been returned to the solid earth by carbonization and oxidation; and the ocean-making process is still active. Prof. Fairchild holds that the atmosphere has been a slow growth from a probable film of carbon dioxide to its present volume, and the growth is still in progress through volcanic and other exudations and by release of gases in the decay of the crystalline rocks.

The carbon dioxide, Prof. Fairchild points out, must have been the first of the elements of the atmosphere to be retained on the surface of the growing globe. The enlargement of the earth and its increased power of attraction or gravitation added the lighter gases to the air. The primitive atmosphere of almost pure carbon dioxide would have been deadly to life. But this gas was absorbed in large quantities in the carbonization of the crystalline rocks. Nitrogen, on the other hand, has suffered little loss, so that it has become the principal element of the atmosphere. Oxygen is a more uncertain quantity, and the varying amounts in the air at different geological epochs is still a matter of speculation.

He shows that in volcanoes we see to-day one method by which water is transferred from the interior to the surface of the globe. The existence of water in the earth's interior, even in the quartz of the crystalline rocks, he declares, has not been sufficiently considered. The steam that comes out of volcanoes we have been accustomed to think of as water that has trickled down into the volcano from subterranean springs, and been converted into steam by the hot lava. But the new theory is that the volcano manufactures its own water vapor. One process is by squeezing it out of the rock crystals. There is another water-making process, more surprising still.

Everyone knows that water is made up of hydrogen and oxygen gases, in the proportion of two to one. An interesting laboratory experiment is the combining of these two gases by an explosion. The result is the formation of a tiny quantity of water. The force of exploding oxygen and hydrogen gases when forming into water is twice the power of dynamite. Right here is the secret of the tremendous power of volcanoes in eruption. It may reasonably be supposed that free hydrogen and oxygen, detonated in a volcano's chimney, are what cause the explosions. The water thus formed is converted into steam by the intense heat, and is carried off into the earth's atmosphere. The steam pressure also adds its force to the explosion.

"The amount of volcanic water," says Prof. Fairchild, "is enormous. Fouque determined that the amount of steam expelled from one of the numerous smaller cones of Mt. Ætna was equal in 100 days to 462,000,000 gallons of water. This equals 16 gallons for every square foot of a square mile, or a depth of 32 inches over an area of that extent. But the steam product of the single cone was probably not the one-thousandth part, perhaps not the one ten-thousandth part, of the whole product of the volcano during that time."

From this it appears that each of the principal active volcanoes of the world is now generating a quantity of water sufficient to form a good-sized flowing river, though it passes out of their craters in steam, instead of flowing down their sides. If one volcano at the present day can in three months produce a volume of water three feet deep over an area almost equal to that of Lake Erie, it is easy to conceive how the process of ocean making could have been carried on by volcanoes all over the world in the slow progress of geological ages. And that process is still going on and may account for the apparent sinking of the coast line of New Brunswick and other countries—the water may be rising instead of the coast sinking.

Another aspect of this interesting process of world-making is presented by Prof. Fairchild, who says: "The seas could not form until the atmosphere had accumulated sufficiently to hold sun heat that would give the earth a surface temperature above the freezing point. Below this temperature the water which was forced from the earth's interior must have frozen in or on the cold surface of the globe. It would seem as if there must have been a long stage of conflict between the interior heat and the superficial cold. In the early stages of the growing globe the water was forced toward the surface only to be buried under the in-falling material of world growth. Subsequently the pressure and rising temperature forced it farther southward."

I referred, a few minutes ago, to the moon, remarking that it was not till the earth had grown larger than our silver-cheeked satellite that it began to manufacture an atmosphere for itself. The moon is supposed to have no atmosphere, to be frozen and dead. According to the new theory of planetary formation, this is because its growth was arrested, in consequence of the scarcity of material, before it grew so large as to have gravitational power enough to retain the gases of which air and water are composed. Its development was arrested by lack of nutriment. It was planted too near the earth, which got a good start of it, and the earth drew to herself most of the planetary material in the region of their influence. And so the moon stopped growing before she could stand alone, so to speak. She is, not a dead planet, but a planet in an arrested stage of development. The sun, at the other extreme, may be merely an overgrown globe,—the spectroscope showing that it is composed of the same elements as the earth,—whose mass is so tremendous that pressure keeps its surface in so continuous a state of volcanic eruption that it is enveloped by a fiery atmosphere of gases thrown out from its interior. The spots on the sun may be the mouths of inactive volcanoes, seen through the gaseous envelope that surrounds that luminary.

This new theory of world origin also involves a new idea of climate from the earth's beginning till now. "Instead of the highly carbonated atmosphere of early geologic ages," says Prof. Fairchild, "according to the old theory, with slow decarbonating and cooling, culminating in the cold climates of the present time and pointing to a final winter, we can regard the past climatic conditions as not greatly unlike those of the present. We shall recognize that throughout geologic time there have been such variations in climate periods of cold and aridity or of heat and moisture as we know have occurred since the Middle Tertiary (about the time that mammals appeared on the earth)."

Just what has made these variations in climate is accounted for by the new hypothesis in this way: The oxygen and nitrogen of the atmosphere are transparent to "dark heat," while carbon dioxide intercepts and stores it. So the temperature of the atmosphere is largely due to how much carbon dioxide and water vapor are in the air. The carbon dioxide forms but one three-thousandth part of the atmosphere. But so exceeding potent is it that a very small variation makes a vast difference in climate. The amount of water vapor in the atmosphere intensifies the effect produced by the carbon dioxide. So the latter may be regarded as the climate maker.

It is shown conclusively by Prof. Fairchild that carbon dioxide comes from the earth's interior, instead of from organic sources, and it is assumed that the rate of supply from volcanoes, springs and other known sources is fairly uniform. But this gas is withdrawn from the air by rock decay and by vegetation, and is stored in rock strata and the sea. Periods of the earth's history when great expanses of land were elevated from the ocean and when extensive limestone formations occurred have been followed by cold climate, as these conditions absorbed carbon dioxide largely from the air. In this way the glacial age is accounted for—the age when an immense glacier slowly moved down the valley of the Miramichi, depositing boulders and scoring rocks in its progress. We have, in our museum, a specimen of rock from Bartibog Island that bears the footprints of this glacier. But subsidence of land and large increase in water area tend to bring about an excess of carbon dioxide in the atmosphere. Any enrichment of the air in this gas is like a blanket thrown around the earth, giving the atmosphere power to retain sun heat, and produces warmer and more uniform climate with greater moisture. Lessening the amount of carbon dioxide makes the air more transparent to reflected heat. The blanket is thinner, the temperature falls, the moisture decreases, and zones of climate are formed because the earth becomes more dependent on the direct heat from the sun which varies with the slant of its rays.

The ocean is an equalizer of climate, not so much because of the water vapor it sends up into the air, but because it is a great reservoir of carbon dioxide, containing 18 times as much as the atmosphere.

In the light of this theory the warm climate of the Tertiary period, when sub-tropical plants flourished in the arctic regions, is thought to be due to an excess of carbon dioxide in the atmosphere, instead of being caused by a molten interior and but recently modified fiery vapors in the air.

This opens an entirely new field in meteorology. If some means can be found of measuring the increase or decrease of carbon dioxide in the atmosphere, as the barometer measures the atmospheric pressure, forecasts may then be made long in advance of warm and cold seasons, and of periods of wetness and dryness.

On the same principle the coming of tropical periods, ages hence, or the advent of glaciers may be calculated as accurately as cold and hot waves are now predicted with reasonable certainty by the weather bureau.

Meteorology in the future will not be merely a study of air currents, of areas of high and low pressure; it will be a combination of chemistry and physics, of geology and astronomy.

And now, if you are not weary of following these speculations, let us go back to our first inquiry, How did we get here? That is, How did life originate on the earth? The generally accepted scientific hypothesis, the nebular hypothesis, carries with it the corollary that all our animal and vegetable life originated on this planet, because no life germs could have lived through the fiery incandescent vapors and molten nucleus of the infant earth. But the new hypothesis opens the door for a new speculation, and makes it possible and probable that life germs existed in the planetesimals that formed the dust cloud from which the earth originated—that life germs have come to it with the dust that has been drawn from the caves of space during the countless ages of its growth. These germs, like grains of corn found in Egyptian mummies, took root, grew, and flourished whenever and wherever the conditions in which they found themselves were favorable, as flower seeds, apparently lifeless in he frozen soil, rise from their lowly prison, deck themselves with garments of green, and blossom into loveliness, and breathe in perfume, under the caresses of warmth and moisture. The germs of life, the germs of all forms of life on the earth, may have been in it from its origin, or they may have come to it in planetary dust from other systems. This theory would be untenable but for the recent discovery that even the extremely low temperature of liquid oxygen does not destroy life germs. But for this discovery it would be taken for granted that such germs would perish, in the low temperature of interstellar space, in their flight from far-off systems to our own. When the earth had grown large enough, say about 100,000,000 years ago, to hold within its sphere of influence the gases that are the raw materials of air and moisture, and began to wrap around its shoulders an atmospheric garment for retaining solar heat, life germs began to develop, one form of life after another, vegetable and animal life, each kind arising whenever and wherever the conditions were suitable to its birth and preservation. According to this theory the origin of life on the earth was many millions of years earlier than would have been possible according to the nebular hypothesis of a gradually cooling mass of fiery matter and gas. Forms of life arose, lived for long ages, and were succeeded by other forms, as the result of climatic and other changes. Some of them have left their bones in the coal measures. The rocks testify of them. We have their skeletons, and they tell us of the state of the earth when they lived upon it. And finally, millions of years, perhaps, after the first animal had basked in the sunlight of earthly life, and probably a million or more years ago, man appeared. His origin is no more mysterious than the origin of any other animal, no more mysterious than the origin of any plant or vegetable. He is only a grain of sand on the shores of the great ocean of life. He arose at different times, on different continents, of different degrees of intelligence and with different habits, when the earth had become fit for his habitation. In one country he was a cave-dweller, in another a mound-builder, in another something else. In one place he lived on shellfish, in another on fruit. In warm countries he went naked, and in cold ones he protected himself with the skins of wild beasts. Whole races—countless millions of human beings—have inhabited the earth—laughed and loved—feasted and starved—warred and worshipped after their own ways and according to their own lights, and then perished. Some were pigmies and some were giants. Some were black and some white, some intellectual and some bestial. Remains of their ruined dwellings, relics of their rude weapons and household utensils, have been found deep under the surface of the ground, showing how earth has grown, by the accumulation of planetary dust, since they were left on its surface by a dying race of human beings.

Are the races that now inhabit the earth to perish, like their predecessors, and be succeeded by other races? Is the human race itself to vanish and leave the earth to a higher and more intelligent type?

The great mystery, the origin of life itself, is unknown and unknowable. Men have professed to know, many men think they know, but their professed profundity of knowledge is only an eloquent proof of their wealth of imagination. It is a growing opinion among investigators of natural phenomena, an opinion that, in spite of the mighty influences to the contrary, is becoming a conviction,—a conviction that is strengthened by the fact, already explained before this Association by Dr. Cox, that there is a time in the embryotic life of animals when different species are as one, a stage of development when even serpents and birds are alike, and when it is uncertain whether they will grow up as birds and wing their way through the pure air, or into snakes and crawl upon the slimy earth—it is a growing opinion that life and matter are co-existent and eternal; that all the different forms of life are but different combinations and developments of one life germ or essence; that, instead of different species having been created or planted where conditions were suitable for them, and with organs and capacities suited to the environment, they have arisen from, or been produced by, their environment.

Life is the one great mystery, an all-pervading mystery. Life is everywhere, even in the output of the fiery furnace of the iron mill. Look at a steel rail. What kind of a home is that for a living thing? But life has been discovered is such a dwelling place. The eternal and indestructible life principle has asserted itself even in the heart of a steel rail. A creature has been born there, breeds there, and lives there, slowly but surely consuming the walls of the house in which it dwells and destroying its usefulness as a rail. How did it get there? Is it not the offspring of the life principle that belongs to matter? The life principle asserts itself, but the nature of the steel rail governs the size and shape and character of the creature that is produced within it, just as excessive moisture produces swamp and jungle, and swamp and jungle produce saurians and beasts of prey.

Visit the electric light works, to see how light is produced, and you will see wheels and drums and shafting revolving rapidly for its production, driven by power—mechanical energy transforming the darkness of night into the light of day. Take a seat in a railway carriage, Monday morning, and travel from ocean to ocean, from Atlantic to Pacific, before the coming of Saturday night, drawn by giant locomotives—past the Great Lakes, over the prairies, through the Rocky Mountains, among the hills of British Columbia, Make a voyage in an ocean steamship, and go tearing through great seas on the bosom of the mighty deep, night and day, day and night, in the teeth of the gale, regardless of the storm. Watch the throbbing, listen to the heartbeats, of the powerful engines that drive the ship so swiftly. What mighty magic is it that turns the machinery, gives wings to the locomotive, and drives the great steamship? It is only steam, you say. And what is steam? Merely water expanded by heat. In the drop of water that sparkles as dew on the bosom of a flower that opens under the caresses of the morning sun, in the teardrop that wets the cheek of beauty in distress, is the mighty power, the great magician, that calls forth the electric light, hauls the train and drives the ship. And so why may there not be, in a microscopic cell, all the potency and productiveness of life in all its myriad forms? The creation of such a life germ in the beginning, with such powers of multiplication and combination, carrying within itself the wondrously beautiful and manifold forms of life, and the laws of mind and matter, would be a greater miracle, an even more astounding manifestation of creative power, than "to speak a world from naught."

There is no irreverence in this hypothesis. For whether we believe that life has been sent to us through the immeasurable immensities of space, or whether we believe that matter was endowed with the potency of life in the beginning, or whether we believe that the Great Husbandman plants it here and there whenever and wherever the soil and climate are ready to receive it and perpetuate it, or whether we believe that man came upon the earth as he is now or has been evolved from a lower animal type, yet we all bow with wonder and reverence and humility in the presence of the great mystery, and feel that it is beyond human comprehension.

We see individuals, races, species, perish, but life lives on. We know that suns, with the worlds (inhabited, no doubt, by sentient beings) that are warmed and lighted by them, have their day and are resolved into the dust and gases of which they are composed, and we know that their birth, life and death are all in accordance with the immutable laws of their being. We know that, so far as this body of ours is concerned, we are as the flower that fadeth and the grass that withereth, but we hope and trust that our inner consciousness, our individuality, is eternal, that we have souls that are immortal, and that we shall, when life's fitful fever or happy dream is ended, wing our way to some realm of glory and delight, learn all things, and be happy evermore.

LIZARDS AND SALAMANDERS OF CANADA.

By Philip Cox, Ph. D.

Scincidæ.

Body covered with scales and dermal plates. Ovoviviparous. Non-aquatic at any period of life. Limbs four, ribs cartilaginous.

Eumeces quiuquelineatus Linn.

Blue-tailed Lizard.

It is probably the only true lizard indigenous to Canada, the numerous species of the genus being of southern range. It occurs sparingly in the peninsula between Lakes Erie and Ontario, and as far east as the County of Peterboro, where it was collected and described by Cephas Guillet in the Ottawa Naturalist, March, 1903, p. 39.

The Smithsonian Institution, Washington, contains a specimen, No. 4135, from "Eastern Nova Scotia," but recent writers on the herpetology of the province, notably L. H. MacKay, LL. D., do not include it in their lists, nor make any reference whatever to its former alleged occurrence. Vide "Batrachians and Reptiles of Nova Scotia" by A. H. MacKay, Proceedings of Nova Scotia Institute of Science, Vol. IX., 1895-6.

It would be interesting to ascertain the facts connected with this record. The late J. M. Jones, who wrote many articles on the fishes and reptiles of that province, published the "Naturalist in Bermuda," in which he described a skink indigenous to the island. Was this specimen referred by himself or some subsequent student to the Smithsonian authorities, who erroneously labelled it from Nova Scotia? The fact remains that there is no well-authenticated record of any having been found on the peninsula.

E. septeutrionalis Baird, a closely allied form, may occur in southern Manitoba and Saskatchewan, for it has been collected in northern Minnesota.

Proteidæ.

Lizard-like forms with smooth, scaleless bodies, aquatic or semi-aquatic for the whole or a part of their lives, and undergoing metamorphism, the young being more or less unlike the adults.

Necturus maculatus Rafinesque.

Mud-Puppy.

This salamander is entirely aquatic and seems to be a form of arrested development, for it retains in the adult stage the external gills of the batrachian larva, and the limbs are short and weak.

Its favorite habitat is ponds and the muddy beds of rivers, and like all reptile forms it presents many color-patterns according to the character of the bottom on which it lives. Very dark specimens are taken from streams tributary to Lake Huron and in other sections of Ontario, which were described by Dr. J. G. Garnier as a new species, *N. huronensis*, but apart from the color due to local conditions, they possess no structural variations from the specific type sufficient to warrant the recognition of a new species.

The Mud-Puppy is fairly common in the neighborhood of the Great Lakes in Ontario, and it has also been collected in Manitoba. It does not occur in the Maritime Provinces. Additional data: Ontario (J. Macoun); common throughout Ontario Nash).

Amblystoma Tschudi.

Salamanders of large size. Tongue attached by its whole base, the lateral and anterior edges slightly free. Mucous pores on the ante—and supra-orbital parts. Parotoid region enlarged and thick. Fingers and toes free without natatory membrane. Tail rather short, but deep.

Amblystoma punctatum Linn.

Great Spotted Salamander.

This is one of the most easily recognized of all our salamanders, as the series of large yellow-to-orange spots on a dark back-ground makes it a conspicuous object. With the possible exception of *A. tigrinum* Green, which replaces it on the plains and in the mountains of the west, it is the largest, and is fairly well distributed over Canada from the Atlantic to the prairie country. Its structural characters, including even the coloration, are remarkably constant, stamping it as an ancient form limited to a region throughout which nearly uniform physical conditions prevail. Additional data: Nova Scotia (MacKay); P. E. Island (Vanwart and Cox); Ontario (Macoun and Nash). Common in New Brunswick. Occurs in the Gaspe Peninsula, P. Q.

A. tigrinum Green.

As remarked above, this species replaces *A. punctatum* in the west, but, unlike its eastern congener, is exceedingly variable. The lack of uniformity and stability in structural characters, and the equally irregular nature of its metamorphic phases, have occasioned much confusion in the scientific study of this species, and led to the multiplication of varieties or sub-species. Some individuals lose the embryonic and larval features long before attaining the adult size; in others they persist until the creatures are about full-grown, even the external branchiæ continuing functional. A collection made at Swansea, Kootenay District, B.C., which I examined most carefully, exhibited these differences in a surprising manner—small specimens a few inches in length entirely divested of all larval features,—others twice as large, indeed about full grown and still essentially larvæ. Altogether the form is decidedly protean, and its careful study ought to shed much light on many vexed questions of metamorphism.

Additional data: Ottawa (Dr. Bell); Smithsonian Inst. Collection. Manitoba (Macoun). Ontario (Nash).

A. jeffersonianum Green.

No more perplexing question confronts the Canadian herpetologist than to decide if this species is really Canadian in its range. It is so variable; has been described by so many authors from varying forms, and the nomenclature is so confused that it is no easy matter to ascertain what is the real type even of *jeffersonianum*. In Canada all the forms would seem to arrange themselves under three subspecies, *laterale*, *fuscum*, and *platineum*, the first being the dominant one, but Hallowell's *fuscum* is not allowed even as a variety by some distinguished herpetologists.

As far as my studies go, and they have not been inconsiderable in this field, *laterale* is the most common type; specimens approaching *platineum* are less common, but DeKay's *granulata* seems also to occur, if it be not the typical *jeffersonianum*. Large specimens appear to blend the alleged specific characters of the last two, and hence I conclude that *three* varieties are here represented, the degree of their occurrence being in the order of their names. But what is to be said of the perplexing mingling of characters in numerous individuals, forming almost imperceptible links between the three extremes? It is clear that the form is protean to a large extent, but are the extremes of variation entitled to subspecific rank? If limited respectively to geographical areas and overlapping only on the borders such rank could be fairly claimed; but as one district appears to exhibit a commingling of all the forms with numerous intermediate links the question assumes more and more that of individualism.

Additional data: Ontario (Drs. Beadle and Garnier). Smithsonian Collection.

A. j. laterale Hallowell.

A form very common throughout the Maritime Provinces and the Gaspe Peninsula, and extending west as far as Hudson Bay. Additional data: Ontario (Macoun).

A. j platineum Cope.

I have retained this doubtful subspecies for reasons already given, and on the authority of Dr. Cope, who identified one collected on the shore of Hudson Bay. Vide Smithsonian Collection No. 5368.

A. Macrodactylum Baird.

This salamander has some features linking it to the last, notably proportions of body and limbs, but possesses peculiar characters sufficient to entitle it to specific rank. It is indigenous to the Pacific slope of southern British Columbia. Additional data: Vancouver Island (Macoun).

A. paroticum Baird.

I have been unable to obtain a specimen for study. but this species is undoubtedly Canadian in range. Professor Macoun, Head Naturalist to the Geological Survey, Ottawa, informs me he collected it on Vancouver Island, and the Smithsonian Institution contains a specimen from the coal mines in the same place.

A. decorticatum Cope.

I have no personal knowledge of this alleged species, but freely accord it a place in this monograph on the authority of Professor Macoun, who has specimens from British Columbia. Professor Cope's type seems to have been Alaskan. It will be no surprise should it prove to be a variety of the last.

Dicamptodon Straunch.

Tongue more completely attached by the base. Palatine teeth in two arched series, separated by a wide interval. Skin smooth; parotoids and costal grooves faintly indicated.

Dicamptodon ensatus Esch.

This is a very doubtful form, but is alleged to be British Columbian. I have no specimen nor any personal knowledge of it. but retain it as a doubtful species. It is so exceedingly rare. that it may prove an abnormal form of some other species.

Batrachoseps Bonaparte.

Tongue free behind and laterally. Costal folds about 19; body long and slender.

Batrachoseps attenuatus Esch.

Said to occur in British Columbia. but I cannot quote any competent authority. I have no knowledge whatever of the species.

Hemidactylium Tschudi.

Toes rudimentary, one of the four nearly obsolete. Otherwise much as in *Batrachoseps*.

Hemidactylium scutatum Tschudi.

This pretty little salamander bears a general resemblance to *Plethedon cinereus* in form and coloration, but as its generic name implies the toes are reduced in number (4–4) and development. Like the next species, too, it is terrestrial in its habits, never depositing the eggs, as most salamanders do, in water. It is rare. Not found in the Maritime Provinces. Ontario (Macoun).

Plethodon Tschudi.

Tongue attached by median line. Teeth on the vomer, the two series separated medially.

Plethodon cinereus Green.

This species occurs sparingly in the Maritime Provinces associated with the more abundant and characteristic variety, *erythronotus*. Apart from the color of the dorsal stripe, I find no character distinguishing it from the latter, and the question naturally arises, is this, generally a very unstable one in creatures constitutionally sensitive in this respect, permanent, or does one color variety pass into another? Specimens half-grown, collected by the writer in the neighborhood of Kingston, N. S., were typical *cinerei* with the dorsal stripe uniformly dark brown, extending in decreasing intensity on the sides. On the other hand, some taken in Restigouche County, N. B., had the corresponding parts of a light liver color. Forms intermediate between this variety and *erythronotus* are rare, a strong presumption in favor of the separation of the two varieties; and unless experiment or new facts make out a very strong case in favor of individualism or the influence of special physical conditions, the conclusion seems to follow that the difference is founded in nature. The phenomena presented are opposed to what must follow from cross-breeding, which might be expected in the case of two closely related varieties, especially when one is very rare.

I have made no experiments with this variety to ascertain to what its coloration may be due and what its real relations to *erythronotus* are; but the subject is so interesting from a scientific point of view that it ought to be investigated. Ontario (Macoun); Hudson Bay Territory (Smithsonian Institution).

P. cinereus erythronotus Green.

Common throughout the Maritime Provinces, Quebec, Ontario, and westward to the prairies. Indeed this variety is so uniform in character and abundant under favorable conditions that it may be regarded as characteristic of Eastern Canada. Nova Scotia, MacKay; P. E. Island, Vanwart and Cox; Ontario (Macoun).

P. intermedius Baird.

This salamander appears to represent the last on the Pacific slope. It is, however, very rare; few specimens are known to science, and I was unable to procure even one for study. Hence I have no personal knowledge of the species. Vancouver Island (Macoun).

P. glutinosus Green.

Exceedingly rare in the southern part of New Brunswick, which marks the northern limit of its distribution. Old lists ascribed it to Nova Scotia, but no mention of its occurrence there is made by recent writers. It is also credited to Ontario, but Professor Macoun has not been able to collect it in that province.

Spelerpes Rafinesque.

Tongue free all round attached by a mere pedicel and capable of considerable protrusion. Digits long, slender and well separated. Species small and of slender body and limbs.

Spelerpes bilineatus borealis Baird.

I have met with this little salamander only in small brooks in the valley of the River St. John in York County. So far as I know it is the only Canadian station.

Desmognathus Baird.

Almost similar to *Plethodon* in external characters and appearance, but vertebræ opisthocœlous. Larval stage aquatic and prolonged.

Desmognathus ochrophœa Cope.

Another rare species which I have collected only in the valley of the St. John River, New Brunswick, under logs, bark &c., near the river margin.

Not having the author's description of this species its identification puzzled me greatly and finally I sent a specimen to him. In gratitude to this distinguished naturalist whose kind heart and facile pen were ever ready to help a humble plodder, I may be pardoned for inserting an extract from his reply, among the last letters he ever wrote, for his death took place a few months after: "The specimen of *D. ochrophœa* represents a variety with a spotted belly such as I never saw in the United States." It would seem then that this variety is peculiar to this section of Canada, and I have found the spotting of the under surface common and uniform.

D. fusca Rafinesque.

Though rarely meeting with the adult animal, I have collected the larvæ in many places in New Brunswick. It retains the embryonic characters longer, perhaps, than any other that is aquatic in its early stages; for specimens nearly full-grown are frequently met with the external brachiæ functional. The size, development of parts, and vigor of many of these would suggest the possibility of this salamander breeding while purely aquatic.

but I have no direct evidence that such takes place.

The dorsal band is lighter in color than in more southern stations.

I am not aware of its occurrence at any other station in Canada. Ten years ago I collected larvæ near New Carlisle, Gaspe, P. Q., which I have since identified as belonging to this species.

D. niger Green.

I have never met with this species, but include it in this list on the authority of Professor Macoun, who reports that it has been credited to Ontario, though he himself had never collected it. Considering the extreme southern range ascribed to it in the United States, its occurrence in Canada is somewhat of a surprise. I feel like risking the opinion that this Canadian *niger* will prove to be dark specimens of *fusca*, just as *N. huronensis* Garnier is a color variety of *N. maculatus* Rafinesque; for in my ichthyological studies I have also observed that many of the smaller fresh-water fishes are much darker in many parts of Ontario than in the east.

Diemyctylus Rafinesque.

Aquatic. Tail compressed, and provided with a dermal margin. Free swimming. Limbs stout, strong, especially the hind ones. One species at least terrestrial at one stage of development.

Diemyctylus torosus Esch.

This is a newt of which I have no personal knowledge, for although reported abundant in British Columbia all my efforts to procure a specimen for study proved unavailing. It is said to range from California to Alaska. Professor Macoun collected it on Vancouver Island.

D. viridescens Rafinesque.

Very common in all suitable ponds and lakes throughout the Maritime Provinces in all of which including Gaspe, P. Q., the writer has collected it. On the mainland it is remarkably uniform in size and coloration, but on P. E. Island it attains a larger size, and presents such variation in the proportion of parts, and in coloration as to call for special mention.

1. The average length is about 130 mm.
2. Much greater length from axilla to groin as compared with that from the muzzle to axilla.
3. Tail longer than head and body, vent included.
4. Profile nearly straight.
5. Crest-margins of lenticular space approximated and nearly parallel.
6. Sides of head less vertical, giving the appearance of greater width of jaw and less interorbital space.
7. The appressed limbs just touch instead of overlapping considerably.
8. The color pattern is complex. A dark stripe of coalescing spots along the side from the axilla to the end of the tail, restricted on the latter to the lower half of the lateral surface. A similar one above this on tail from a point above the insertion of the hind leg to the end of the caudal. The two separated by a yellow narrow stripe, and the inferior border of the tail also yellowish-white. This newt was found at only one station, Afton Lake, and is a strongly marked local variety. Nova Scotia (MacKay); Ontario (Macoun); Westward to Hudson Bay Territory (Smithsonian Institution).

b. V. miniatus Rafinesque.

The Red or Vermillion Est is but a seasonal stage of the last species and can usually be found in the immediate vicinity of lakes and ponds containing the aquatic variety. Its delicate form and bright colors, glinting and sparkling when exposed to the sun, make it as attractive and charming to the observer as its strange life-history is interesting and instructive to the naturalist. No example of *miniatus* was found by the writer in Gaspe where the aquatic forms occurred, which might imply that the terrestrial stage in development may not obtain in its most northern range.

FIFTH REPORT OF THE COUNCIL OF THE MIRAMICHI NATURAL HISTORY ASSOCIATION.

Membership.

Honorary members,	3
Corresponding members,	9
Members.	37
Associate members.	24
Total.	73

A number of members during the last two years have been lost by death and removal, but an equal number of new members have been elected, so that the number is about the same as in our last biennial report.

Financial Standing.

Balance on hand February, 1905,		$ 49 69
Government Grant 1905.		100 00
" " 1906,		100 00
Dues. membership fees,		38 50
		$ 288 19
EXPENDITURES.		
Contingencies,	$ 44 33	
Bulletin,	50 00	
Building Fund,	150 00	244 33
Balance on hand,		$ 43 86

Museum.

As one of the main objects of the Association is to establish a Museum representative of the Natural History and Archæology of the North Shore, considerable attention has been given to increasing and properly arranging the material of this department.

A reference to the list of donations will convey an idea of their character and value in this respect.

In addition to such, zoological specimens were from time to time prepared and given to the Association, these not always appearing in the records of the Society.

These comprise Botanical, Ornithological, and Ichthyological specimens, as well as others belonging to different departments of Zoology.

Whilst the museum collection represents good all-round work for a young Association, there are some lines of investigation along which for various reasons little has been done. One of these is the study and collection of the shell fishes and other marine animals of our coast waters, many of which are of considerable commercial importance, whilst others play an important part in furnishing food for the many valuable fishes resident in, or annually visiting, these waters.

The expense that such an investigation might entail may be too great for any member, however enthusiastic, to undertake, as dredges and various other appliances would be necessary, and it is recommended that, if the finances of the Association justify the step, a certain sum be expended for this purpose.

Archæology.

The Society is continuing to add interesting objects and relics belonging to this class, most of them obtained from various places on the North Shore.

Meetings, Papers, Lectures, Etc.

1905.

Feb. 13. Annual Meeting.

Feb. 20. The Moon. James Nicol.

Feb. 27. Ethnology of the British Race. Rev. J. M. MacLean.

Mar. 6. Ethnology of the British Race. Rev. J. M. MacLean.

Mar. 14. Monthly Meeting.

Mar. 21. Fresh Water Microscopic Life. J. Baxter, M. D.

Mar. 26. Desmids of Miramichi. J. Baxter, M. D.
Apl. 4. Diatoms of Miramichi. J. Baxter, M. D.
Closed on account of smallpox.
June 13. Monthly Meeting,
Nov. 11. Monthly Meeting.
Fishes of Bay du Vin River. Dr. Cox.
Dec. 12. Monthly Meeting.
Old Ruins on Bartibogue River. Dr. Baxter.

1906.
Jan. 9. Monthly Meeting.
Jan. 16. Conservation of our Forests. Dr. Cox.
Jan. 23. Evolution in the 20th Century. Dr. Baxter.
Jan. 30. Browning's Treatment of Immortality. Rev. J. B. McLean.
Feb. 6. Children of Genius. J. L. Stewart.
Feb. 13. Annual Meeting.
Feb. 20. The Beaver in Relation to N. B. Forestry. Dr. Cox.
Feb. 27. Insect Life with Camera. Col. Mackenzie.
Mar 6. The Living Body as a Machine. Dr. Baxter.
Mar. 13. Monthly Meeting.
Mar. 20. Ferns, their Past and Present. Dr. Cox.
Mar. 27. Insect Life with Camera. Col. Mackenzie.
Apl. 3. The Cell in Plants and Animals. Dr. Baxter.
Apl. 10. Monthly Meeting.
Apl. 17. Should Forest Owls be Protected? Dr. Cox.
Apl. 24. Ethnology of the British Race. Rev. J. M. MacLean.
May 1. Astronomy. Rev. Fr. Doucet.
May 8. Monthly Meeting.
Geological Notes, Paper. Geoffrey Stead.
May 15. Old Sol. James Nicol.
May 22. Minas Basin. Dr. Hannay.
May 29. Our Game Birds, their Lives and Habits. E. W. Jarvis.
June 12. Monthly Meeting.
Nov. 12. Monthly Meeting.
Dec. 11. Monthly Meeting.

1907.

Jan. 8. Monthly Meeting.
Jan. 15. New Theory of the Earth's Origin. J. L. Stewart.
Jan. 21. Books. Dr. Baxter.
Jan. 29.
Feb. 4. Development of the Science of Geology. Dr. Cox.
Feb. 12. Annual Meeting.

Donations to the Library.

Records of Australian Museum. Sydney, N. S. W.
Canadian Birds, Part I. Professor J. Macoun, Ottawa.
Yearly Series Ottawa Field Naturalist. Ottawa.
Canadian Entomologist.
Exploration East Coast Hudson Bay.
Proceedings Boston Society Natural History. Boston.
Great Landslide at Frank, B. C.
Proceedings Linævian Society, New York. New York.
Report Geological Survey 1900. Ottawa.
Minutes and List of Members Mir. Mechan. Inst. 1836–1869. Andrew Brown, Chatham.
Proceedings Canadian Forestry Association. Ottawa.
Ancient Egyptian Medical Prescription. Dr. Baxter, Chatham.
Report Minnesota Academy Natural Science. Minn., U. S. A.
Description of Certain Plants. Smithsonian Institute, Washington.
The Passenger Pigeon. Historical Society, Manitoba.
Report Boston Natural History Society. Boston.
II Canadian Entomologist.
Report Boston Society Natural History.
Bulletin New York Botanical Society.
Report Central Experimental Farm.
Australian Museum.
Ottawa Field Naturalist.
Geological Report. Ottawa.

Donations to the Museum.

Relics of Miramichi Fire. R. R. Call, Newcastle.

Shells from John O'Groat's. Mrs. A. Leishman, Chatham.

Freak Growth of Beech Tree. E. W. Jarvis, Chatham.

100 Specimens of Minerals. Dr. Bell, Ottawa.

Mounted Four-legged Chicken. E. Hutchison, Douglastown.

Asbestos. H. Brobecker, Chatham.

Beaver Trap dredged up in Miramichi River. Fred Fowlie, Black River.

Samples of Aged Building Materials. J. Y. Mersereau, Chatham.

International Ship's Code. Pilot Club, Chatham.

Greenland Sculpin. Samuel Ball, Chatham.

Italian Asbestos. E. J. Lay, Amherst.

Shells of Amazon River (collected by Prof. Agassiz). John A. Wilson, New York.

Lava, Mount Vesuvius. Miss Ida Haviland, Boston.

Fossil Rush. Col. J. D. B. F. Mackenzie, Chatham.

Metallic Relics from an old grave. Dr. A. C. Smith, Tracadie.

Curlew. Seymour Williston, Bay du Vin.

Unidentified Tooth of large Mammal (found at Chatham). Mrs. McLeod, Bay du Vin.

40 Pressed Plants. Dr. Cox, Chatham.

Specimens of Fishes from Bay du Vin River. Dr. Cox.

One Deep Sea Crab. John MacHardy, Lower Newcastle.

Ear Bones of Two Varieties of Whales. A. Miles, Newfoundland.

Blistered Stone, found in Chatham. A. MacKay, Chatham.

Old Stone Handmill, Burnt Church. Wm. Anderson, Burnt Church.

Pistol found in old camp back of Douglastown. Miss Ida Jessamin, Douglastown.

Skull of Porpoise. Miss Ida Jessamin, Douglastown.

Freak Growth of Birch Tree. Wm. C. Stothart, Lower Newcastle.

Old Kitchen Relics from Ruin on Bartibogue River. J. Robinson, Chatham.

Historic Relics from Louisburg. A. Brown, Chatham.

Sea Urchin. Miss E. Simmonds, Chatham.
Beaver-gnawed Section of Tree. Sheriff O'Brien, Nelson.
Samples British Columbia Minerals. Mrs. H. McKinney.
A Medal. Numismatic Society, Montreal.
Petrified Wood. E. P. Williston, Newcastle.
Old Bayonet, Fort Cumberland. C. Warmunde, Chatham.
Fossil Shark's Tooth. Mrs. R. Ritchie, Newcastle.
Norway Lemming. W. P. Gibbs, Hjerpen, Sweden.
Two Rare Plants. Wm. Crawford.
Case of Alabaster Specimens. C. J. Osman, Hillsboro.
Stalactite from Cuba. Capt. Barker, S. S. Basuto.
Large Iron Harpoon, Two Mile Brook. Dr. Cox
An Old Horse-head Timber Axe. Dr. Cox.
Large Nest of Mason Bee. Wm. Tait, Chatham.

EXCHANGES.

Name.	Place.
Trustees British Museum,	London, England
Royal Society,	London, England.
Royal Colon Institute.	London, England.
Biological Society,	Liverpool, England.
Marine Biological Association,	Plymouth, England.
Lancashire Sea Fish District Marine Laboratory,	Piel, Barrow-in-Furness England.
Royal Society of Canada,	Ottawa.
Entomological Society of Ontario.	London, Ontario.
Natural History Society,	Montreal, P. Q.
Historical and Scientific Society of Manitoba,	Winnipeg.
Nova Scotia Institute of Natural Science,	Halifax.
Canadian Institute,	Toronto, Ont.
Natural History Society of British Columbia,	Victoria, B. C.
New Brunswick Historical Society,	St. John, N. B.
New Brunswick Natural History Society.	St. John, N. B.
Australian Museum,	Sidney, N. S. W.
New Zealand Institute,	Wellington, N. Z.
Smithsonian Institute,	Washington, D. C.
Leland Stanford Jr. University,	Palo Alto, Cal.
Boston Society of Natural History,	Boston, Mass.
Gray's Herbarium, Harvard University.	Cambridge, Mass.
New York Academy of Science.	New York.
Linnæan Society of New York.	New York.
American Museum of Natural History,	New York.
Natural History and Antiquarian Society,	Charlottetown, P. E. I.
Geological Department, Ottawa,	Ottawa, Ont.
Fredericton Natural History Society.	Fredericton, N. B.
Mount Allison Academy,	Sackville, N. B.
University of New Brunswick.	Fredericton, N. B.
Iowa Academy of Science,	Des Moines.
Academy of Natural Science.	Philadelphia.

Minnesota Academy of Natural Science,	Minneapolis.
California Academy of Science,	San Francisco, Cal.
Societie Scientifique du Chile,	Santiago.
Royal Academy of Science,	Stockholm.

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Librarian—Miss B. M. Creighton.
Curators—Col. J. D. B. F. Mackenzie, A. Adams, W. M. Robertson, Dr. P. Cox.
Additional Members of Council—G. Stead, H. K. Austin, W. T. Denham.

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PROCEEDINGS

OF

MIRAMICHI NATURAL HISTORY ASSOCIATION.

NO. VI

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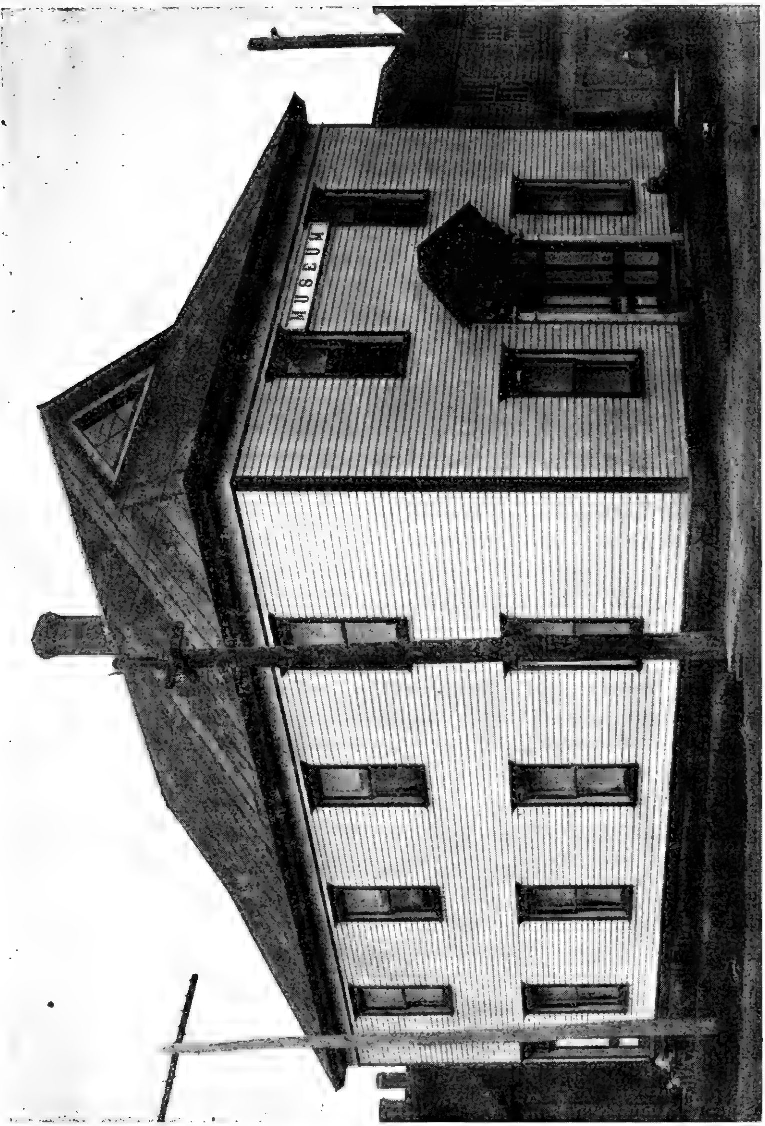
1911.



MIRAMICHI NATURAL HISTORY BUILDING.

PROCEEDINGS

OF

MIRAMICHI NATURAL HISTORY ASSOCIATION.

NO. VI.

CHATHAM, N. B.:
THE WORLD PRESS.
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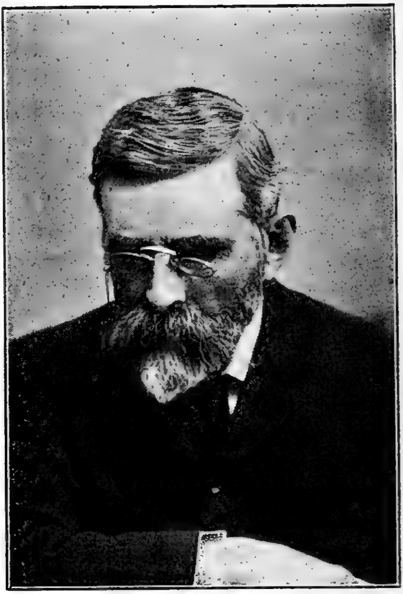


J. L. STEWART.
President Miramichi Natural History Association, 1909-11.

APOLOGY.

An apology is due to our readers for the delay of this Bulletin in appearing, and also for the large amount of matter of mere local interest in its contents.

In order to frame this apology it is necessary to glance over the past history of the Association.

This Association was founded in 1897 with 84 members. The place of meeting was the brick school house in Henderson street, where the rudiments of its then small museum could easily be accommodated. After two or three years, application was made to the Dominion Government for the use of the old stone post office, then vacant, in Water st. This permission was granted, and the Association, after making large repairs to the building, moved in and set up its museum, which, by this time, was assuming quite creditable importance. Here they remained for some years, until they were suddenly informed that the Government intended to sell the building. The Association made a bid for it, but failed to get it. They then moved the museum back to the (at that time) unoccupied brick school house, where it remained two years.

The amount of museum material was now large, and the building was in a leaky condition, so that all the material was more or less injured and some of it destroyed. No remuneration was made, nor asked for indeed, for the repairs placed on the post office building, and the Association, very much discouraged, applied to the Town Council for the use of their Council Chamber as a temporary lecture room. This was granted, and for some time meetings were held there, while the museum material was going to destruction in the school house.

Things looked "blue" for us then. But every cloud may have a silvery lining. A resolution was passed to erect a suitable and permanent building, a home from which we could not be kicked at the will and pleasure of anyone, and during the last three years all our efforts have been in that direction, until now we are able to say we have a suitable building of sufficient capacity and fitted up for advanced work in our line, and every dollar paid on it.

It is lighted with electricity, and special wires have been put in for a large $250 reflectoscope, which we hope soon to have and towards which we are now working

This is one reason why the Bulletin was delayed. A cut of this building is the frontispiece of this number.

Another reason must be stated for the character of the contents of this Bulletin. It is this: Of our former contributors, one has accepted a chair in a University, and left us; one has moved to the Pacific coast; one has moved East, still further, and also left us; one has died; one pleads loss of memory from growing old age, and about all the others plead dearth of new material.

So what is to be done?

Simply this. We will give the readers what we have, hoping that this cloud also may have a silver lining and that something better may be in store for us.

May our exchanges kindly have a little patience with us now that they know our straits, and we will do better as soon as we can.

SHIP FEVER IN 1847.

BY DR J. McG. BAXTER.

Nearly 64 years ago there was a great deal of immigration to Canada, and either from some European focus, or spontaneously from the crowded ships during the long passages, typhus or ship fever broke out simultaneously in several ports, such as St. John, N. B., Chatham, N. B., and Quebec. Sixty-four years is a long time ago, and those that were in adult years at that time have mostly passed over to the majority, and if one wishes to get information about circumstances that occurred at that time, from those that were there, he should not waste time but carpe diem, for these old gentlemen will soon go on the lonesome voyage and will not wait to be interviewed.

These notes are what I have been able to pick up in this locality

Rev Hugh McGuirk was 87 years of age the 18th of December last, yet is straight as an arrow, quick in his movements, has a wonderful memory, and converses with equal readiness in Latin, French and English. He was born in St. John, N. B, was ordained a priest in Quebec by Bishop Turgeon the 13th of May, 1847, and four days later, viz. May 17th, was sent to attend the ship fever patients at Grosse Isle, where he stayed five weeks till he took the fever himself. He says: "When I went there, Father McGauvern had been there ten days and left when I arrived. I was then left there alone to attend to all those people, and had to work night and day, and never had time to go to bed, but remained dressed to answer calls at any minute. People were afraid, and would not come near the poor people. I kept this up for five weeks, till I suppose the disease, making its appearance, or from an overstrained nervous system, I had to be carried around to the bedsides in a chair. As nearly as I can recollect there were twenty-five or thirty ships lying there. At last they got another priest to take my place, and I was taken to the Marine Hospital at Charles River. During the last five days of my stay at Grosse Isle, there were 300 deaths a day. I do not know the total number of deaths. I was then taken to the Marine Hospital, and was sick for six weeks and very nearly died. After I recovered I attended the rest of the sick there all summer till the autumn. These were ship fever cases, and the General Hospital was full, and a number (I do not know how many) military tents were set up in the grounds."

This statement, although not connected with the object of this paper, viz., Ship Fever at Middle Island, I thought I might as well put in here, and it will be a note for the man that writes up Ship Fever at Grosse Isle.

In May, 27th or 28th, the brig Richard White arrived in this port, having small-pox and ship fever aboard. Although James Desmond does not think so, as his statement shows he thought there was only measles aboard, but why then should she be quarantined so long? And observe also Mrs. Hawbolt's statement.

STATEMENT OF JAMES DESMOND, ESQ., CHATHAM.

I came out to this country in the brig Richard White. We sailed from the city of Cork, Ireland, and were about six or seven weeks at sea, and arrived here about one week before the bark Loostock, viz., about May 27th or 28th in the year 1847.

There were about 45 or 50 passengers besides the crew. Many were sick on the way out, but principally from sea sickness. I don't think there was any ship fever on board. A sister of my own died on the way out with measles. We were all landed on the Island and put in quarantine. I was sick myself after being put on the Island, but think it was only exhaustion from the long voyage. Dr. Vondy attended the sick on the Island. There was one woman died on the Island, but I do not know what was the matter with her. We lay in quarantine about five weeks, and there were about twenty sick altogether. We were in tents on the west end of the Island. Dr. Vondy died after we left the Island. Rev. Jno. Sweeney was the clergyman who visited us, he who was afterwards Bishop of St. John, N. B.

STATEMENT OF MICHAEL DEE, CHATHAM

I was a passenger on board the bark Loostock, a craft of about 800 tons, built at St. John, N. B., and on that voyage sailing from Liverpool, England, to Quebec. I was at that time about 20 years of age. We were seven weeks and four days on the voyage, but as sickness broke out among the passengers the captain considered it advisable to make for the nearest port, which was the Miramichi. There were 800 passengers, of whom about one-half died, either at sea or after they arrived here The mate, whose name was McCully, was exceedingly kind to the passengers in their distress. He stood at the gangway and handed them down one after another into the scow that brought them ashore, and after they got ashore gave them personally all the attention he possibly could. He caught the fever himself then and died, and was buried on Middle Island. The captain, whose name I do not remember, but who was a native of St. John, N. B., was sick himself before we arrived here. A pilot spoke us in the Straits, but when he found there were fourteen or fifteen lying dead on deck, and a lot more sick, he made off. The captain then sent all the bodies below, and said the next pilot would know nothing about it till he was on board. The pilot that brought us in was a man by the name of Petterson, whose son now lives at Bushville, but he himself is dead Petterson then asked the captain where his sailors were. He said they were at the bottom of the ocean. The pilot said somebody must go aloft and loosen sail. The captain then, although sick himself, with a handkerchief tied around his head, went aloft and let go the sails. We then came up to Middle Island and lay there in quarantine for about one month. Then the bark was fumigated and proceeded to St. John, but most of the passengers had had enough of her and they proceeded to St. John in schooners. The captain of the Loostock recovered. I think there were about 200 or 250 persons died and were buried either at sea or on Middle Island. Drs. Key, Thompson and Vondy attended the sick there on the Island. Dr. Vondy, who was exceedingly kind to the sick, feeding and moving them into comfortable positions. &c., took the disease himself and died. His body was taken up the river at night in a boat and was buried at St. Paul's graveyard, three miles above Chatham. The Bollivar and the Richard White were lying in quarantine with us at the same time, but with different diseases. A man by the name of Ryan, and also the steward of the ship, jumped the quarantine and swam ashore, and I heard that Ryan died and his body was found in the woods. I was sick all the passage, and all the month on the Island. They had old sheds like barns for the sick, and you could see outdoors through the cracks, so that they were little protection. The date was June, 1847, and the disease ship fever or typhus.

MICHAEL DEE.

In regard to Dr. Vondy's death, I have the following letter from Judge Wilkinson:

Bushville, 10th May, 1908

DEAR DOCTOR: I am afraid the within enclosed pencillings will hardly give you the information you want. I copied them from the tablet in the porch of the church and from the memorial stone in the graveyard this afternoon. In the blank before the words ——Ship Loostock, the stone is all crumbled and broken, so that I cannot tell what was there. I think, however, it was the name of the country to which the ship belonged—as Norwegian or German ship. My father-in-law's (Rev. Mr. Bacon's) diary says the funeral was 2nd July, 1847. The records of the sessions of that date I should think would give you the other particulars.

Yours truly,

WM. WILKINSON.

Tablet erected in the porch of St. Paul's Church, Chatham, N. B.

"In memory of J. Vondy, Esq., of this place, who in the faithful discharge of his professional duties fell a victim to a malignant fever which prevailed on Middle Island among the passengers of the Looshtauk."

From the memorial stone in St. Paul's churchyard.

"This monument was erected as a public testimonial of respect to the memory of John Vondy, Esq., surgeon of this place, who in the faithful discharge of his professional duties fell a victim to a malignant fever which prevailed on Middle Island among the passengers of the —— —- Ship Looshtauk. His remains were interred in this burial ground, July 2nd, 1847."

W. WILKINSON.

The above name Looshtauk is probably spelled as it is on the monument.

The following statement is from Dr. Vondy's sister. Mrs. Chas. Hawbolt, who went to the Island to nurse her brother. Her statement, I think, may be entirely depended upon, as she is bright and clear, mentally, and more especially as, strange to say, she had a small memorandum made at he time. I enclose it in lines. It justifies my doubt of the correctness of the 800, as it seems there were little over half that number on board, and it corroborates the large number of deaths. After going on the Island she was quarantined for twenty-one days. Her brother, Dr. Vondy, was unconscious when she arrived, and did not last long, but died and was buried as in Dee's statement. She speaks of a good many abuses that were complained of such as appropriation of the passengers' money, &c., which need not be mentioned now, as no good would be gained thereby.

MRS. CHARLES HAWBOLT'S STATEMENT.

"I went to the Island to nurse my brother, Dr. Vondy, who was ill with the fever. He was unconscious when I arrived. We were at the southwest part of the Island. I still have a memorandum made at the time in my possession. It is this:

June 3rd. 1847. The bark Loostock arrived.
Left Liverpool with 467 passengers.
117 died on the passage.

I do not know how many died afterwards. The captain's name was Thayne, of St. John, N. B. The Loostock's passengers were in fish sheds on the northeast corner of the Island. The vessel was overcrowded, and the passengers were crowded down in the hold like cattle. There was not one person entirely well in all that number when they landed. I was not allowed to leave the Island for twenty-one days. The passengers of the Richard White (barquentine, I think) were put in tents over near ours on the southwest part of the Island. I do not know what disease they had. Drs. Key and Thompson attended the sick. There was much mismanagement and dishonesty charged against those in attendance. The patients were cheated and badly fed and cared for. They were a superior class of persons, and had considerable money on them, all in gold. When they sent to town for the smallest article they got no change back."

I then heard that there were one or two old men at Barnaby's River that might know something about the matter, and I wrote to Rev. E.J Bannon, parish priest, and the following is his reply:

INFORMATION OBTAINED FROM REV. E. J. BANNON, P. P., BARNABY RIVER, NORTH'LD CO.

Nov. 8th, 1908.

"I do not know any person up here who was in the Loostock. The father of John Shea was a passenger in the vessel, but is dead. However, I consulted Michael Meagher, who is 80 years of age He had some interesting items that indirectly might be of interest, and I put them down in about the manner he related them. He came to this place in the cutter (fast sailer) called the John Hawkes. He sailed from Limerick and arrived at the Island (Middle Island) 7th June, 1847. They had 147 passengers aboard and several cases of fever. They had no doctor aboard, and the captain did the best he could. He heard no complaints of want of water or food. A child was born on the way out and twenty persons died. One was his own brother. When they arrived at Middle Island the Loostock was there in quarantine, with another brigantine from Cork. This last had small-pox and fever aboard also. The passengers heard that they would be examined by the doctors and probably sent to the Island, a thing they dreaded. With three others he swam ashore at 12 o'clock at night. They landed at Cunard's mill and the brewery. They thought Chatham was a large town or city, and they were surprised the next morning to find out—1st, That they had passed through Chatham; 2nd, To see the good ship, the John Hawkes, coming up the river with all flags flying, &c. The first people he met were Johnston Barnet, Ephraim (Abrum) Lacey, Michael Quilty (Bartibogue), John Cain and John Lahey. He was surprised to see the number of coffins sent down to the Island."

There was one more ship to account for, viz., the Bollivar She was a barque that traded here regularly in lumber and timber for the Gilmour & Rankine concern. I had the name of the captain, but have mislaid it and cannot find it now. The following is

JOHN BROWN'S STATEMENT.

"I remember the bark Bollivar. She came in here about the middle of June, 1847, with ship fever aboard. She had I should say about 250 passengers. I do not know how many died. I was a boy working for Hon. Joseph Cunard at the time, and he used to send me down with several large tin cans of milk for them every morning I used to drive down opposite the Island, and they came over in a boat to get the milk Sometimes I used to go back with the boat to the Island to see the people that were sick. The Bollivar's passengers were not allowed to mix with those of the Loostock. The Bollivar was three weeks or more in quarantine, and then was fumigated and towed away. Five of us went down one night to steal Miss Vondy (now Mrs. Hawbolt) out of quarantine, but the guard took us and we had to stay there. I helped to make the beds for the Loostock's passengers These were just planks laid on the ground, with one plank on edge between each bed and the next. I saw fifteen of the Loostock's passengers buried in one square hole. They had canvas wrapped around them up to the neck, and were then laid in the grave. Five years after Cunard's horses were pasturing on the Island, and I went down to bring them up. One of them in galloping across the Island, put his foot down into one of the graves, and in pulling it out brought up a Glengarry cap full of human hair. So the graves were not deep."

JNO. BROWN.

In digging for the sewer pipe for one of the hospitals the men came on a pile of human bones, which were put together and reburied. Thus only by accident will we ever know where these unfortunates were buried.

After this time we had no ship fever till 1899, when the bark Lilly, Capt. Olsen, from Para, Brazil, came in. The following is what I have gleaned in reference to her:

STATEMENT OF HARRY BROBECKER, NURSE, WHO ATTENDED THE MEN ON MIDDLE ISLAND WHO WERE LANDED FROM BARK LILLY.

"I was sent for to go to Middle Island to nurse the men that were sick and placed on the Island in quarantine. There were three of them. Two recovered and one died. I do not remember the year, but I think the month was June. The captain's name was Olsen. I understood they had yellow fever. When I got there one man was dead. The others remained on the Island, one of them for two weeks and the other for a l ng time, I think until fall. Then he was removed to the Marine Hospital and from there he went to the Hotel Dieu. Rev. D. Forsyth came on the Island and held the funeral services, and the captain and crew attended He was buried on the Island. The bark remained twenty-one days and then she was fumigated and proceeded to Newcastle and Nelson to take on cargo."

H. BROBECKER.

The above is not exactly correct as to dates, as will be seen from the following certificates. The bark Lily evidently arrived some time about the 1st of July, because the certificate of burial dates July 4th, and she did not remain twenty-one days in quarantine, as she entered in the customs July 11th. I give these below.

LETTER FROM REV. D. FORSYTH.

MY DEAR DR. BAXTER: I have enclosed extract from the Register of Burials in the Parish of S Paul's, Chatham. It will, I hope, answer your purpose. The word "Drummen" in the extract indicates the name of the locality in Norway where the sailor's home was. I do not know whether or not the name is written correctly, as it was a little difficult to understand the broken English of the seamen of whom I made the enquiry as to the particular locality of the sailor's nativity.

I am, with all good wishes,

Very sincerely yours,

D. FORSYTH.

Certificate of Burial.

Name.	Abode.	When Buried.	Age	By Whom the Ceremony Performed
1899 Hans Holden No. 1001	Norway Drummen sailor died on Middle Island	July 4th on Middle Island	53 years	D. Forsyth, Rector.

I certify that the above is a correct extract from the Register of Burials in the Parish of S. Paul's, Chatham, N. B., in the year of Our Lord one thousand eight hundred and ninety-nine.

D. FORSYTH, Rector of S. Paul's,
Chatham, N. B.

St. P ul's Rectory, Chatham, N. B., Nov. 12th, 1908.

On searching through the books of entries in the customs I find the following:

Bark Lilly, 499 tons.

Entered July 11th, 1899, Capt. Olsen, Para, Brazil, ballast. G. J. Vaughan.

I can find no mention anywhere of what the disease was for which she was quarantined. The sailor hailed from Drammen, Norway.

I applied to Mother Kane, at the Hotel Dieu, in reference to the seaman spoken of as having gone there after leaving the Marine Hospital, and the following is what she gave me:

"His name was Wm. Dean, and he was born at Penarth, Wales, England. His father's name was Frederic Dean. His mother's name was Elizabeth Dean.

"He entered the hospital here Oct. 4th, 1899, and left Jan. 26th, 1900, but worked for us under wages for one year and three months after. We never had a better nurse nor a more honest man about the place. He used to hear from his mother frequently, and, judging from her letters, she was a well-educated woman. His father, I think, was dead. He attended the English Church regularly, and sang in the choir. We have nothing but good to say for him. He seemed an exemplary young man. He had ship fever and malaria, and was crippled from lying in a short bunk on board the Lilly."

Chatham, January 26th, 1909.

Mother Kane says that Dr. McDonald pronounced the disease ship fever, and that is all the evidence I can find here to tell what it was.

J. BAXTER, Quarantine Physician.

PRACTICAL FORESTRY IN NEW BRUNSWICK.

BY PROF. R. B. MILLER.

Every lumberman with whom we have conversed on the subject of forestry realizes the truth and the benefits of its principles, and has in his mind certain ideals which he would like to see carried out on his own or the holdings of the Government. He is in favor of forestry education, both in the public schools and the college, so long as its theories do not affect his own pocketbook. When they do that he would rather see the forester addressing Women's Clubs or the Boy Scouts instead of grown men with logs to get out. If the forester and the lumberman shall ever, metaphorically speaking, occupy the same bunk, it can only be when the lumberman realizes that forestry methods, if adopted in small measure in this province, will increase the cost of lumbering. If they did not they would be of little advantage either in theory or practice.

Realizing this as the starting point, the private owner who is lumbering on his own lands has the choice of adopting a policy which will cost him something but will leave his woods as so much forest capital, unimpaired for his children. The question of adjustment between the lumberman and the Provincial Government who owns the lands is another affair altogether, and the best results can only be obtained by cooperation in adopting proper limits and methods of cutting and means of protection. Rules for cutting and disposal of brush and slash could be best made by a Forestry Commission, such as they have in many of the States, organized on a non-political basis, with some or a majority of the members being practical lumbermen with the good of the province and the future of the lumbering industry at heart. Such a commission, through their chairman and executive officer, the Surveyor-General, should have the power of making and enforcing all regulations which they decided to be wise for cutting timber on the Crown L nds. The plan of entrusting this task to one or two men is unfair both to them, the Government and the forests they are striving to preserve. If they make regulations which it is unwise to carry out the lumbermen rebel and the regulation becomes a dead letter so far as its enforcement is concerned; or they may be accused of favoritism by their political opponents in the matter of laxity of enforcement or collection of stumpage dues. In either case their position is a hard one and forestry progress slow.

Given such a commission, with expert knowledge available on any subject, coupled with the practical experience of the lumbermen on such a body, and the power of public opinion back of them, and they could progress by gradual stages to the accomplishment of their designs. The very fact that they were administering the forests not for the prestige of a political party but as held in trust for the people would insure careful deliberation and cautious procedure before any important regulations were made.

Under present conditions, let us speak of some of the dangers which threaten the forests. Apart from fire, a subject which is re-hashed at every forestry convention but never exhausted, the principal cause of forest destruction is unwise and improvident cutting. Speaking of this danger of overcutting, Forester Graves in Forestry Quarterly, Volume 6, says: "The responsibility of a forester in this matter to a private owner is great, but it is even greater for the forester in charge of public land, where the interests of a great number are involved. There is a special temptation to overcut public forests without sufficient regard to the future. Appropriations are usually small at the beginning, and the forest officer is naturally anxious to make a record by showing a large financial return. His appropriation is frequently insufficient to protect his forest properly or to establish an efficient executive and administrative machinery. To secure the money for this one is apt to make heavy cuttings. Our public foresters have the responsibility of providing a supply of timber to meet the present demands, but even a greater responsibility to provide for the future, not only for the demands of twenty, thirty but fifty to one hundred years hence, when the virgin supply on private holdings will have been exhausted and the public supply will be of much greater importance than at present. Foresters in charge of Government and state property hold a trust from the people, not only to utilize wisely the present supply of timber, but to maintain and increase the production of the future. Extensive lumbering operations, on our Government and state reserves, if made without regard to reproduction, or when the forester has practically no knowledge of reproduction, may be followed by consequences which it is unpleasant to contemplate."

Such a responsibility should manifestly not be thrown upon the shoulders of one individual. "The temptation to overcut public forests" is increased in this province for a slightly different reason than mentioned above, because of the political situation—viz., that each Surveyor General desires to show as large returns as possible over his predecessor from stumpage dues. Many of the papers picked up at the end of the fiscal year have articles of this kind under flaming headlines. If this increased amount of revenue is due to closer collection of stumpage dues, better scaling, etc., well and good, but if we are overcutting our forests, as some of the lumbermen believe,— then it is beating the tom-tom at our own funeral.

But, says someone, "our annual growth in New Brunswick is very rapid, so that we are not overcutting our forests." Who knows that we are not? There are no definite figures of growth available so far (we mean the results of scientific growth studies), all we have being a guess. The annual growth on Crown timber lands is estimated by that department at 5% or on 1000 board feet per acre say 50 board feet per acre per annum. But according to Dr. Fernow, who is an eminent authority, the annual growth on the well managed forests of Germany is only about 2½%, and if this is the case there is need of some anxiety on this point. At least enough to justify the collection of some sort of definite figures of growth instead of taking an isolated tree here and there where conditions are very likely abnormal and taking this as a standard for all other localities and types of timber in the province. Just as reasonably pick out one man in the province and say he is a typical New Brunswicker or Canadian. Even more reasonably, for the tree is much more vitally influenced by its direct environment than the individual.

WASTE IN LOGGING.

The reduction of waste in cutting is another thing to be considered. The waste of timber is enormous. At the present time it is estimated that in logging operations for every 4000 feet of timber logged at least 1000 feet or one fourth are lost. The loss in the woods is greatly reduced under forestry regulations by cutting low stumps, taking the timber as far up into the tops as possible, and the use of inferior species for skids and roads. The majority of these points are included in leases for lumber on Crown lands, and private companies are going a little bit further in their requirements for clean logging. The New Brunswick Railway Company limits the cutting of spruce to trees above 14 inches in diameter at the stump, snow being shoveled away from the tree if necessary to insure low stumps. Smaller spruce can be cut for roads, yards and landings when necessary and by special permission and also in making thinnings in thicket growth. Any undersized spruce trees cut contrary to the contract are to be charged up to the lessee at the rate of $1.00 per tree. While no top diameter is specified "all logs are to be run well up into the limbs before cutting off the top end, so that no saleable timber shall be left in the woods." If this contract contained a clause about the disposal of brush either by lopping or burning it would not differ materially from the provisions the forester would insert for careful and economical logging. To enforce these regulations requires tact and constant watchfulness on the part of the woods superintendents, but they are certainly worth while, and good operators are given inducements for careful work. In the thinning out of thicket growth where the timber is small they give the operator who is careful 12, 14, 16, 18 and even 20 hundred feet of lumber for 1000 feet charged, meaning that in the latter case he gets his lumber at half price, or 2000 feet for 1000. The decision is left to the scaler in this case as well as many others where the regulations enforced to the letter might work a hardship to the operator. In the case of cedar or hemlock, for example, it would be foolish to require low stumps when the butt of the tree was rotten or shaky. Care for young growth is another thing mentioned in the contract, which is a wise provision.

DISPOSAL OF BRUSH AND SLASH.

It is often said that the loss by fire in many places has been equal to timber cut. It is obviously then in the interests of forestry to dispose of brush and slash left after lumbering, as the severity of forest fires is in direct proportion to the amount of debris on the ground. The usual methods elsewhere are, the lopping of tops so they will lie flat on the ground and rot more quickly; the lopping and scattering of brush over the ground (with hardwoods); and the piling and burning of brush either as logging proceeds or as a separate operation. To make regulations as to the disposal of brush requires a careful investigation into the effects and costs of disposal by the different methods.

In the Canada Lumberman of November 15, 1910, will be found an interesting article on the lopping of branches of coniferous trees as required by statute in the State of New York. While the cost is the main argument against it, one lumberman states that through decreased labor in skidding the actual cost of lopping does not exceed five cents per thousand feet of lumber. Another by taking timber out of the tops for pulpwood, says that with a force of eight men and a horse for six days he secured 97 cords of pulpwood worth $7.00 per cord, an average of two cords per day, making a very profitable operation. The advantages for lopping of tops as given are: 1. They will lie close to the ground and rot very much faster, lessening the fire danger. 2. In the Adirondacks reproduction is promoted because the ground is kept moist and seedlings are protected by the tops. 3. The saving of material in logs or pulpwood, which may partly pay for the cost of the work. 4. Less labor for swamping and skidding. In New Brunswick, perhaps, the first reason would be the strongest argument, since most operators claim that the logs are so small and pulpwood so knotty obtained by running further into the tops that it would not pay the cost of driving. Conditions in the Adirondacks and here are very similar, but this regulation could only be adopted and enforced after a careful investigation and trial as to results, costs and success elsewhere.

The burning of slash is a step still farther in advance which the limit holder would decry here, but on the National forests in the United States every operator burns his brush under the direction and oversight of a forest officer or ranger. Otherwise the operation is not closed up and he is held for extra stumpage. For soft woods the cost of burning brush varies from 15c. to $1.00 per thousand feet of lumber, depending on the thickness of the stand and character of the tops. This cost is necessarily lower when the burning can be carried along with the lumbering, but the best time is when the snow is on the ground, so that is not always possible. A series of experiments will be carried on by the Minister of Forests of Ontario this winter in brush burning in the Rainy River district. Many of the lumbermen there, as here, would favor the proposal if their neighbors were required to do so. This would no doubt require a large force for supervision, and would meet with opposition, but it would certainly be to the best interests of the forests and may come in time.

As to the setting of fires by railroads the law now enacted to place the responsibility upon the railroad company seems a decided advance, but there is no doubt that the forest lands through which new railroads are passing in New Brunswick will be burned and ravished by fire as before. Last summer there was a test made at Purdue University of a new spark arrester before representatives of several leading railroad companies The device works upon the principle of centrifugal force and was entirely successful, not a spark being seen at night to issue from the locomotive upon which the test was made. It is claimed that it does not interfere with the draft of the engine, which is the main objection to the present spark arrester made of wire gauze I know nothing of the cost of this apparatus, but if its cost is moderate and it will do the work as demonstrated last summer its adoption by the new railroad companies would certainly be a boon to the forests of this province.

These are some of the things that forestry agitation has done and can do for the future welfare of our forests. In writing upon this subject we have tried to keep in mind that since lumbering is a practical business in this province all fads and fancies must be laid aside by the forester and only those measures discussed which would appeal to the progressive lumberman as wise and expedient. On the other hand, the lumberman must think of the future of the forest, as it is this which makes all the difference between conservative and destructive lumbering. And conservative lumbering is perhaps the nearest approach we can hope to make to forestry in New Brunswick at the present time when the majority have no fear of the bogey of a timber famine or regard for a future supply.

THE UNITY OF NATURE.

By Dr. J. McG. Baxter.

(Lecture delivered before the Association.)

We, as members of the Natural History Association of Miramichi, are like children playing with pebbles on the shore while the great Ocean of Truth lies stretched out beyond us. And in fact the study of Natural History is only in its infancy the world over, as we can see by the fact that so much is to us a terra incognita, an ocean of doubt, with little islets of truth discovered showing up here and there, but immense gaps between.

The field of course is immense, and the laborers are few, comparatively speaking. We can have some idea of the work that is done when we pick up a book on any branch of the subject that is one hundred years old. We can see how much of what was then considered truth has since been contradicted and proved erroneous, and we can see how nomenclature has varied, how the members of one class have been relegated to another, &c., &c. Old books used to start out with something like this:

Objects in Nature may be divided into the following classes—

1st, Man; 2nd, The A imal Kingdom; 3rd, The Vegetable Kingdom; 4th, The Mineral Kingdom.

This seems, at first, a natural and indisputable division to which no one can object and no one dispute, but let us look more carefully and see

In the first place, we must remember that it is man himself that is doing the classifying, and in his pride and desire of self-glorification, because, forsooth, "vultum ad sidera tollet"—because he walks upright and looks up to the heavens, he must needs place himself alone in a class at the head of all Nature around him. Is he justified in this? I think not. When we come to examine his physical structure particularly, we find that from the crest of the biparietal suture to the last phalanx of the little toe, every bone in his body can be duplicated in every member of the quadramana,—from the tendinous aponeurosis of the occipito-frontalis muscle to the insertion of the abductor minimi digiti, every muscle can be duplicated in the quadramana. Even the peroneus longus, supposed to be peculiar to man alone, has been proved to exist in most monkeys, and even the brain's hippocampi majores and minores, lateral ventricles, lobes, sulci, &c., are all represented in that of the quadramana ; and even in intelligence and reason, responsibility, invention, and all the qualities of the mind, it has been proved pretty conclusively to be more in degree than in kind. So homo sapiens must consent to step down off his pedestal and take his place among the quadramana,—a civilized and highly advanced relative, indeed, but still a relative. So the separate class Man merges into the Animal Kingdom wholly and entirely, and that hiatus is bridged over.

Now let us follow down and glance through the Animal Kingdom, and it will be but a glance, for we went over the ground once before at this assembly.

Look at the horse, for example. Take his bony structure and compare it to man's, carefully, and you will be struck with the similarity, modified though it be.

Look back at the eohippus, and compare it to the modern horse, and you will find less disparity between man and horse than between the five-fingered, five-toed progenitor and the modern horse.

Then take the biungulata. What is the difference whether the race concludes to walk on two toes or only one? The relative position of the bones of the skeleton is the same. The frontal, parietal, occipital, maxillary bones, the spinal column, the ribs, the limbs, are the same, with modifications suited to its particular mode of life.

Look now at the bird, and see if you can find the anterior and posterior digits, the double tibia and fibula, ulna and radius of the four limbs, the single femur and humerus, the spinal column and acetabulum, and the cranial bones all represented.

Look back through the æons of the past and examine the archiopteryx, the odontopteryx, and you find birds with a tail and teeth. Look even at the bats of to-day and you find a quadramana on the wing. And where will be your line of demarcation? You may say that birds are oviparous. Well, look at the origin of man himself, and say nothing more about that.

Now follow down, and the whale, the seal, the walrus, bridge the gulf between the viviparous and the fish. In fact, we find no hard and fast line until we come to the gap between the Animal and Vegetable Kingdoms, and even this is almost bridged over.

The Euglenidæ, a single cell with a little wiggling tail, proclaims an animal. The monad, some of which are animal, others vegetable, as the books say, and you see the line of demarcation is very fine.

Take the diatoms for instance. They are exceedingly small, many of them invisible to the naked eye, yet beautifully carved. They act like an animal and propagate like a plant. That is, they have motion and seemingly volition, so much that under the microscope I have often watched the Navicula viridis, and its motion is as steady and stately as a man-of-war with twin-screw propellers. I have seen it sailing along and strike a piece of algæ, when it would reverse its motion and steer a little to one side and try again, strike again, back off, steer to the other side, try again, strike again, then give it up, turn at a right angle or right about, and sail off into the open sea; and yet these propagate by spores like our ferns somewhat. Is it an animal or vegetable? No one knows, but it is generally allowed to be a vegetable. But how does it get its motion, and even its apparent reasoning power? No one knows.

However, for the present, it seems to obliterate the line of demarcation between the Animal and Vegetable Kingdoms.

Then take the Vegetable Kingdom itself, from the gigantic Quercus Robur down to the micrococcus tetragenous. What is the principle that leads them to choose their proper nourishment from the soil, to pump it up to the loftiest leaf and to distribute it; to draw in its carbon dioxide and to expel its oxygen; to select and place its silica, and to manufacture its chlorophyl?

Some say it is life. But what is life, and how does it act? Is it conscious life, and so acts intelligently? Or is it a species of vegetable or even animal magnetism, as some say (for not only vegetables but animals also are built up by this cell formation) which attracts like particles to itself and so is a species of animal or vegetable—crystallization, as it were, that builds up the cell and its contents?

This is a process called the "Solway Process," after the name of its author, that tries to explain life by a chemical process in the cells of the animal body, for he says:

"The animal cell which is called alive is simply a living chemical reaction—or more exactly a living oxidation of carbon which has organized itself by the creation of services of entry and exit of materials of reaction, precisely as we organize our factories industrially.''

The cicatrization of the scar that covers former severed continuity between the Animal and Vegetable Kingdoms is almost complete.

Now we come to the last gap between the Vegetable and Mineral Kingdoms. This seems an unbridgable gulf, but I will give you the latest scientific notes on the subject, and you can think them over and judge for yourself if you can see where the organic world leaves off and the inorganic commences. I will quote ad verbatum as nearly as possible.

The latest attempt to explain the phenomena of life on purely physical grounds is made by Dr. Benedickt, professor in the University of Vienna, in a book entitled ''Biomechanism, or Neo-Vitalism in Medicine and Biology.'' In this he maintains that different organs and organisms, their functions, changes, and multiplications, are due only ''to the properties of the substances that compose them, and to divers combinations of forces.''

This is no new doctrine, but the writer skillfully upholds it. by correlating with it some of the latest results of investigation both in biology and physics. In a supplement, written by Dr. Benedickt for the French edition of his book, he states his theories concisely in a few pages whose contents are quoted in the Revue Scientifique, Nov. 14th.

In the first place the author directs attention to the points of similarity between crystallization and organic growth, which, he asserts, are becoming more noticeable with each advance in our knowledge of the process. The old suspension theory of solution he regards as dead. Dissolved bodies, he tells us, are not in a state of suspension. Solution is a sort of chemical combination. He goes on to say that Schrœn, of Naples, who has made a still closer study of these facts, has succeeded in following the phenomena that precede the formation of a crystal. His investigations have been, so to speak, cinematoscopic. Microphotographic views were enlarged and thrown on a screen, enabling him to make a thorough study of the process. Dr. Benedickt says:—

''Schrœn observed, in a large number of salts, certain precrystalline states. First, there develops a plasma without determinate form, then there appears in this 'petroplasm' (as he calls it) a separation of two optically different substances In this secondary plasm develop freely very small nuclei (petroblasts) and other formations resembling cells (petrocellules). These two formations act, as he states, 'germenatively' on the ultimate development of the plasma. The petroblasts are capable of turning into crystals. The cellules and the 'blasts' take the substance of the plasma and attract them to themselves. Thus they increase. Furthermore, they also multiply by division and budding. Crystals then form by the hyalization (turning into a glassy substance) of the blasts, the cellules and the cellular regions. These cellular and nuclear forms attract matter to themselves and transform it into a substance like their own. They therefore grow. They also split up; they are thus capable of reproduction. These phenomena recall those of vital processes. They represent a grade much lower than life, and form a connecting link between the mechanics of the inorganic world nd Biomechanics. If these phenomena are not those of life, we shall be obliged to revise the ideas and notions that we have entertained of life If on the contrary we regard these phenomena as vital, we shall have to enlarge our definitions of life. These studies have a high value in biology. Whoever has looked into the matter cannot doubt that a crystalline form peculiar to each microbian species is produced in the albumenoid and plastic secretions of the microorganisms, in exactly the same manner as the phenomenon takes place (as above described) in sterile saline solutions. At any rate, Schrœn has proved the presence in these solutions of forms precedent to crystallization, which is an indisputable step forward. If it is true that the precrystalline stage of solutions is a vital phenomenon then Schœn's 'precellules' give us an example of spontaneous generation in the present geological epoch. In the beginning, all life originated from inorganic matter: the different atoms formed particular associations, and their energy was distributed in a special way: this is an absolutely justifiable and permissible hypothesis. Very well. We have no reason whatever for maintaining that this passage from the inorganic to the organic world took place in only one limited geological period. There is no proof that in the animal and vegetable world, these transformations are not still taking place. Methodical logic does not exclude this possibility."

The writer now goes on to explain the bearing of some modern chemical ideas on his theory of the origin of life. The mode of action called catalysis, he reminds us, has lately been the object of special study. This is the property possessed by certain substances of promoting or retarding chemical action without being themselves chemically altered. These substances the writer proposes to call inducts-composers and inducts-coherers. They may act at the same point without neutralizing each other's action, and it is in this way, according to the writer, that tonics at the same time favor the chemical decomposition of waste products, and stimulate tissue formation. From some such play of chemical force as this, he would have us understand, the change of dead to living matter arose, and still arises. According to Benedickt this spontaneous generation took place in thousands of places and in thousands of conditions, but because the conditions were largely similar, similar organisms resulted He would then, it would seem, reject the universal relationship of living beings except as we may consider it to inhere in origin from the same combinations of inorganic substances. The writer closes with a promise to apply his biomechanical principles to a variety of problems in anatomy and physiology, and he has confidence that this method of treatment will be productive of great results for science.

Whether this occurs or not it certainly is one of the most audacious theories lately promulgated. These men from their position must certainly be men of authority, each in his own department, and their word carries proportionate weight. Their experiments also seem to have been carried on with care and also with the aid of microphotography, a process that cannot be disputed, and we will only await results, and accept the truth although the heavens fall.

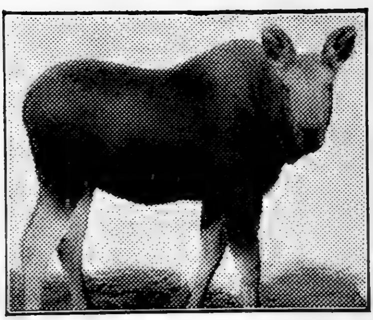
But in the meantime, I ask you if this should happen to be true, what becomes of that last gap between the Mineral and Vegetable Kingdoms? Where are last year's snows?

There is an interdependence and unity in Nature's works, only fragments of which we can as yet grasp, for it is only

"He who through vast immensity can pierce,
See worlds on worlds compose one universe,

Observe how system into system runs,
What other planets circle other suns,
What varied Being peoples every star,
May tell why Heaven has made us as we are."

The more we study, the more cause we will find to conclude that Nature is one and indivisible.



BABY MOOSE.

SOME MEDICINAL PLANTS INDIGENOUS TO THE MIRAMICHI, WITH THEIR COMMON NAMES AND USE IN MEDICINE.

By J. D. B. F. Mackenzie.

Botanical Name.	Common Names.	Medicinal Use.
SANGUINARIA CANADENSIS	Blood Root	*Throat Affections*
	Red Root	
	Indian Paint	
	Pucoon	
	Tetterwort	
DROSERA ROTUNDIFOLIA	Sundew	*Asthma*
	Dew Plant	
	Lustwort	
	Youthwort	
	Insect Plant	
CAPSELLA BURSA PASTORIS	Shepherd's Purse	
	Cocowort	*Hemorrhages*
	Pickpocket	
	Pick Purse	
	Toywort	
	St. Janes's Weed	
RHUS TYPHINA	Stag's Horn Sumach	
	Staghorn	*Rheumatism*
	Vinegar Plant	
HYPERICUM PERFORATUM	St. John's Wort	*Jaundice*
	Cow Grass	*Gravel*
	Marl Grass	*Fever*
TRIFOLIUM PRATENSE	Red Clover	*Purifying the Blood*
TRIFOLIUM REPENS	White Clover	*Purifying the*
	White Shamrock	*Blood*

PRUNUS VIRIGIANA	Wild Cherry Choke Cherry Black Cherry Black Choke Rum Cherry Cabinet Cherry	*Debility of the Stomach* *Coughs* *Consumption*
FRAGARIA VESCA	Strawberry Wild Strawberry Wood Strawberry	*Dysentery*
RUBUS VILLOSUS	Blackberry Dewberry Cloud Berry Thimble Berry	*Dysentery*
HAMAMALIS VIRGINICA	Witch Hazel Winter Bloom Striped Alder Snapping Hazel Hazel Nut Tobacco wood Pistachio	*The bark for Hemorrhage of the Lungs* *The leaves for bruises and sprains*
ARALIA NUDICAULIS	Small Spikenard False Sarsaparilla Wild Licorice Rabbit's Root Shotbush	*Chronic Rheumatism and Skin Eruptions*
EUPATORIUM PERFOLIATUM	Boneset Thoroughwort Ague Weed Joe Pye Fever Wort Cross Wort Wood Boneset Vegetable Antimony Sweating Plant Indian Sage Tearal	*Influenza* *Dyspepsia* *Tape Worm* *Promotes Vomiting*

TANACETUM VULGARE	Tansey Hindheel	*Hysteria*
TARAXACUM DENS-LEONIS	Dandelion Lion's Tooth White Endine Swine Snout Priest's Crown	*Diseases of the Liver*
NABALUS ALBUS	Lion's Foot Canker Root White Lettuce Rattlesnake Root Gall of the Earth	*Dysentery* *Rattlesnake Bite*
UVA URSA	Bearberry Upland Cranberry Mountain Cranberry Bear's Grape Meal Berry Kinnikinnick	*Kidney and Bladder Troubles*
GAULTHERIA PROCUMBENS	Wintergreen Checkerberry Canada Tea Partridge Berry Boxberry Wax Cluster Mountain Tea Deerberry Chink Grouse Berry Hill Berry Ivory Plum	*Rheumatism*
CHIMAPHILA UMBELLATA	Pipsissewa Prince's Pine King's Cure Ground Holly Noble Pine Rheumatism Weed Pine Tulip	*Scrofula* *Rheumatism* *Kidney Troubles*

PRINOS VERTICILLATA	Black Alder Winterberry Brook Alder Feverbush	*Diarrhœa* *Fever*
VERBASCUM THAPSUS	Mullein Velvet Plant Woolen Bullock's Lungwort Flannel Flower Shepherd's Club Hareb's Beard Cow's Lungwort	*Catarrh* *Asthma*
VERBENA HASTATA	Vervain Wild Hyssop Simpler's Joy Blue Vervain	*Colds* *Fevers*
NEPETA CATARIA	Catnip Catmint Catrup Field Balm Cat's Wort	*Flatulency in Children*
SCUTILLARIA LATERIFOLIA	Scullcap Blue Pimpernal Hooded Willow Herb Mad Dogweed Hoodwort Mad Weed Helmet Flower	*Neuralgia* *Delirium Tremens* *Nervous Exhaustion*
SYMPHYYUM OFFICINALE	Comfrey Gum Plant Healing Herb Kintback Slippery Root	*Chronic Catarrh* *Consumption*
HYOSCYAMUS NIGER	Henbane Hog Bean Stinking Nightshade Poison Tobacco Insane Root	*Hysteria* *Nervous Diseases*

FRAXINUS AMERICANA	White Ash	*Gout*
MYRCIA CERIFERA	Bay Berry	*Diarrhœa*
	Wax Berry	*Jaundice*
	Wax Myrtle	*Scrofula*
	Tallow Tree	
	Candle Berry	
	Vegetable Wax	
	VegetableTallow	
ARUM TRIPHYLLUM	Indian Turnip	*Asthma*
	Dragon Root	*Whooping*
	Wake Robin	*Cough*
	Jack-in-the-pulpit	*Catarrh*
	Starchwort	
	Pepper Turnip	
	Bog Onion	
	Marsh Turnip	
ACORUS CALMUS	Sweet Flag	*Stomach*
	Calmus	*Troubles*
	Grass Myrtle	*In Perfumery*
	Myrtle Flag	
	Sweet Myrtle	
	Sea Sedge	
	Sweet Grass	
	Sweet Rush	
IRIS VERSICOLOR	Blue Flag	*Liver Complaint*
	Poison Flag	
	Water Flag	
	Flag Lily	
	Water Lily	
	Fleur-de-lis	
	Liver Lily	
	Snake Lily	
VERATRUM VERIDE	White Hellebore	*Heart*
	Indian Poke	*Disease*
	Devil's Bite	*Insecticide*
	Earth Gall	*A Powerful*

	Tickle Weed	*poison*
	Itch Weed	
	Bugbane	
	Wolfsbane	
	Swamp Hellebore	
TRITICUM REPENS	Couch Grass	*Irritable*
	Shelly Grass	*Bladder*
	Quack Grass	*Dropsy*
	Quitch	
	Dog Grass	
	Quickens	
	Witch Grass	
	Knot Grass	
	Dog Weed	
	Dog's Tooth Grass	

FRANCIS PEABODY, THE FOUNDER OF CHATHAM.

BY DR. J. MCG. BAXTER.

It is the imperative duty of every one, of whatever station in life, and whatever may be his mental qualifications, when he becomes acquainted with any facts in reference to the past history of his country, to verify them, arrange them to the best of his ability, and put them in black and white in some permanent form, so that when the veritable historian comes along he may be able to possess himself of all interesting and instructive data, reliable and ready to hand.

It is for this reason only, and with this object in view, that the present writer is endeavoring to fulfil what he considers a duty owing to future generations. If these notes are crudely set down, defective, lacking in clearness or even afterwards may be proved untrue, it is to be hoped that future writers and readers will excuse imperfections, always bearing in mind that the writer strove to do what he considered a duty, and overlook the manner in consideration of the matter.

There is also this to be said, that information may be gleaned now and proved which later may become impossible. There are now a very few persons living that are in a position to confirm or deny circumstances from their own personal experience which in a very few years will have passed on to the majority and be unavailable.

The first thing to be done is to describe as nearly as we can the appearance and state of the country, the number and condition of its inhabitants, the progress made since the first settlement, the difficulties that had to be contended with, the principal products, &c., &c.

The Miramichi is a large and beautiful river, navigable for about 40 miles from its mouth, running at this part of its course from South West to North East, and varying in depth from 22 ft. at the bar to 60 ft. in some places, and say 17 at the head of navigation. The South bank rises from the water level to about 80 feet half a mile back, and from that is fairly level for miles. The

North bank rises more abruptly to 150 or 200 feet, and from that undulates on towards Bathurst. The soil, resting on a sandstone foundation, is light and friable but fairly productive.

The river at this time of which we would treat abounded with fish and the woods wi h game, and in fact they do so still. The forests were unbroken, and consisted of birch, beech, maple, spruce, fir, and hemlock, but, best of all, with a magnificent growth of majestic stately pine, suitable for masts for H. M. largest men-of-war. In fact, about the first English settler on the river was Wm. Davidson, who located here expressly for that purpose, viz., to procure masts for the navy. He lies buried at Wilson's Point, Newcastle, and his tombstone reads as follows:

"Sacred to the memory of Wm. Davidson, Esq., Representative for the County of Northumberland, Province of New Brunswick, Judge of the Court of Common Pleas, Contractor for masts for H. Majesty's Navy. He died on the 17th of June, 1790, aged 50. He was one of the first settlers on this river, and greatly instrumental in promoting the settlement. He has left a widow and five children to deplore his loss."

There were no roads at this time, but communication was carried on by schooners and other vessels to distant ports, and canoes to the handier settlements; or the traveller went on foot through the forest, or on horseback around the shore.

The principal articles of trade were lumber and fish, and vessels were built here on the shore both for home trade and to sell. The farms, when they began to turn their attention to agriculture, were surveyed back from the shore one and three-eighth miles with varying frontage, and what is now the town of Chatham was in the hands of a few individuals. Through the kindness of Lieut. Governor L. J. Tweedie I have had access to the oldest plan of the place extant, I believe, and there I find the following:

Lot No. 30. Peter Taylor, 166 acres.

This, I find, is a mistake. It was Patrick Taylor, as the deeds in possession of persons now living on the ground plainly show. His property extended from Jno. Irving's line up a little across McIntosh St., and he lived in a stone house back in the field opposite the old lime kiln. The cellar is plainly to be seen yet, and two or three birch trees, now dead with age, but all traces of the house are gone. Some of his descendants still live in Napan, and the late Wm. Taylor, M. P. P. for Gloucester, who lived in Shippegan, was also one.

Lot 31. Robt. England, 110 acres.

This property extended from Taylor's line to St. Andrew's St. Several of his descendants still live on a portion of the property. The original England house was a one-story log-house and stood about 150 feet back from Water St. on the lane that leads up to the McFarlane house, now owned by W. S. Loggie, M. P.

Lot 32. Wm. Brown, 159 acres. S. 22 degrees East 113 chains.
Lot 33. Wm. Brown, Sr., 100 acres.
Lot 34. Wm. Brown, Jr., 134 acres.

This Brown property extended from St. Andrew's St. to King St., but how to reconcile these three Wm. Browns with the Peter Brown mentioned in Wm. Innis's letter I cannot tell. The Wm. Brown, Sr., might have been a son of Peter Brown of Innis's letter, but the other two, being of the same name, could not have been brothers. Where the original Brown house stood, or where the descendants now reside, I can find no trace.

Lot 35. Peter Henderson, 100 acres.
Lot 36. George Henderson, 100 acres.

These were brothers, and their property extended from King St. to Johnston St., or, as it used to be called, Foundry Lane, and it was from Geo. Henderson that Peabody bought his property. Peter Henderson's house stood where Connell's house is now, being erected beside the manse in Water St., and Geo. Henderson's where Bryan Moran's store now stands.

Lot 37. Thos. Lobban, 160 acres, extended from Johnston St. to the Almshouse, which is likely the upper limit of the town. The original Lobban homestead stood back of where John H. Lawler now lives. The cellar only is to be seen. Some of the descendants still live here.

Who the O'Shahancy spoken of in Innis's letter was, or what became of him, I can find no record.

Of the Hendersons, one died lately in Toronto, and one lives, I believe, in New York.

Well, these were the settlers on the shore of what is now Chatham when Peabody came, in 1800, to what then had the general name of Miramichi, from the river.

As far as I can learn there were no places of public worship except a barnlike, unfinished building that stood at Wilson's Point, across "The Tickle" from Beaubair's Island, where Wm. Davidson, Esq , and a number of others lie buried to-day, and the Indian Chapel at Burnt Church. This building at Wilson's Point, I understand, was never finished, but rotted down without anything further being done on it.

There had been before this some visits paid to Miramichi by travelling clergymen. For instance, in Dr. George Patterson's life of Rev. James McGregor, D. D., of Pictou, we find the following:

"The Miramichi, next to the St. John, is the largest and most important river in the Province of New Brunswick. In two large branches it traverses nearly the whole country and falls into the Bay of the same name in the Gulf of St. Lawrence.

"It is navigable more than 30 miles for large vessels and for barges nearly to its sources. It has since been famous for its large exports of timber, and its salmon fisheries. The first British settler was a Mr. Davidson, who in the year 1764 emigrated from the North of Scotland, and on the following year obtained a grant of 100,000 acres on the South West Branch. He was afterwards joined by a Mr. Cort from Aberdeen, and they soon established a valuable trade. During the American Revolutionary War the place was plundered by the Indians, but it recovered, and at the time of his visit, a population, considerable for the time, had been collected from various quarters. In the year 1797 he paid his first visit to Miramichi. He had been applied to as early as 1791, but hitherto had not been able to visit them. We are not certain how he went, but it is probable that it was by water. In regard to his visits to this quarter all the information I have been enabled to gather is contained in the following extract of a letter from the Rev. Jno. McCurdy, viz.:

' "Many recollect him distinctly but few can give dates. His being present at the induncfion of Mr Thompson in 1817 is well remembered. One old lady, Mrs. MacR, remembers his visit in 1797.

"Mr. Perley remembers of his coming up from Bay du Vin, in a vessel with two shipmasters, that he called at his house (that is his father's), and that as they were at the door the doctor turned their attention to a field of ripe wheat before them and said, referring to the drooping heads, 'these were the heaviest, and so they that have the most grace are the most humble.' On the first and second visit he preached and baptized at Black River, Bay du Vin, and on both sides of the Miramichi, up as far as the Point, so called, at the junction of the North and South West Branches" '

In a letter in Appendix E. I find the following:

"Fraser, Thom & Co., respectable merchants in Miramichi, promised to write to Hunter & Co., Greenock, to answer the order of the Rev. Jas. Robertson, Kilmarnock, for the passage of the minister to that place, and we suppose he has performed it, or if not, it will be done before the passage be long due."

This letter is signed by James McGregor, Duncan Ross and John Brown, and dated Pictou, Feb. 5, 1799.

Cooney, in his history of Northern New Brunswick says: "In 1790, agreeably to a contract made between him and Messrs. Hunter & Robertson of Greenock, Mr Davidson shipped three cargoes of masts and spars for His Majesty's dock yards on board of the 'Achilles', Capt. Pike, the 'Admiral Parker,' Capt. Skinner, and the 'Queen', Capt, Dawson. After the death of Mr. Davidson which happened in the course of this year, the mast contract was taken by Messrs. Fraser & Thom, a firm then lately established on Beaubair's Island. For the five or six succeeding years, the whole trade of the country, then embracing a very brisk and profitable exportation of fish, furs, peltries, and sawed lumber, fell into the hands of these gentlemen."

The representatives of the County of Northumberland to the General Assembly were:

First returned—Elias Hardy and Wm. Davidson.

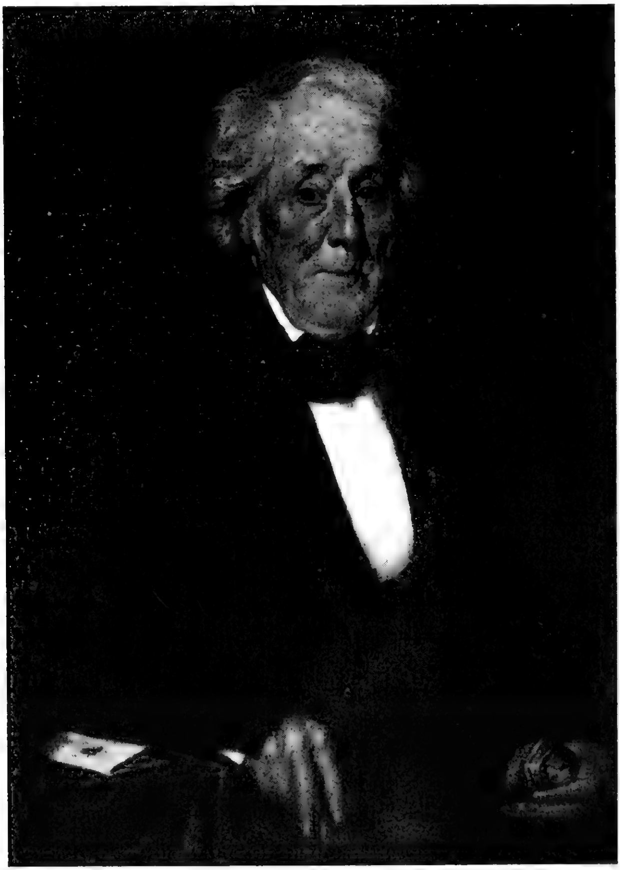
1791—Elias Hardy and Harris W. Hailes, Vice Davidson, deceased.

1793—General Election—John Black and Ward Chipman.

1795—Dissolution of the House—James Fraser and Sam'l Lee.

This James Fraser was the Fraser of Fraser & Thom of Beaubair's Island. They also, in 1792, shipped the first two cargoes of squared timber ever exported from Miramichi.

Cooney also gives the following as articles of commerce at this



FRANCIS PEABODY.

time on the Miramichi :—Salmon, alewives, herring, moose skins, beaver skins, red fox skins, otter skins, loupcervier, fisher, martin, mink and musquash skins, white pine, red pine, and black birch timber, white pine lath wood, white pine masts, spruce spars, W. P. boards, clear boards and planks, and shingles.

There was at this time a great deal of trouble with the Indians, who were particularly hostile. Cooney says that "the sedition of a Mr. McLean, who suffered at Quebec, for conspiring against the Government, and whose execution took place, I believe, in the fall of 1793, afforded an opportunity to the Indians for renewing their outrages. It is said that this man was here; that he used every means to excite a revolt among them, and that he secretly supplied them with arms and ammunition. It is also stated, that for some time after he went from this, the Indians frequently assembled in great numbers, at Burnt Church and Moody's Point. On one occasion, upwards of two hundred of them met at the former place, and concerted measures for the total extirpation of the people, when the timely arrival of the Rev. Mr. Cassinette, a Roman Catholic priest, from Gaspe, put an end to the conference, by informing them of the fate of the man who had seduced them from their allegiance. On receiving this disagreeable intelligence they all returned to their duty: and the people who had been obliged to abandon their homes, and concentrate themselves at Mr. Henderson's, in Chatham, and other places of defence, returned to their respective homes, and enjoyed a tranquility which has never since been disturbed by the Indians." He further states that at this time "there were then, neither churches nor schools, roads or bridges, ferries or highways. Every one travelled by water; communication was tedious and uncertain; travelling dangerous and fatiguing; supplies extravagantly dear and very precarious; delicacies unknown and privations familiar."

Such then was the state of the country at the time of the arrival of Francis Peabody in 1800.

Now who was Peabody? For the history of himself and family I am indebted to the history written by Ven. Archdeacon Raymond, LL. D., of St. John, N. B. He gives, as copied from an old paper in possession of the Perley family at Fredericton, the following:

"In the year 1761 a number of provincial officers and soldiers in New England, who had served in several campaigns during the then French war, agreed to form a settlement on the St. John river in Nova Scotia, for which purpose they sent one of their number to Halifax who obtained an order for survey for laying out a township, in mile squares on any part of St. John's river. This township, called Maugerville, was laid out in the year 1762," &c. Among the retired officers that became interested in this settlement at Maugerville was one Capt. Francis Peabody who had served with distinction in the then late war and is mentioned in Parkman's "Wolfe and Montcalm." He came first to St. John, and remained there till some difficnlties were settled about their property at what is now Maugerville, on the St. John river, near Fredericton, and this settlement was first called the Township of Peabody in his honor, as he seemed to be the leader in the little company that had acquired these lands from the Government at Halifax. He moved from St. John to Maugerville between the years 1763--4. He came with his family from Massachusetts. This family consisted of the following: Samuel, Stephen, Francis, Oliver, Elizabeth, Hannah, Heprabeth. This Capt. Peabody continued living at this settlement, which is now called Maugerville, for nine or ten years. He made his will in 1771, as follows:

'In the name of God. Amen. I Francis Peabody, of Maugerville, in the County of Sunbury and Province of Nova Scotia, being through the abundant goodness of God, though weak in body, yet of a sound and perfect understanding and memory, do constitute this my last will and testament and desire it may be received by all as such.

"First, I most humbly bequeath my soul to God my Maker, beseeching his most gracious acceptance of it, through the all-sufficient merits of my Redeemer Jesus Christ.

"I give my body to the earth, from whence it was taken, in full assurance of its resurrection from thence at the last day.

"As for my burial I desire it may be decent, at the discretion of my dear wife and executors hereinafter named.

"As to my worldly estate I will, and positively order, that all my just debts be paid first. I give my dear and loving wife one-third part of all my estate in Nova Scotia, real and personal (excepting my wearing apparel), and one-third part of my land in Middleton and Rowley and Canada, the use of two hundred dollars now in New England, during her natural life, and the principal if necessity calls for it.

"Item. To my son Samuel I give one-fourth part of all my lands not yet disposed of, excepting the land at Oromocto Island, and all the money I have in New England except two hundred dollars given his mother, his paying all my just debts in New England, and fifteen dollars to his sister Elizabeth White, and two dollars and a half to his sister Hannah Simonds, and one hundred and fifty dollars to his sister Heprabeth on her marriage day.

"Item. To my son Stephen I give the same quantity of lands as I gave to my son Samuel, his paying the same sums to his three sisters as I ordered for his brother Samuel to pay.

"Item. To my son Francis I give one-half of my lands not yet disposed of.

"Item. To my son Oliver I give all of my lands not yet disposed of.

"Item. I give to my daughter Elizabeth White thirty dollars, to be paid by my two eldest sons in household goods.

"Item. To my daughter Hannah Simonds five dollars, to be paid by my two eldest sons.

"Item. To my daughter Heprabeth I give three hundred dollars, to be paid by my two eldest sons in household goods on the day of her marriage.

As to my household goods and furniture, I leave to the discretion of my loving wife to dispose of, except my sword, which I give to my son Samuel.

I appoint my dear wife and my son Samuel executors of this my last Will and Testament.

"As witness my hand.

"FRANCIS PEABODY, SR.

"Delivered this twenty-sixth day of October, the year of Our Lord 1771, in the presence of us—

"ISRAEL KINNEY,
"ALEX TAPLEY,
"PHINEAS NEVERS.

"This will was proved, approved and registered this 25th of June, 1773

"BENJAMIN ATHERTON, Reg'r.
"JAS. SIMONDS, J. Probates."

This son Francis mentioned in this will was the Francis Peabody that was the so-called Founder of Chatham. He was evidently born in New England and not on the St. John River, as Mr. Innis's letter says,as he would be about two years of age when his father, Capt. Peabody, came to St. John in 1762. However, I will give you the letter of Mr Innis as I have it. It was found among the papers of the late Lieut. Governor J. B. Snowball, and was evidently an answer to one asking for information.

Lower Newcastle, Oct. 1st, 1898

DEAR SIR: Your favor of the 25th came to hand. In reply to your enquiry concerning the late Francis Peabody.

He was born on the St. John River at a place called Maugerville.

His father, Capt. Francis Peabody, who was a native of the United States, came on the St. John River A. D. 1763.

When the late Mr. Peabody came to manhood, he went to Halifax, loaded a schooner with wet and dry goods, and came to Miramichi as early as 1800.

He did business on board of the vessel, supplying the people with everything they required, and took in return salmon, shad and alewives and disposing of the fish at Halifax and the United States

This trading business he prosecuted for four years, then settled himself down at the Spruce, so called at that time. This tree grew on the bank where D. & J. Ritchie built their store.

Mr. Peabody afterwards called the place Chatham in honor of Lord Chatham, who was at that time a member of the British Ministry.

The only persons who were living here at the time were Peter and George Henderson, Peter Brown and Thomas Lobban; after came a man named O'Shahansy.

On account of Mr. Peabody's honesty and sobriety he had the good-will of the people and was called the Cheap Merchant. He built five vessels, the "Miramichi", "Lydia", "London", "Sir Howard Douglas", the fifth I do not remember the name. He also built a small sawmill on Sabies River The "London" was launched on the 26th day of August, 1816.

Several years before his death in 1841 he gave up doing business.

I have given you all the particulars about Mr. Peabody with the exception of letting you know, that one Conrad of Halifax traded to Miramichi with a schooner loaded with dry and wet goods and Leonard Hawbolt did business for him.

I am, Sir,

Yours &c.,

(Signed) Wm Innis, Sr.

The spruce stood opposite the Bowser House on the property now owned by W. S. Loggie, M. P.

Francis Peabody, after he settled down here, acquired possession of the north west corner of the Henderson farm, which includes that portion on which to-day are the following properties—The World office, MacLachlan's warehouse, A. & R. Loggie's warehouses and wharf, Hickey Bros' store, the house and store of the late Hon. Senator Muirhead, the Telephone Exchange, Jas. Desmond s property, the Golden Ball property, Gillis house, &c., around to Johnston street, with all its river frontage. He lived in a small one-and-a-half story cottage that stood between Hon. Wm. Muirhead's store and the Telephone Exchange, on what is now a vacant lot. This cottage was afterwards struck by lightning and consumed with all the outhouses connected with it, and two or three cattle were burned, but this was after Peabody had moved out.

He had his store where The World office now is, and his business grew to be very extensive. He built the first ship that was built on the river. Where his shipyard was I am unable to find out. Our oldest inhabitant says he thinks it was where Snowball's mill now stands, and which was afterwards Cunard's ship yard, but why he should go away down there a mile to build when he had just as good a chance on his own property, where Hon. Wm. Muirhead afterward built some large vessels, I cannot understand. He built five vessels, as Mr. Innis says, and the fifth one, that Mr Innis forgets, was the bark "Peabody," which was lying at Newcastle the day of the Miramichi fire of 1825, drifted across the river, burnt to the water's edge and sank. Some portions of it, with crockery, tables, utensils, &c., were dredged up a few years ago, and one iron knee with copper bolts was presented by Governor L. J. Tweedie to the Miramichi Natural History Association and is now to be seen in their Museum. Besides this property in town, Peabody owned lands from the

Bishop's residence that now is back to the swamp beyond the Chatham Branch, I C. R., on the West side of the Chapel road, with barns on it for storing the produce.

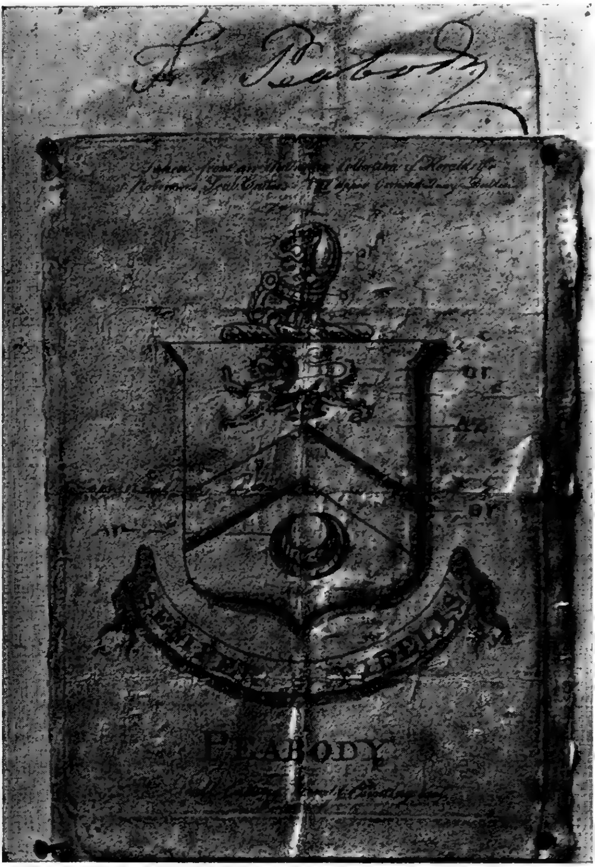
He built what at that time must have been considered a splendid residence in 1838, viz., that large two-story house occupied and owned afterwards by the Hon. Wm. Muirhead, and now owned by A. & R Loggie and occupied at present by Mr. Babineau as "Babineau's Hotel." The work on this house was done by Andrew Currie, stone mason, and is a fine piece of work, as the cement and joinings, &c., are all as perfect to-day apparently as the day it was built; but a third story in wood has lately been added to it. He was a man of considerable importance on the river and was quite well off. He was the means of giving the town its name, as Mr. Innis shows in his letter. One of his vessels and a street in town, viz., what is now lower Duke St., from Princess to St. Andrew's St., were called after his wife, Lydia.

He had no family but his wife lived until 1845, and is well remembered by some persons still living.

Some of the principal men in Chatham, in consideration of the services rendered by Mr. Peabody to the town, had a large oil painting, about 4x5 feet, made of him by some artist in the old country and presented to him.

This portrait at his death fell in o the hands of his legal adviser, the late George Kerr, Esq. At Mr. Kerr's death it fell into the hands of his clerk or amanuensis, John Ellis, Esq., and after his death the late Dr. Joseph Benson obtained it from Mrs. Ellis, and at Dr. Benson's death it passed to his sisters, the Misses Benson, in whose hands it now is. This picture shows a fine looking old man with a thick growth of long grey hair around a face of strong, pronounced, firm features, bright black eyes, a clean shaven face, with a prominent nose and a set mouth. He is seated beside a small table, on which lies a book and an old-fashioned folded letter with a large wax seal. His right hand lies on the arm of his chair; the left lies on his lap, holding his well-remembered tortoise shell and silver snuff box. A photograph of this portrait, as well as his coat of arms and his signature (original), are to be seen in the museum of the Miramichi Natural History Association at Chatham. (See cut in this number.)

The coat of arms is Azure, a chevron or between a Lion passant or in chief and a crescent argent at base. The motto, "Semper Fidelis." The crest a talbot's head erased proper, gorged, in or on a bandeau azure and or.



PEABODY ARMS.

Peabody did not seem ever to have sat in the Legislature, as Cooney gives the following list:

"1802 Jas. Fraser and Alex. Taylor.

1809 Jas. Fraser and Alex. Taylor.
1816 Jas. Fraser and Richard Simonds.
1819 Richard Simonds and Joseph Saunders.
1820 Richard Simonds and Hugh Munro.
1827 Richard Simonds and Alex. Rankin.
1829 Alex. Rankin and Joseph Cunard.
1830 Alex. Rankin and Joseph Cunard."

He also gives in his list of ships built between 1820 and 1830:

"Builders.	No.	Tonnage.	Supposed Value.
Francis Peabody & Co.	5	1.594	£15.940 . 0 . 0 "

Nor does Peabody seem to have had any connection with the central Government offices. The seat of Customs was not at that time either in Chatham or Newcastle, but at a point half way between, at Bushville, and the Customs officials were men sent out from England for the purpose. The custom house was a small one-story building with a portico with green columns It stood slightly back from the road at the North West corner of the Ullock property, below Judge Wilkinson's, and John Wright, when he was Customs Collector, lived in a cottage-roofed house a little further back from the road and in the centre of the lot. This house was only lately burned down

To find out who were the appointees here I have written to Fredericton, Ottawa and London, and have searched all available material at the Custom House here, where I came across an old book of Ships Entries or Ship Register, in which I find John Wright's name signed as Collector of Customs from 22nd June, 1828, to Nov. 3rd, 1834. He was evidently the Imperial Collector sent out from England, but how far back his appointment, or how long after he continued to act, I do not know, but if I get a reply to my letter sent to the Customs Department, London, before I finish this paper, I will put it in the Addenda. In this book also, signed as Controller, I find attached the name of George Pinchin. This I took to be the appointee of the Local Government, as then there were always two, one Imperial, the other Local. I wrote to Fredericton, and, through the kindness of Jos. Howe Dickson, I have the following:

"1828, June 25: Dedimus to James Peters to qualify George Pinchin.

1832. Leave of absence to George Pinchin as comptroller, waiter and searcher of Miramichi.

1832. J. D. Lewin, appointed in place of Pinchin, during absence."

This I found to be fully verified by this book of ships entries, as Pinchin signed as Comptroller from July 21st, 1828, to the 17th Sept., 1834, except an interval from 29th October, 1832, to 16th August, 1834, when J. D. Lewin signed as acting in his stead. This J. D. Lewin was afterwards President of the Bank of New Brunswick at St. John, N. B., and a Senator of Canada. I might also here note that in this report from Fredericton I find also the following:

"1823, Nov. 8. Perry Damaresq, of St. Peter's, Northumberland Co., as a preventative officer.

"1824, Dec. 28, Theophilus Desbrisay, Esq., Clerk to the Naval or Navy Officer in the ports of Miramichi, Richibucto, Shediac and the Bay Chaleurs, including four outbays, in room of B. P. Wallop, deceased."

This is all the information I have thus far got on the subject, but I find that there was also a Deputy Treasurer appointed by the local Government in every county where there were shipping entries, to make his returns to the Provincial Treasurer, and the Deputy Treasurer at Miramichi was Thomas Horsfield Peters, who was appointed April 1st, 1813, and who seems to have held the office until the appointment of J.T. Williston on Dec. 1st, 1854.

Mr. Peters was appointed Clerk of the Peace for Northumberland, Feb. 22nd, 1812; Surrogate 21st June, 1822; Notary Public, 1815, and a member of the Legislative Council Dec. 30, 1843. He went by the name of Judge Peters here, and built the house that Judge Wilkinson now lives in and lived there.

Francis Peabody was a tall and rather stylish looking gentleman. He was about six feet or a little over, but slightly stooped; had a smart, sprightly, business-like air; was always neatly dressed in what we would call to-day a Prince Albert coat and dark pants. He had mixed grey hair and was an inveterate snuffer, and always had his snuffbox of tortoise shell with silver cover about the shape and size of a cake of toilet soap. He has it in his hand in his picture, which we give with this. He had two places of business or stores, one on each side of the entrance to his wharf. One (THE WORLD office) still stands; the other was burned down. It was the building where the late George Parker lived The frames and lumber for these two buildings were brought from Tabusintac and got out by Benjamin Stymiest. The pine sills of the Parker house were still sound and good when it was burned They were pine sills squared with the axe, and I do not think could be duplicated to-day in New Brunswick.

What Peabody's religious convictions were I do not know, but he attended the Presbyterian church regularly in his later years. The very year that he came here there came also the first Protestant minister, Rev. —— Urquhart, and the next year or the second, 1801 or 1802, was built the Moorfield church, opposite the lower end of Chatham, across the river, at what is now called Mill Bank.

The Rev. D. Henderson has in his possession a silver Communion Flagon, with the date 1805, which belonged to this congregation. The services and the people were at this time very primitive; for instance, the service was held on alternate Sund ys at Wilson's Point and at Moorfield. The people came from both up and down the river in canoes, which contained the worthy householder, his whole family, a picnic basket of provisions and a jug of West India rum. The canoe was hauled up on the beach, and the people sat around on the shore or in the graveyard till the service commenced, but as very few had watches (and the sexton evidently had none) a pair of the minister's pants were hung out of the manse window when it was time to ring the church bell, and all filed into their pews or rather benches to hear a sermon from one hour to one-and-a-half hours in length. Then came intermission of half an hour or so, when the picnic baskets and jugs of Jamaica were interviewed, which no doubt infused sufficient spirit for another one to one-and-a-half hours' service in the afternoon.

The people at this time, both male and female, dressed entirely in homespun, until one day a sprightly and rather "sporty" lady marched up between the rows of benches in a silk dress. No, I am not going to tell you the lady's name, but suffice it that the swish of that silk dress and the name of the wearer have echoed down through the years to the present day. Whether Peabody was among those worshippers at Moorfield or not I cannot find out, but probably he was, as I know for certain that he attended regularly afterwards at St Andrew's and lies buried in the churchyard.

I have heard from what I believe to be good authority that Moorfield church was burned down, but the graveyard is still used and there are some very curious inscriptions on the tombstones. I here give a few:—

"Here lies the remains of Jno Taylor, son to Alex. Taylor, Esq., who misfortunately drowned on the 26th July, 1814, and was here decently interred on the 28th ditto, accompanied by the Major of the 1st Battallion Northumberland Militia. Many respectable gentlemen with honours of war bestowed.

"He was aged 32 years. Held a Lieutenancy in said militia and left a wife and three helpless children to bewail their loss"

I don't know what they buried the major for, but here is another:

"To the everlasting memory of Helen Newlands, spouse to Wm Barclay, who died Aug. 27th, 1820, aged 25 years.

"She was harmless to all, enemy to Non
Left two children and parents their loss to bemoan
Grieve not my friends because I die
I gain by death eternity."

Probably composed by the late Wm. Barclay.

Another sorrowing widower, Patrick Taylor by name, who married Isabella McLean, daughter of Daniel McLean, late collector of the customs in Montego Bay, Jamaica, at Isabella's death, Aug. 12th, 1791, and only 27 years of age, was so affected that he set up a large double tombstone covered with skull and crossbones and other insignia, and filled one half of it with information about Isabella and left the other half vacant, probably for himself; but whether he married again or died away from home, or changed his mind about Isabella, the other half is still vacant. [This might even be Patk Taylor of Lot 30—? J. B.] Another reads:

"Memento mori oh ye thoughtless"

"In memory of Mary Magdlen Grige, who lived respected and dyed lamented, 27th October, 1807, aged 26, leaving her Consort and one child to bemoan their loss"

You will notice that the schoolmaster was already abroad in the world.

It is just possible that the Moorfield church was burned in the fire of 1825, for Cooney says: "Moorfield, an old and populous settlement near Douglastown, was a pile of ashes." He also gives Francis Peabody's name on the local relief committee for the sufferers after the fire.

In wandering through the St. Andrew's graveyard on the Chatham side I found a gravestone with the following inscription:

"In Memoria
Thomas Æ Bell

"Qui olim in Classe Regia Medicus per Sex decimannos Miramichi medici munere humanissime defunct. Cum magno omnium mœrore XLV ætatis anno VIII Kal Jan anno Dom. Nostri MDCCCXX mortuus est.

Linque domum hanc miseram nunc in Sua fata ruentam."

I immediately set up enquiries about this Wm. Bell, and for a long time in vain. Nobody ever heard of him. But finally Alex. Fraser told me he had often heard his mother speak of him, and that "he was the only doctor on the river, and travelled from Miscou to Fredericton, and was always on the road, either on horseback or canoe." This may have had something to do with his early death. This was all I could find out, but I wrote to Lord Strathcona to have the Navy Records in London searched, and if I hear from him before this paper is finished I will give what information I get in addenda. He was the only medical man on the river from 1804 to 1816, when Dr. Key arrived. After Dr. Bell's death Dr. Key was the only physician here till 1832, when Dr. John Thompson and Dr. Stafford Benson settled here to practice.

I mention these facts to show that without doubt Dr. Bell would be Peabody's family physician until 1816, then Dr. Key from 1820 to 1832, but after that, which of the thr e, or who attended him in his last sickness I do not know. In 1816 dissatisfaction arose with the minister at Moorfield, and a congregation was started on the Chatham side of the river. Rev. James Thompson was called, and in 1817 St. Andrew's Church was built at the end of the blazed path that led through to Richibucto, which is now called St. Andrew's St. Here Francis Peabody was a regular attendant up to the time of his death in 1841.

There still lives a man here who has often seen him sitting in his pew, snuff-box in hand, Sunday after Sunday.

In 1832 James Thompson died, and the Rev. Robt. Archibald (Mrs. J. B Snowball's father) was called to the congregation, and was there at the time of Peabody's death in 1841, and without doubt performed the funeral ceremonies. Peabody is buried behind where the church used to stand (for it was torn down about 1865), and his wife Lydia lies beside him, their graves over-grown with a tangle of tall grass and brambles. The inscription on the grave-stone reads: Sacred to the memory of Francis Peabody, son of Capt Peabody of Majorville. Sunbury, who departed this life on the 4th of July, 1841, in the 81st year of his age. "The memory of the just is blessed." Also of Lydia his wife, who departed this life on 15th of Nov., 1845, aged 70 years.

LETTER RECEIVED FROM LORD STRATHCONA.

17 Victoria Street,
London, S. W.,
21st February, 1911.

DEAR SIR: With further reference to your letter of December 22nd, last, some enquiry has been made as desired respecting the Customs officers of Miramichi, N. B., between 1803 and 1841, and the particulars are enclosed herewith. No trace can be found of any officers for the period 1760 to 1803.

With regard to Thomas Æ. Bell, Steele's Navy List 1801 gives a Thomas Bell- Surgeonon half pay, but the name drops out in subsequent issues. The name of Dr. Bell also appears in the Admiralty Registers-Full Pay, Vol. 1. page 52, as Dr. Thomas Bell, with the following particulars appended :—

Ship's name Abergavenny—Service from 6th October, 1795 to 25th May, 1797—Ship's name Tourterelle—Service 4th June, 1797 to 3rd November, 1798.

Trusting that the information furnished will be of interest and service,

I am,
Yours faithfully,

W. H. Griffith.

J. McG. Baxter, M. D.,
Chatham, N. B,
Canada.

Customs Officers at Miramichi, N. B., 1803 to 1841.

March 1803.	Alexander Taylor, Preventive Officer.
1814.	" " still in office.
	Richard S. Clarke appointed by Collector at St. John (Wanton) but on retirement of latter, the new collector at St John, Wright (appointed 3rd May, 1816) sent his son J. Wright to Miramichi.
10th April, 1818.	Petition of Richard S. Clarke against J Wright's appointment since he was only a minor, being born in 1796.
11th Jany 1823.	J. Wright appointed preventive officer and sub-collector.
1840.	J. Wright still in office.
21st July, 1828.	George Pinchin, Comptroller, landing master and searcher.
1823.	George Pinchin still in office.
8th June, 1830 21st May, 1838	James Davis Lewin, Customs Clerk.
9th Aug. 1834 10th July 1837	S. Forsayeth, Comptroller.
18th Nov. 1835 19th Oct. 1842	D. Swayne, Comptroller, etc.
13th May, 1843 20th Oct., 1853	" " death of
24th June, 1837	Joseph Dean, Landing-waiter and Searcher.
23rd July, 1838 23rd Dec. 1840	W. (or N.) B. Barron, Collector's Clerk. death of
22nd Sept. 1841	Richard Hocking, Clerk.

TREASURER'S REPORT.

1907–8.

Balance on hand Feb, 12th, 1907	$ 43 86	
Government Grant, 1907	200 00	
Membership fees, Bulletin, &c.	69 50	
		$ 313 36
Expenditure:		
Contingencies	$ 69 14	
Addition to Building Fund	200 00	
Balance on hand	44 22	
		$ 313 36

1908–9.

Dues	$ 16 50	
Government Grant	200 00	
Interest	16 20	
Sundries	1 65	
Rent of Hall	20 00	
Subscriptions to Building Fund	912 06	
Balance from last year including reserve for Building Fund	419 18	
		$ 1585 59
Expenditure:		
Paid on building	$ 1400 00	
Electric lighting	62 00	
Furniture	21 06	
Insurance	22 50	
Sundries	18 16	
	1523 72	
Balance on hand	61 87	
		$ 1585 59

1909–10.

Balance from last report	$ 61 87	
Government Grant	200 00	
Proceeds of picnic	37 64	
Dues	22 50	
Gift from County Council	50 00	
Subscription to Building Fund	650 00	
		$ 1022 01
Expenditure:		
Paid on building	$ 900 00	
Paid mounting specimens	62 00	
Current expenses	54 81	
Balance on hand	5 20	
		$ 1022 01

1910–11.

Balance from last report	$ 5 20	
Government Grant	200 00	
Subscriptions to Building Fund	45 00	
Dues paid, Interest	37 46	
Total		$ 287 66
Expenditure:		
Insurance on building and contents	32 50	
New cases, mounting specimens, etc	80 51	
Running expenses	72 49	
Balance on hand Feb. 14th	102 16	
		$ 287 66

The insurance for next year, the printing of this Bulletin, further cases for specimens, &c., will more than cover this balance.

CURATORS' REPORT.

We beg leave to report a great access to the material in the museum.

In fact it is coming in faster than we can spare means to build cases to contain it. We received a fine specimen of a young female moose from the Government's collection in Fredericton. A young bear and some other smaller animals are being stuffed now and will be ready soon. A most valuable lot of minerals. about 400, and mounted plants, 150, all classified and labeled by the late Dr. Chalmers was bought at a bargain and a series of cases to contain all mineral specimens for years to come is being set up. These we hope to have ready next summer.

The following is the list of accessions:

The following list of donations does not include all as there are a number of specimens being mounted that are not mentioned. The mineral and plant specimens from the estate of the late Dr. Chalmers make a very valuable addition as they are classified and labeled by undoubted authorities.

J. D. B. F. MACKENZIE,
A. ADAMS.
W. ROBERTSON,
A. J. LOGGIE,
Curators.

DONATIONS TO MUSEUM.

1907-1908.

Sample of Barytes from Lake Anslie, C. B., from J. R. McMillan.

Old Breast Saw and Cannon Ball from the Bartibogue ruins, from A. McLennan.

Copper Kettle from Moody's Point, from Rev. Father Morriscy.

Box of Shells, from Miss S. Benson.

Specimens of Minerals from Cobalt, from C. C. McCulley.

Specimens of Petrified Wood, from Geo. Nealy, Sr.

Raftman's Pike Pole dredged from the river, very old, from C. Bernard.

Harpoon and pair of handcuffs, from Dr. Cox

20 specimens of Marine Animals from James McHardy, Mill Bank.

Pom Pom Cartridges from South Africa, from E. Hutchison.

1908–1909.

Crecopian Moth, from D. Lewis, Escuminac.

Old Ox Shoe and a pair of Ox Shoes, from John Johnston.

Walrus Tusk, from Dr. J.B. Benson.

Amularia Latifol, petrified, from A. Gordon Leavitt.

Box of Shells, different varieties, from Miss S. Benson.

Gray Lynx (stuffed), from Mrs. A. Brown.

Specimens of Minerals from C. C. McCulley.

Works of a watch which had passed through the battle of Bunker's Hill, from Myer Moss.

Specimen of Antimony, from Mr. McEachern.

A large number of salt water specimens of all kinds, from James McHardy.

Stuffed Gannet, from A. H. Marquis.

1909–10.

2 Pictures (framed) of the oldest house in Chatham, Year Book, Department of Agriculture, U. S. A., Picture of a Moose in a Sleigh, Fancy Tea Box, Chinese, from Dr. Baxter.

Specimens of Fire Crystalized Rock, one from Tobique River and one from Restigouche River, from Fred Ferrisk.

Large Glass Demijohn, ornamented, from Mrs. W. Johnston.

Specimen of the growth of Kelp on the lobster traps in the Gulf, from James McHardy.

Old fashioned handcuffs and Harpoon, from Dr. Cox.

Curling Stone, Lignum Vitæ (1834). from Mr. W. Wyse.

Old Directory and other old books, Surveyor's Book (old 1827), Box of specific Gravity Beads, Test scales for weighing gold, Old Dictionary, from R. S. Hocken.

Old time Lanthorn (100 years old), from Dr. McKenzie.

Bottle of Scorpions, from Captain —

New Brunswick Debenture, from Dr. Vaughan.

Stone Arrow Head and Old Coin, from Dr Losier.

Minute Book of the Mechanics' Institute, from Col. McCulley.

Sickle (reaping hook). from John Johnston.

Foot of a Duck, from George Fraser.

Old Book, from James Mowatt.

Skin of a Rattlesnake and of a Turtle, in alcohol, from Thomas

Murphy.
Two Stone Gouges and a Chisel, from A. Wheeler.
Cigar Case of Grass, West Coast of Africa, from Captain———
Stone Arrow Heads, Mr. W. Wyse.
Peculiar Worm, in alcohol, from J. D. B. F. Mackenzie.
Flintlock Gun and Cutlass, from Alex. Fraser.
Remarkable Stone, from E. P. Williston.
Specimens of Magnetic Iron Ore, Bog Ore, and Iron Pyrites from the Bathurst mine, from J. J. Harrington.
Horns of a Mountain Goat, from Thomas McFarlane.
Old Powder Horn, from Mrs. Ellis.
Part of the Vertebrata of a Whale, from Ken. McLennan.
Ore and Borings from the Bathurst mine, from James Neilson.
Specimen of Iron Pyrites, from James Blakely.

1910–1911.

3 Old Flint Lock Guns, from L. W. Barker.
Head of Deer, do
Deer's Horns in the Velvet, from Fred Pallen.
Flax and linen made from flax, from J. D. Irving.
3 Specimens of Algæ, mounted, from Dr. Baxter.
Piece of Coral, do
Varra Racca, a poisonous snake from South America, from Dr. Baxter
Straw Cane, woven by natives of Angora Islands, and native pottery from Venezuela, from Dr. Baxter.
11 Specimens of Minerals from British Columbia, H. W. Falconer.
Gaelic Bible and other books from A. H. Marquis.
Specimens of Minerals, from Miss Mowatt.
Specimen of State Building Stone, Hartford, Conn., J. F. Dower.
Lace Tree, St. Lucia, B. W. I., from Mrs. Robert Ritchie.
Copper Spikes from French man o' war sunk in Restigouche River, from Mrs. Robert Ritchie.
Specimens of Minerals from Nova Scotia, from G. Stead.
Fungus growth on a birch tree, from Andrew Brown.
Piece of a poplar tree bored by a woodpecker do
2 very small Duck's Eggs, do
Gigantic Fungus growth, do
Cocoon of Silk Worm, Agates from Mount Blomidon, N. S., from

Miss Carter and Miss Clark.

Old Pistol, from Mr. Wood, Douglastown.

Piece of Slag, from C. A Boysen.

Pieces of the planking, &c. from a vessel sunk in the fire of 1825. from Mr. Manny.

A Snake, from P. C. Johnson

Flying Squirrel, caught on the Wellington Road, Dudley Perley.

Specimens of Coral and Galena, from J. Feinbrook.

Flat fish, half of the under side is white and half dark color, from Ernest Ryan.

Korean Coin, from Miss B. M. Creighton.

Nova Scotia half cent, 1861, from J. D. Creaghan.

2 English Pennies, 1861, from R. A Lawlor.

An odd piece of stone dug up in the street in Newcastle, from E. P. Williston.

Specimens of Magnetic Iron Ore, Bog Ore, Iron Ore, Iron Pyrites, Mountain Stone, from the mines at Bathurst, from J. J. Harrington.

LECTURES AND MEETINGS.

1907–8.

1907.			
Feb.	12	Annual Meeting.	
	19	Adjourned Meeting.	
	26	Patron's death. No Meeting.	
Mar.	5	Echinodermata,	J. Baxter.
	12	Business Meeting.	
	19	Some Peculiar Insects,	J. D. B. F. Mackenzie.
	26	Echinodermata, continued,	J. Baxter.
		Skates' Eggs,	Dr. P. Cox.
Apr	2	Geology of Northern Counties,	Dr. P. Cox.
	9	Business Meeting.	
	16	Some Denizens of the Sea,	F. A. Dixon.
	23	Adjourned Meeting.	
	30	Icthyo and Plesiosauri,	Dr. P Cox.
May	7	Mythological Faunæ,	J. Baxter.

	14	Business Meeting.	
June	13	Business Meeting.	
Nov.	12	Business Meeting.	
Dec.	10	Business Meeting.	
1908.			
Jan.	14	Business Meeting.	
	28	Canals on Mars,	J. Nicol.
Feb	4	Postponed on account of weather.	

1908–9

	11	Annual Meeting President's Address.	
	18	Inferior Planets,	J. Nicol.
	25	Peculiarities of some Insects.	J. D. B. F. Mackenzie.
Mar.	3	Local Election. No meeting.	
	10	Winter Birds,	J. McIntosh
	17	Brown Tail, and Gipsy Moth, Tent Caterpillar,	J. D. B. F. Mackenzie.
	24	Bacteria	J. Baxter.
	31	Bacteria in Arts,	do
Apr.	7	Bacteria in Agriculture	do
	14	Business.	
1909.		No meetings in fall, engaged with new building.	
Jan.	12	Opening New Hall.	
	19	Business.	
	26	History of Ship Fever here,	J. Baxter.

1909–10

Feb.	8	Annual Business Meeting.	
	14	Forestry,	Mr. Lawlor.
	22	Significance of Consciousness,	Principal C.J. Mersereau.
Mar.	1	Crime,	Dr. O. J. McCully.
	8	Business.	
	16	Coinage and Coins.	J. D. B. F. Mackenzie.
	22	Canadian Coinage,	J. D. B. F. Mackenzie.
	29	Travels in Europe,	Jno. T. Hawke.
Apr.	5	Language,	Rev. G.F. Dawson
	12	Business.	
	19	Mars,	J. Nicol.
	26	The Land of Lorna Doone,	Dr. G. U. Hay.

May	3	A Promenade,	J. Baxter.
	10	Business.	
Dec.	13	Business.	
1910.			
Jan.	10	Business.	
	17	No Meeting.	
	24	Extra Business.	

1910–11.

Feb.	16	Annual Meeting.	
	23	Address, The Great Civilizer,	J. L. Stewart.
Mar.	2	Mediæval Natural History,	J. D. B. F. Mackenzie
	9	Business. President's Address.	
	16	Jelly Fish,	J. Baxter
	23	Evening with Microscope,	do
	30	Natural Law in the Moral World,	J. L. Stewart.
Apr.	6	Forestry,	Hon. C. E. Oak.
	13	Random Thoughts,	J. Baxter.
	20	Big Things and Little Things in Science.	Dr. O. J. McCully.
	27	The Evolution of Incarnation	Rev. A. J. W. Myers.
May	4	Indian Superstitions,	J. Baxter,
	11	Business Meeting.	
	18	Adjourned Meeting.	
Dec.	13	Business.	
1911.			
Jan.	10	Business.	
	17	Nature One and Indivisible.	J. Baxter.
	24	Educational Meeting.	
	31	The Land of the Southern Cross.	W. F. Hatheway, M. P. P.
Feb.	7	Witchcraft and That Sort of Thing.	J. L. Stewart.
	14	Business.	

DONATIONS TO LIBRARY.

1907–1908.

The Canadian Entomologist, The Ottawa Field Naturalist.
Bulletin, Central Experimental Farm, Ottawa.
Records of the Australian Museum.
Proceedings of the Boston Society of Natural History.
A number of volumes of Acadiensis from Dr. J. B. Benson.
A number of pamphlets on British Columbia, from the Deputy Minister of Agriculture, B. C.
Geological Maps, from the Geological Department, Ottawa.
Report of Ottawa Field Naturalist Club, Ottawa.
Report of Australian Museum. 1906.
Proceedings and Transactions of the Nova Scotia Institute of Science.
Proceedings of the California Academy of Science, San Francisco, Cal.
Canadian Antiquarian, Montreal.
Report of Geological Survey Department, Ottawa.
Report of Experimental Farm, Ottawa.
Bulletin of the New York Botanical Gardens, New York.

1908–1909.

Copies of Acadiensis.
Reports from the Agricultural College, Ottawa.
Number of Ottawa Field Naturalist.
Number Canadian Entomologist.
Acadiensis for one year, Dr. J. B. Benson.
Five numbers of Acadiensis, from the publisher.
Report of the Geological Survey.
Reports of Government Experimental Farm, Ottawa.
Reports, Falls of Niagara.
Proceedings, Boston Natural History Society.
Canadian Antiquarian, Chateau de Ramesay.
Bulletin New York Botanical Gardens.
Proceedings, California Academy of Science.
Records of Australian Museum.
Reports, Department of Agriculture, British Columbia.

Report, Historical Scientific Society, Manitoba.
Manitoba Birds of Prey
Annual Report and Proceedings, Belfast Natural History Club.
Twenty-five years' Geographical Society reports, Dr. Baxter.
13 Volumes, year book, Department of Agriculture, Dr Baxter.
1 ornamented glass Demijohn, Mrs. Wm. Johnston.
Birds of Ontario, W. Nash.
Fishes of Ontario, W. Nash.
Batracians and Reptiles of Ontario, W. Nash.

1909–1910.

Index to General Species of Forminifera, Smith Institute
Report of Fishery International Exhibition, London.
Check List of birds, fishes, reptiles and batrachians, Ontario Government Report.
Weber's Archive, Mutation in Mosquitoes.
Marine Biology.
Record of Articulations, musical, Vol. 6 and 7.
Bulletin of Lloyds Library.
Bulletin, No. 61, Experimental Farm, Ottawa.
The Relation of Insects to Disease, Set No. 1.
Annual Report of the Superintendent of Education, Nova Scotia.
Canadian Entomologist, Vol. 6.
Bulletin of New York Botanical Gardens, Vol. 6, No 20.
Proceedings of Academy of Natural Science, Philadelphia, Vol. 60, No 123.
Archæological Report of Ontario

1910–1911.

Copy of the Decennial Report of the New York Zoological Park, 1909, from Samuel Adams.
Transactions of Warren Academy of Science, Warren, Pa., 1903–7.
Annual Report and Papers read before Warren Social Science Club
Reports on United States Grasses from G. Stead.
Large Map of the Dominion from Lieutenant Governor Tweedie.
300 Volumes of Books from the Masonic Lodge.
Report of Result of Different Kinds of Feed, No. 66, from the Experimental Farm, Ottawa.

The Library is steadily growing and these last 300 volumes from the Old Mechanics Institute make a valuable addition.

B. M. Creighton.

OFFICERS OF ASSOCIATION.

1908--1909.

President—James Nicol.
Vice Presidents—G. Stothart and J. L. Stewart.
Treasurer and Corresponding Secretary—Dr. Baxter.
Secretary—G. B. Fraser.
Curators—A. Adams, J. D. B. F. Mackenzie, Wilfred Robertson, Dr Cox.
Librarian—Miss Bessie M. Creighton.
Additional Members of Council—G. Stead, J. McIntosh, John Johnston, and Warden of County Council.

1909--1910.

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1910--1911.

Patron—Lieut. Governor L. J. Tweedie.
President --J. L. Stewart.
Vice Presidents—G. Stothart, D. P. MacLachlan, M. P. P.
Treasurer and Corresponding Secretary—Dr. Baxter.
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The Association reformed on February 14th of this year, appointing Trustees and in all other respects conforming to the Act of Incorporation requirements.

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PROCEEDINGS

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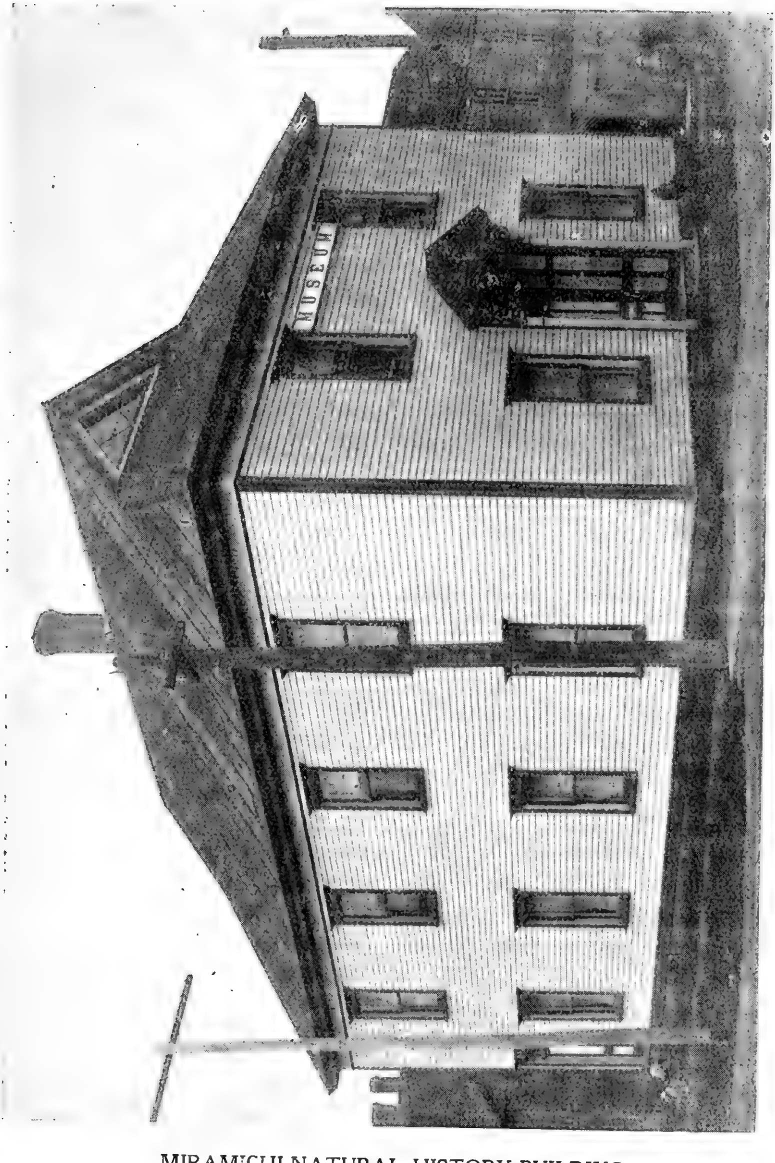
MIRAMICHI NATURAL HISTORY ASSOCIATION.

NO. VII.

CHATHAM, N. B.:
THE WORLD PRESS.
1913.



MIRAMICHI NATURAL HISTORY BUILDING.

PROCEEDINGS

.·. OF .·.

MIRAMICHI NATURAL HISTORY ASSOCIATION.

NO. VII.

CHATHAM, N. B.:
THE WORLD PRESS.
1913.

J. McG. BAXTER, M. D.

OPENING ADDRESS.

BY HON. L. J. TWEEDIE.

MR. PRESIDENT, LADIES AND GENTLEMEN:

When Dr. Baxter invited me to deliver a short address at the opening Winter course of this Society I readily assented, as I understood from him that a set speech was not expected, but that I was merely to make a few remarks in the nature of a 'curtain raiser.'

In common with many others of the Town folk I have been greatly interested in this Society, and have watched with pleasure its growth and development, and although circumstances have prevented me from taking an active part in its work, and attending its meetings, I have in other ways endeavored to assist and help it along since its formation in 1897. The membership at first was small but gradually increased, and now numbers nearly one hundred. The object of the Society is the study of nature, the collecting of relics and information on the past history of the Northern portion of this Province, comprising Restigouche, Gloucester, Northumberland and Kent, the education of the youth—implanting in their minds a love of nature and nature's works, and also to encourage a greater knowledge of the resources and possibilities of our own province. Lectures are given once a week, and last year twice a week on Tuesdays, and Fridays. The average attendance at these lectures has been from 150 to 200. The building was erected at a cost of about $2500, and everything connected therewith is owned by the Society, and is entirely free from debt. The Association has exchanges with similar Societies all over the world, and is in a most flourishing condition.

As too often happens in starting a movement of this kind the burden falls upon a few. In this particular instance the principal burden bearers were Dr. Baxter, Col. Mackenzie, and Dr. Cox, and these gentlemen deserve the highest credit for the zeal and well directed efforts to which its success is largely due.

I do not think that any of us know fully or appreciate the extent of Dr. Baxter's work. To him mainly is due the credit for raising sufficient funds to erect this commodious building, and collecting with the assistance of the other gentlemen so many interesting specimens of Natural History and material belonging to the past, and has resulted in the Society possessing a Museum and most valuable collection which is second to none in this Province of New Brunswick. I had the pleasure sometime ago of attending a reception at the rooms of the Natural History Society at St. John, and after examining their collection, I concluded that the Natural History Society of Chatham had nothing to be ashamed of, and would compare favourably with that of the larger city.

To have such a building and valuable Museum and collection, all unencumbered and free from debt, is somewh t unique in the history of societies and associations of this kind throughout the Province.

When a boy the name of Baxter was not very popular with me, and I have no doubt there were many other boys like me. Often times on a beautiful soft sunny Sunday when all nature was cal ling to me I had to stay in the house and read "Baxter's Call to the Unconverted" and "Baxter's Saints Rest," and this at a time of a boy's life when the "heart exults and sings, the pulses leap, the feet have wings," and "the boy's will is the wind's will, and the thoughts of youth are long, long thoughts." I had no ambition then to be a saint, and the last thing I required was rest, and therefore the author did not appeal to me. That was a boy's view, but to the mature mind and to the men who must work and the women who must weep, I have no doubt the reading of these books brought comfort and consolation.

The name of Dr. Baxter will always be associated with this Society and will be deservedly popular, because he has shown what can be done in the interest of a community by one who takes an interest in his fellowmen, and in the youth of the country, and unselfishly devotes his time and talent to encourage a broader view of life and the education of the people.

The opinion of many is that the present time is not as moral or religious as it was generations ago, and that the great ambition and apparently sole desire of the people is to make money, and "get rich quick" is the slogan of the times. There is no doubt that with the progress and advancement that is being made during the past century along all lines, the facility for money making is greater than ever before. New avenues have been opened up, new industries started, and inventions and discoveries made, which all tend to increase the money making power, yet while all this be true there never was a time in the history of the world when greater efforts have been made for the attainment of knowledge, to benefit society, to educate the people and generally uplift humanity. Take religion. The Churches are more active and energetic than ever before, and are doing more to-day to assist the poor, to protect the weak and rescue the fallen than in any other age. Take for example the great work of General Booth and the Salvation Army—one of the greatest moral movements that has ever taken place in the history of the world. The efforts of his Army have been directed on a gigantic scale to assist the unfortunate. In every civilized country its banner is waving and zealous workers are everywhere struggling with vice and crime, and in every possible way endeavouring to rescue the perishing, to reform the drunkards and the fallen, and to inspire hope in the despairing. To follow the great work of that Army creates amazement and wonder. The feeding of the enormous numbers of the needy on New Year's and Christmas days at the great city centres, the bringing of joy and pleasure to the little ones with Christmas gifts, and comfort and consolation to those who mourn is only a part of the great work that has been and is being accomplished. Take the medical profession. Never before have there been so many able men labouring and struggling with difficult problems, and in research in order to benefit their fellow-men, and conquer those fell diseases such as tuberculosis and cancer, the great enemies of the human race. Since the days of George Peabody, who almost stood alone half a century ago as the world's greatest philanthropist, how great has been the growth of philanthropy. Millions have been given for religious work, millions for scientific work, millions for moral reform, millions for educational work, universities and colleges, millions for medical research and hospitals, millions for libraries and millions for the preservation of the world's peace. Rockefeller, Carnegie, Lord Strathcona, Sir Wm. McDonald and others have contributed vast sums for the betterment of the human race, and although it may be a question as to whether Carnegie's gifts to circulating libraries is a good policy, and a benefit to the people, yet all this goes to demonstrate that man to-day is taking a less selfish view of life and is endeavouring to to help forward his neighbour and thereby strengthen the nation.

Richard Brinsley Sheridan has said "that a circulating library in a town is an evergreen tree of diabolical knowledge," and in my opinion there is some truth in this statement. One great drawback to educational advancement and the attainment of knowledge to-day is the class of literature with which the country is flooded, pernicious in the extreme, inculcating false views of life and of manhood and womanhood. To counteract this evil, literary societies and associations such as this can exert a most healthful influence. The possibilities of this association for improving the mind of the youth of the country, and inspiring them with proper and laudable ambition, are great. It is unfortunate that in the days gone by our forefathers took such little interest in preserving records of their times which, if preserved, would to-day be of immense value to their descendants. No record of important events of the past century, or at all events very incomplete records, have been kept. Even the facts in connection with the great Miramichi Fire are but imperfectly known. In the Legislative Assembly and Provincial Departments at Fredericton, public documents of great value have been lost or destroyed, and almost criminal neglect has been displayed on the part of those who should have seen that they were properly taken care of and preserved. Some few years ago business called me to the city of Portland, Maine. While there I visited the early home of the poet Longfellow, and spent a most interesting morning. Almost everything connected with his life from childhood to manhood had been preserved. The little trundle bed on which he slept, with the coverlet and bed clothes, was there. His school books, on the first page of which was scrawled in boyish hand the legend "Henry Wadsworth Longfellow"; the skates that he used; the desk at which he sat and wrote "The Rainy Day"; the correspondence with his father when he made his first visit to Europe; the cost, bills and accounts of that trip; the old-fashioned uniform of his military ancestors; the first piano that came to the city of Portland, and other most interesting relics, were all there. His sisters' dolls and their little beds—not the fancy dolls of to-day with their wealth of hair, and eyes that open and shut and who say papa and mamma, but the old-fashioned wooden dolls, ancient pin cushions well filled with pins of a century ago. The old kitchen utensils, the favourite arm chair. All these and many other things were viewed while there, and which enabled me to spend a very pleasant morning. Loving hands had preserved all these things, and at a great age the poet's sister at her death bequeathed the house and property with all its equipments to the city of Portland.

On another occasion I had dinner at the Sudbury inn, the scene of Longfellow's "Tales of a Wayside Inn." Most of the relics of bygone years had been preserved and were most interesting. The house has been kept in the same style. No alterations made since it was built. The old bar was there, and a grille was supposed to be lowered at the hour of closing, which I believe in these days was nine o'clock. When this grille was closed there was no communication supposed to be had behind the bar with the outside room, but I observed that room enough was left between the grille and the counter for the passage of the pewter mugs which were used in those days for drinking beer, and was evidently the way the landlords of the time had for getting over, and for evading, the law, and I have no doubt that if the Scott Act had been in force in these days the same difficulties would have been found as are to-day experienced in its enforcement.

To be able to know how our ancestors lived, and what was the daily routine of life, in years gone by, is most interesting, and it is regretable that people in the past have not appreciated that fact.

Again it is well to be fully informed and have an accurate knowledge of our own country, and while this Society has by its lectures, interested the people in our great Dominion, its resources, industries and public works, yet in a practical way great good might result, in my opinion, if lectures were delivered, and discussions had upon the natural resources of this Province. These resources are principally agriculture, lumber, and fishing. The interest taken in agriculture at the present day is widespread. The farmer is at the head of all other industries, and to the development of agriculture all Governments are looking for the material prosperity of the people. Two or three years ago a notable gathering met at Rome attended by delegates from the four corners of the globe, to discuss matters pertaining to agriculture, and to increase the knowledge of the tillers of the soil, and the best conditions under which to labour. The delegates in all represented forty-six nations, and assembled in the magnificent marble palace in the grounds of the Historical Villa Borghese. The Institute was opened by King Victor Emmanuel, at whose suggestion the International Institute of Agriculture was formed. This Institute has for its principal object the collection of complete and reliable information concerning farm crops in all parts of the world. A number of special departments or bureaus were erected, each to have charge of some particular branch of the work, such as the gathering of crop statistics, the obtaining of information about the prices paid for farm work, new diseases of vegetation, and the effective remedies, agricultural co-operation, insurance and credit, simplification of weights and measures. This is evidence of the great interest that is being taken in the agricultural problem.

Great assistance is given in our own Dominion for the promotion of this industry. Experimental farms have been established in all the provinces. Practical men have been sent out to lecture and educate the farmer.

I would like to see this association take an interest in the agricultural advancement of this Province, and particularly of this section.

If we had a gentleman of the ability of Dr. Baxter to give his whole time and attention to matters that might well be taken hold of by this association, good results would follow. For instance, one great drawback to intelligent, not to say scientific, farming is the lack of knowledge of the requirements of the soil. If the farmer could bring samples of his land to this Society and have the same sent forward to Ottawa to be analyzed, so that he might be informed as to what material the soil lacked and the partic lar fertilizer suitable for it, it would of itself be of great advantage. Of course sufficient salary would have to be provided, but I have no doubt that if the matter were properly pressed and brought before the Federal and Provincial Governments a grant might be made for the purpose of assisting the farmers in this locality and bringing them more closely in touch with the Experimental Farm and the agriculturists at Ottawa.

Again take the Forest Lands—the great asset of our Province. How many men in the Province know or can give a correct estimate of the extent and value of our forest lands? Having some experience in these matters I say without hesitation that even the Crown Land Department has very meagre knowledge of the Crown Timber lands. To a certain extent we are living in a fool's paradise. We are over producing. The lands cannot stand it, and while we may boast of the great revenue we derive from stumpage collection for timber cut, it is only a question of a very few years when that revenue will be materially lessened. The experience of the United States has been disastrous. We are prone—those of us who are not engaged in the business—to view with careless eye the devastating of the forests. We borrow money on a long term of years for Provincial and municipal purposes, the building of railways, permanent bridges, Court Houses, Jails, and other public works, expecting that posterity will have to pay its share of the cost,and while this may be correct still it is unfair to posterity that we should dissipate the assets of the Province which properly should go to pay their indebtedness. Millions of dollars have been lost by forest fires. Indiscriminate cutting of undersized logs has devastated large tracts of land. Conservation and protection is a vital question and one in which every person in the Province should be interested. There are large tracts of land to-day which should be reserved for years, and no cutting allowed to take place. Under proper conservation of these valuable lands in twenty years from now this Province would be the richest for its area of any Province in the whole Dominion. To properly protect and conserve our interest a thorough and complete survey of our forest lands should be had, and such lands should be classified, and lands fit for agriculture should be set apart and reserved for that purpose. Unfortunately squatters take possession of lands which are entirely unfit for agricultural purposes and cause great damage by fire. It is necessary that the people should be aroused and take an intelligent interest in discussing such a vital question. This Society by means of lectures and in other ways could be of great assistance in drawing public attention to the necessity of greater protection and in suggesting means by which satisfactory results could be obtained.

Again, an important matter to be dealt with is the protection of the game of the Province. It is comparatively a few years since anything like ample protection of the game was afforded, but the policy of protection adopted has been most advantageous and a source of revenue.

Guides are not always the better people from whom to obtain reliable information. Naturally they will tell you to-day that the large game is increasing—Moose and Caribou, but I believe and have every good reason to believe that the fact is otherwise. Hunters during the open season look for the heads with the largest spread of horns or antlers. Killing off these noble animals year after year must necessarily exhaust the supply, and I have always advocated that there should be a period, say for a year or so, in which the slaughter of the Moose and Caribou should be entirely prohibited The State of Maine, which was a great game country for years, pursued a sleepy policy. No great attention was paid to the preservation of the game and in consequence the Province of New Brunswick became a greater game centre than that of Maine, but now seeing their error they have very stringent laws for the preservation of Moose and Caribou and Deer in that State.

Another sublect that might well receive the attention of this Society is our fisheries. It is claimed, and I have reason to believe that the claim is well founded, that our fish hatcheries are engaged in producing a useless or fall fish instead of the bright Spring salmon, and to prove this fishermen will point out to you that in the month of September of each year this noble river of ours is filled with salmon which are of no commercial value. Illegal fishing is also carried on to an alarming extent. Many of our finest trout streams have become depleted. The oyster beds of the river Miramichi and the bays are a most valuable asset, but in a short time, unless proper means are taken, this industry will be destroyed. Prince Edward Island has suffered in this respect.

All these matters might well be discussed and dealt with by this Society, and I have no doubt that educating our people along the lines suggested would be of great practical benefit.

Another matter that might well engage the attention of this Society is the fact that no recognition whatever has been given to the public men of this County who took such a prominent part in their efforts to obtain Responsible Government, and also in the scheme of Confederation by which this Dominion was formed. The names of two of these men stand out prominently—Hon. Peter Mitchell and Hon. John M. Johnson. Mr. Johnson was Attorney General of the Province, and filled other offices in the Provincial Government with great ability. He was our first representative in the Dominion Parliament, and was one of the delegates to England on the Confederation question. Hon. Peter Mitchell was one of the ablest men the Province ever had. He was the first Minister of Marine and Fisheries, and to him is due in a large measure the credit of establishing that office. Sir Leonard Tilley, a contemporary with him, has been honoured by the city of St. John in many ways. A monument was recently erected to his memory, and it certainly would be a graceful act on the part of the people of this County if they bestirred themselves and paid a proper tribute to the memory of their former representatives. From time to time the matter has been informally discussed, but no result has been reached, and I feel that it is not to the credit of the people that the memories of these men should be allowed to pass into oblivion by the constituents whom they so ably represented.

It is a good thing for the rising generation to be acquainted with the lives and history of the men who occupied high positions in the Province. The study of the lives of these men and their works tend to broaden the views. I am sure that I voice the sentiments of the people of this County when I say that some practical means should be adopted to keep the memories of such men in remembrance.

The great power that exists to-day is education, and the future of the country depends in a great measure upon the proper education of our children. The illiterate young man to-day is handicapped. He is entirely out of the race. The avenues that are open to an educated man are shut to him. and it is our bounden duty to endeavour by all possible means to see that the youth of the country receive proper instruction and education. Well informed young men are in great demand for all professions and trades. The knowledge of electricity has opened up broad avenues, and the future is bright for every ambitious young man to make his mark in the world.

We are only in the ante-room of development and knowledge.

There are higher heights to attain, and deeper depths to fathom. All the secrets of the Almighty have not been brought to light and all the forces of nature have not been discovered. We have to "tread paths that are still untrod" and "read what is still unread in the manuscripts of God." It is the desire of all that this country should progress and prosper, and to give effect to that desire, we should take every means in our power to accomplish that along proper lines, and in expressing a wish for prosperity and happiness to you all for this present New Year I cannot do better than close these remarks in the language of the late poet laureate when he said:—

Ring out wild bells to the wild sky,
  The flying cloud, the frosty light:
  The year is dying in the night;
Ring out wild bells, and let him die.

Ring out the old, ring in the new,
  Ring happy bells, across the snow:
  The year is going, let him go:
Ring out the false, ring in the true.

Ring out the grief that saps the mind,
  For those that here we see no more;
  Ring out the feud of rich and poor,
Ring in redress to all mankind.

Ring out a slowly dying cause,
  And ancient forms of party strife:
  Ring in the nobler modes of life,
With sweeter manners, purer laws.

Ring out the want, the care, the sin,
  The faithless coldness of the times,
  Ring out, ring out my mournful rhymes,
But ring the fuller minstre in.

Ring out false pride in place and blood,
  The civic slander and the spite;
  Ring in the love of truth and right,
Ring in the common love of good.

Ring out old shapes of foul disease,
  Ring out the narrowing lust of gold;
  Ring out the thousand wars of old,
Ring in the thousand years of peace.

Ring in the valian man and free,
  The larger heart, the kindlier hand;
  Ring out the darkness of the land,
Ring in the Christ that is to be.

FREEZING OF OUR RIVERS.

BY J. McG. BAXTER.

Noticing in Vol. 6, part 3rd, of the Bulletin of the Natural History Society of New Brunswick a list of the dates of opening and closing of the St. John river to navigation from 1825 to 1910, I thought it might be interesting and perhaps instructive to compare these dates with those of the Miramichi, as I have a list of the dates of the opening and closing of the Miramichi, although not quite so far back, viz. only to 1830; still that is far enough for comparison. These notes were taken by the late Hon. Richard Hutchison and after his death continued by ourselves, so are pretty reliable. I am sorry not to be able to add the Restigouche to these; but I do not know where I could procure the data in that region.

	ST. JOHN		MIRAMICHI		Difference in Days.		
Year	Open	Close	Open	Close	Open	Close	
1830	April 18	Nov 29	April 17	Dec 20	1	21	p 22
1831	April 10	Dec 1	April 16	Dec 4	6	3 days	m 3
1832	May 3	Nov 15	May 3	Dec 3	0	18	p 18
1833	April 10	Nov 5	April 14	Dec 1	4	25	p 21
1834	April 11	Nov 17	April 12	Nov 29	1	12	p 11
1835	May 1	Nov 23	May 5	Nov 22	4	1	m 3
1836	April 28	Nov 19	April 26	Dec 14	2	25	p 27
1837	April 17	Nov 9	April 16	Nov 27	1	18	p 19
1838	May 1	Nov 25	April 29	Nov 25	2	0	p 2
1839	April 25	Nov 23	April 24	Dec 19	1	26	p 27
1840	April 16	Nov 23	April 18	Dec 2	2	9	p 7
1841	April 27	Nov 27	May 2	Dec 22	5	25	p 20
1842	April 24	Nov 22	April 25	Dec 6	1	14	p 13
1843	April 26	Nov 14	April 26	Nov 29	0	15	p 15
1844	April 14	Nov 27	April 18	Nov 28	4	1	m 3
1845	April 23	Dec 4	April 30	Dec 3	7	1	m 8
1846	April 6	Nov 28	April 1	Dec 7	5	9	p 14
1847	May 2	Nov 20	May 6	Nov 30	4	10	p 6
1848	April 19	Nov 13	April 23	Dec 7	4	24	p 20
1849	April 8	Dec 2	April 11	Dec 11	3	9	p 6
1850	May 2	Nov 27	April 19	Dec 10	13	13	p 26
1851	April 16	Nov 17	April 23	Dec 6	7	19	p 12
1852	April 26	Nov 25	May 1	Dec 15	5	20	p 15
1853	April 17	Nov 25	April 29	Dec 3	12	8	m 4

	ST. JOHN		MIRAMICHI		Difference in Days.		
Year.	Open	Close	Open	Close	Open	Close	
1854	May 7	Nov 10	May 2	Dec 8	5	28	p 33
1855	April 28	Nov 22	May 1	Dec 14	3	22	p 19
1856	April 25	Nov 17	April 23	Dec 3	2	16	p 18
1857	April 18	Dec 5	April 16	Dec 4	2	1	p 1
1858	April 22	Nov 13	April 17	Dec 1	5	18	p 23
1859	April 16	Nov 29	April 16	Dec 4	0	5	p 5
1860	April 23	Nov 27	April 21	Dec 5	2	8	p 10
1861	April 20	Dec 3	April 16	Dec 12	4	9	p 13
1862	April 18	Dec 3	April 22	Dec 2	4	1	m 5
1863	April 27	Nov 17	April 25	Nov 25	2	8	p 12
1864	April 20	Dec 9	April 26	Nov 30	6	9	m 15
1865	April 6	Nov 10	April 8	Dec 6	2	26	p 24
1866	April 14	Dec 12	April 20	Dec 11	6	1	m 5
1867	April 22	Nov 17	April 28	Nov 30	6	13	p 7
1868	April 22	Nov 16	April 28	Dec 10	6	24	p 18
1869	April 20	Nov 26	April 23	Dec 3	3	7	p 5
1870	April 11	Nov 22	April 13	Dec 23	2	31	p 29
1871	April 10	Nov 24	April 18	Nov 28	8	4	m 4
1872	April 22	Nov 29	April 25	Dec 5	3	6	p 3
1873	April 23	Nov 12	April 29	Nov 21	6	9	p 3
1874	April 21	Nov 22	April 20	Dec 1	1	9	p 10
1875	April 27	Nov 19	May 4	Nov 28	7	9	p 2
1876	April 22	Nov 30	April 24	Dec 9	2	9	p 7
1877	April 13	Dec 4	April 16	Dec 11	3	7	p 4
1878	April 5	Dec 18	April 26	Dec 19	21	1	m 20
1879	April 27	Nov 22	April 27	Dec 1	0	9	p 9
1880	April 22	Nov 21	April 25	Nov 23	3	2	m 1
1881	April 2	Nov 22	April 24	Nov 28	22	6	m 16
1882	May 1	Nov 26	May 5	Dec 2	4	6	p 2
1883	April 18	Nov 15	April 21	Dec 4	3	19	p 16
1884	April 16	Nov 19	April 18	Dec 11	2	22	p 20
1885	April 23	Nov 27	April 25	Dec 1	2	4	p 2
1886	April 21	Nov 23	April 23	Dec 4	2	11	p 9
1887	April 27	Dec 1	May 4	Dec 1	7	0	m 7
1888	April 26	Nov 2[illegible]	April 28	Nov 2[illegible]	2	1	m 3
1889	April 16	Dec 1	April 16	Dec 3	0	2	p 2
1890	April 21	Nov 20	April 24	Dec 1	3	11	p 8
1891	April 14	Nov 29	April 16	Dec 1	2	2	0
1892	April 15	Dec 6	April 19	Dec 2	4	4	m 4
1893	April 14	Nov 21	April 22	Dec 1	8	10	p 2
1894	April 21	Nov 20	April 19	Dec 2	2	12	p 14
1895	April 19	Nov 22	April 23	Dec 1	4	9	p 5
1896	April 18	Nov 21	April 18	Dec 5	0	14	p 14
1897	April 21	Nov 21	April 24	Nov 30	3	9	p 6

	ST. JOHN		MIRAMICHI		Difference in Days.		
Year	Open	Close	Open	Close	Open	Close	
1898	April 20	Dec 9	April 12	Dec 9	8	0	p 8
1899	April 26	Nov 13	April 24	Dec 4	2	21	p 23
1900	April 21	Nov 20	April 16	Nov 29	6	9	p 14
1901	April 17	Nov 24	April 14	Dec 6	3	12	p 15
1902	Mar 23	Nov 29	Mar 27	Dec 7	4	8	p 4
1903	Mar 24	Nov 27	April 11	Nov 27	18	0	m 18
1904	April 25	Nov 10	April 26	Nov 28	1	18	p 17
1905	April 20	Nov 21	April 20	Dec 2	0	11	p 11
1906	April 15	Nov 26	April 27	Dec 3	12	7	m 5
1907	April 17	Nov 20	April 29	Dec 14	12	24	p 12
1908	April 21	Nov 23	April 25	Dec 4	4	11	p 7
1909	April 19	Nov 30	April 24	Dec 24	5	24	p 19
1910	April 6	Nov 29	April 6	Dec 6	0	7	p 7
					days	Total	p 669

I do not know from what point on the St. John river these data were furnished, but those of the Miramichi were from Chatham and Douglastown. The first thing that will strike the reader is that although the opening of the two rivers generally occurs within 2 or 3 days of each other the times of closing differ widely, and in one case, viz., 1870, as far as 31 days, and in adding these differences up he will find that during the period of comparison from 1830 to 1910, a period of 80 years, the Miramichi has enjoyed a total of 669 more days of open water than the St. John. This was certainly a great surprise to me. I can only account for it by the supposition that the water here is more rapid and has more salt in it.

I have not seen the St. John except at St. John city and at Fredericton and so cannot speak of the conditions there, but I know that the North West branch of the Miramichi, being a much slower flowing river than the South West, freezes over often two or three weeks earlier than the South West or the main river.

The Miramichi also is kept open by the tides, which go 20 miles above this point, whereas I imagine the St John is not very materially influenced by the tide much above the reversible falls. However, I will leave this point to be discussed by some one that knows the conditions better than I do. I hope this comparative table and these remarks may not be without interest to some of our readers.

AQUATIC INSECTS.

By R. Matheson, M. S A , Ph. D.

Although water in the form of lakes, ponds, and streams forms a very considerab e portion of our continents, yet comparatively little attention has been paid to the aquatic environment as compared with the terrestrial. Yet nowhere else does one find such wonderful organisms, both plant and animal. It was only after the invention of the microscope and the later appearance of Darwin's famous "Origin of Species" that naturalists turned their attention to the study of aquatic organisms. The microscope aided in their study while the "Origin of Species" furnished the great thought that living organisms first appeared in the water. Yet despite all these encouragements the intensive study of the fresh-water environment has made but little progress. This is particularly true of the insect life of the water. Our students of entomology have too long devoted their attention to the mere collection, listing and describing of species. This of course is necessary work, but it should be only the beginning of more complete studies. To the sadly neglected field of aquatic insects we should therefore direct our attention.

Insects are all primarily terrestrial. Adaptation to aquatic environment is secondary and is found not in isolated orders or families but practically in nearly all of the great orders of insects. The evidence that adaptation to an aquatic environment among insects is secondary is practically conclusive, and this adaptation occurred not only once but at least over a hundred times in widely separated families of insects. Comparatively few insects are aquatic. They are found only along the shores of fresh water ponds and lakes and in streams. They have not invaded the deeper waters and only a few rare forms are found along the seashores, while but a single genus of water-striders (Halobates) is found at sea, long distances from land. Despite their comparatively few numbers they exhibit the most wonderful variety of adaptation to the new environment. Practically nowhere else will the student of evolution find more wonderful examples of special adaptations. The adaptations to environment are often remarkable while the various methods of locomotion and of securing an air-supply are truly wonderful.

There is not a single order of insects in which all the species are aquatic throughout larval and adult life. There are several orders in which all the larval forms are aquatic. May-flies (Ephemerida), Stone flies (Plecoptera), Dragon flies (Odonata) and Caddis flies (Trichoptera) are all aquatic in the larval stages, whereas the adults are ærial. Several families of Hemiptera and Coleoptera are aquatic throughout larval and adult life, whereas many Neuroptera, a few rare Lepidoptera, several large families as well as many widely scattered species of Diptera are aquatic during larval life. And in the Hymenoptera, one of the most highly specialized of all orders of insects, aquatic forms are found. But few of these have been studied. They are all parasitic, either on aquatic larvæ or eggs of aquatic species. These remarkable insects swim either by means of their legs or wings. To see some of these minute parasites swimming through the water, using their wings as organs of locomotion, is one of the most wonderful sights imaginable. Undoubtedly many species exist, and if more entomologists were to devote their attention to rearing aquatic insects many new species of these parasites would be discovered. At the present time only ten aquatic Hymenoptera are known, two of which are common to Europe and America.

As all insects were originally terrestrial those that have assumed aquatic life were forced to it either through severe competition on land or by a more available food supply in the water. Provision had to be made for an air-supply. Aquatic organisms may obtain their air-supply either by coming to the surface to breathe or by making use of the oxygen dissolved in the water. The common method of securing air dissolved in the water is by means of blood gills which are rare among insects,being found in but a few scattered forms. The common methods are either by the use of tracheal gills, thin membranous extensions of the body-wall in which there are numerous small trachea, or by the insects coming to the surface to secure air directly by means of open spiracles. Some aquatic forms which live in swift streams possess no respiratory organs, securing their air supply directly through the thin body-wall.

As this short paper does not claim anything new or original it may be well to restrict it to a hurried discussion of the more important aquatic insects, and at the same time direct the attention of the members of the association to an inviting field at their own doors. Assuredly no more interesting facts can be gleaned than by studying aquatic organisms. All sorts of problems will soon appear, and the solving of any one of them will abundantly repay all efforts expended.

The May-flies (Ephemerida) are probably one of the most interesting groups of insects. From earliest times they have been under observation and the May-fly dance has been the subject of many interesting papers May flies are not particularly abundant in species though very numerous in individuals One can easily be convinced of this fact by observing the enormous numbers of nymphs that may be found in a single stream or observing the cast nymphal skins along the banks of rivers or ponds. Also when the adults emerge they often appear almost as thick as snowflakes. The nymphs occur in a variety of situations. Some are found burrowing in the mud and ooze of ponds or streams, others in swift-flowing water, in rapids or in gently flowing streams or in stagnant ponds. In collecting for the nymphs one should examine every possible situation, for new facts may be gleaned at almost every turn.

This group is of very considerable importance, for both the nymphs and adults furnish excellent fish food. As they occur in such large numbers they form a considerable part of the food of certain fishes. Long ago Swammerdam observed that at the time of emergence of certain May-flies the fish were larger and fatter than at any other season of the year. If we had only some successful method of rearing these forms the problem of a food-supply in fish-culture would be brought a long way toward solution. May-flies have long been used as bait for fishing and no anglers' guide but gives an extensive account of the different kinds suitable for alluring the hidden beauties.

Stoneflies (Plecoptera) are a small, compact group, widely distributed and very common in our clear streams. If one examines the under side of any stone in our clear sparkling springs he will be almost sure to find one or more of them rushing to the side farthest from the light. They appear like shrimps and are very active. The tip of the abdomen ends in two long setæ while nearly all the May-flies possess three anal filaments, The adults emerge in early summer,and then one may observe millions of the cast nymphal skins clinging to the stones along the banks of streams. A gaping slit along the upper side of the thorax shows how the adult emerged. The adults are poor fliers and are easily caught. Mating takes place soon after emergence, and the female drops its eggs in the water and soon perishes. Some species emerge in early spring before the snow is off the ground, and the small, dark, almost black flies may often be found on the snow. Very little is known regarding this order of insects. Many species undoubtedly exist in our clear, flowing streams,and as the nymphs are easy to rear the study of them should not be neglected. As different species occur throughout the season the study of the seasonal forms should prove extremely interesting.

The Dragon flies (Odonata) have long been objects of fear especially to children. "Sew up your ears", "Devils' darning needles", "snake doctors", etc., are names which terrified us in our youth and with what frantic haste we would scramble away from a pond or stream where these dreadful animals occurred. Despite all this slander and superstition, the Dragon flies are not only entirely harmless but are our best friends. The nymphs occurring in every pond are voracious feeders, destroying many mosquito larvæ, "wrigglers", while the adults feed largely upon gnats, etc. The nymphal life lasts two or three years and is spent in sluggish ponds, where there is an abundant food supply. The nymphs of Dragon flies have a wonderful breathing apparatus, the rectal portion of the intestine being modified into a tracheal gill. Water is sucked into the chambers and the oxygen is taken up by the small tracheoles. The water can be ejected at will with considerable force and aids materially in propelling the nymph. In the Damsel-fly nymphs the tip of the abdomen bears three leaf-like gills which serve for breathing. The nymphs of both Dragon flies and Damsal flies exhibit many wonderful adaptations and deserve careful study. The fauna, particularly the insect fauna of the Maritime Provinces, has been sadly neglected and surely the time is ripe for more concerted effort, even though our efforts result only in the collecting and labeling of species.

The Caddis-flies (Trichoptera) offer a very interesting field for study. The case-building species are numerous in all our ponds and streams, and the wonderful houses that they build may well excite our curiosity and interest. The non-case-building forms which spread their nets in the riffles and waterfalls afford opportunities for the most acute observer to discover new facts and add to our literature the wonderful tales of the lives of our humbler insect friends. Many of these forms furnish food for our fresh-water fishes and thus are of direct economic importance. Very little is known about this group and it only awaits the keen observer, in love with his work, to add to our stores of knowledge.

It is not necessary for me to do more than call attention to some of the other aquatic insects. In the Hemiptera are found several families which spend their entire lives in the water. The graceful water boatmen (Corisa) the rapidly darting back-swimmers (Notonecta), the long, narrow, slowly crawling water-scorpions (Ranatra), and the giant water-bugs (Belostoma and Zaitha) are undoubtedly familiar to all, while the long-legged water striders (Hydrobatidæ) appropriate the surface of the water for their home. In the great order of Lepidoptera (Moths and Butterflies) are found forms which possess aquatic larvæ. Such forms are extremely rare but should be searched for by all lovers of insect life. In the Diptera (flies) there are several large families (Culicidæ, Chironomidæ, Simuliidæ, etc.) in which the larvæ are aquatic while the aquatic habit is widespread in the order. Owing to the discovery in recent years that the adults of certain mosquitoes act as intermediary hosts in the transmission of several serious diseases, malaria and yellow fevers, the Culicidæ have assumed a very important place in man's welfare and have been the objects of closest study. Methods have been devised for the extermination of these pests, and places once the centres of malaria and yellow fever are now absolutely free from these diseases. Time and space will not admit of the discussion of the many aquatic insects in this order. In the Coleoptera (Beetles) we find the predaceous diving and water scavenger beetles (Dytiscidæ and Hydrophilidæ) abundant in our stagnant ponds while the graceful Whirligig beetles (Gyrinidæ) perform their varied curves on the surface. The larvæ of these forms are interesting creatures and are found in the places frequented by the adults. Several families (Parnidæ etc.) are aquatic in both larval and adult stages. The life histories of the aquatic beetles are but little known and the study, though a difficult one, is of extreme interest. It is difficult at times to furnish the necessary food for the rapidly growing larvæ and especially difficult to provide suitable environment at time of pupation. However, the difficulties to be overcome only add more interest to the problem.

In conclusion a word may be said regarding the aquatic Hymenoptera. Only a few species are known and they are parasites either on the larvæ of Caddis-flies or on the eggs of various aquatic insects. The wonderful adaptations or modifications of these tiny insects in order to enter the water and oviposit in such out-of-the-way places are often remarkable. This offers an inviting fieid to the interested nature-lover, and surely some one will undertake to discover and record such interesting creatures.

Aquatic insects are not only of wonderful variety and diversity but are of great economic importance. They form a large percentage of the food of our fresh-water fishes. In order to study the fish-food problem one should be familiar with aquatic organisms, particularly insects. Could we control the breeding of many of our aquatic insects we could immediately begin a water culture similar to our present day agriculture, with this difference, that the crops would be,—fishes. In many places our fresh-water fish supply is rapidly becoming depleted despite the millions of young fry that are planted every year. These young fry are distributed without any knowledge of the environment in which they are placed, so that millions die because of uncongenial surroundings, and lack of suitable food supply, while many others are devoured by predaceous forms. It is to be hoped that in the near future we may see started an extensive study of our immense areas of fresh water in order that the basic principles of fish culture may be determined. In the meantime whatever facts can be gleaned by the study of aquatic insects will be of permanent value.

PUBLIC WATER SUPPLIES--HISTORICAL.

By John A. Stiles, B. A. Sc.

University of New Brunswick.

The first method of obtaining a public water-supply was, without doubt, by the sinking of wells. The deepest of these were in China, depths as great as 1500 ft. being recorded. We read of wells in Greece, Assyria, Persia and India. The idea of saving the water took shape in the digging of reservoirs. Jerusalem had underground cisterns built near the city and the water from these ran by gravity through masonry conduits. Later, Egypt began the building of immense reservoirs for the storage of water for irrigation purposes. Assyria followed this example, and when the English occupied India they discovered no less than 50,000 reservoirs which had been built for irrigation purposes. The magnitude of the latter undertaking seems astounding when we read that it involved the building of no less than 30,000 miles of earthen embankments.

Previous to 312 B C. Rome obtained her water supply from the Tiber, but it finally became so polluted that some other method had to be adopted. This led to the building of the famous aqueducts. Rome was to receive by these aqueducts over four hundred million gallons a day, but the conduits leaked and a careful study reveals the fact that not over 50 million gallons per day ever actually reached the city.

When Rome fell, the aqueducts were destroyed, and it is said that, although the popes made an effort to keep up the supply, there were many cities which even forgot for what purpose the aqueducts had been built. The terrible ravages of pestilence in the Middle Ages were doubtless due to the drinking of grossly polluted water.

During the ninth century a few aqueducts were built by the Moors in Spain, but very little activity along similar lines is recorded until hundreds of years later.

Paris was drinking water out of the Seine until 1183, when the first aqueduct was constructed. As late as 1550 the amount per capita per day did not exceed one quart.

In London, England, as early as 1235 water was brought to the city in lead pipes and masonry conduits. However, only a small portion of the city was thus supplied. In the latter half of the sixteenth century a pump, to be operated by the current, was placed on London bridge, for the purpose of supplying part of the city with water through lead pipes. They had yet to learn about lead poisoning.

In the beginning of the 17th century the New River Company was incorporated and began to lay wooden pipes throughout the streets. The people were notified as to the time of the day that the Company intended to turn on the water and governed themselves accordingly, for the supply was as yet intermittent.

In the eighteenth century came the steam pump which gave a great impetus to the development of water-works systems. London was the first to use it in 1761, and later in 1781 a steam pump was erected in Paris. In 1800 steam was used for pumping in Philadelphia, and about this time Germany also became interested.

The water supply of London, England, was not brought under municipal control until 1904 and the New River Company still supplies a part of London.

THE IMPORTANCE OF GOOD WATER.

Remembering that the New River Company was incorporated in 1619 and that the plague took place in 1664-5 one cannot help wondering to what extent the water-works system was responsible for a death rate as high as 30,000 in one month.

Canada and the United States use on the average three times as many gallons per capita per day as the various municipalities of Europe, and it is also worthy of note that we have on the average five times as many deaths from typhoid. We have made great efforts to get plenty of water, but it has concerned us but little, evidently, whether it was good or bad.

Toronto continues to get water from Lake Ontario just below her sewage outlet, notwithstanding the fact that she had been warned repeatedly, her attention being drawn to the fact that the direction of the current is such as must bring the sewage to the intake. Ottawa can only look back on the past year and say that she is sorry, but yet she was not sorry enough to stop the coming exhibition which brought thousands of people to the city to drink the polluted water that had already claimed hundreds of victims. Montreal admits that conditions are such in her case that a similar outbreak any day would be of no great surprise, and even Fredericton can testify that she has learned the difference between good and bad water.

THE CHOICE OF A SYSTEM.

The first inspiration for a public supply of water usually follows some more or less severe loss by fire. The cry is then raised, "We must have water to protect us from fire, and for that purpose the water from the river will be good enough. We have wells and they will do for many years for drinking purposes, but for extinguishing fires the bucket brigade is out of date." Thus the system is installed and water that is probably far from pure is pumped through the mains. Again someone calls attention to the fact that the sewage system is out of date and that the leaching cess-pools are beginning to exact their annual toll. Now comes the digging of sewers and the piping of the river water into the houses, the sewage being run into the river to look after itself.

After the public have been put to a considerable expense it is finally discovered that the water in the river for drinking purposes is far from good, as the death rate easily shows. Had the original system been designed with a little more care for the future. the outlay, which is now facing the town, or a great deal of it, could have been avoided. The next move is to either install an expensive filtration plant, in the hope of straining out other people's sewage, or an expensive trip up country in the search for spring water. Usually at this stage of the proceedings there is considerable delay, perhaps years, and the average man becomes sick of discussing the old subject. But in some respects the delay is not always such a bad thing as might at first be considered. In all matters involving the expenditure of public money it is only right that there should be a long delay. It gives people a chance to think it over and no censure for precipitate action can then be brought against the authorities.

That it pays, when possible, to wait and think things over thoroughly, even though it involves years and the subject becomes wearisome to the man in the street, can be well illustrated by quoting the case of London, Ontario. As far back as 1900, London began to realize that her water supply was inadequate. One expert after another was called in, each advising a different scheme which usually represented his particular leaning. The spring-water man said, go miles into the country and gather up all the spring water; the filtration man said, you must build a filtration plant, while the artesian well expert said, filtered water is like rain water. You must dig wells. Then the average man stopped and scratched his head saying, how am I to decide. Each proposed system represented nearly a million dollars, with the exception of artesian wells and experiments along that line had always yielded sulphur water. One scheme after another was brought up and the people asked to vote upon it. This they refused to do because they knew nothing about it and the vote polled was always too small to warrant action. When everyone was disgusted with experts and their advice a private individual, at his own expense, sunk one after another, some fifteen artesian wells. Some gave sulphur water, as had been previously the case with similar wells, but others gave an abundance of good water. The total expenditure for digging the wells was not more than ten thousand dollars. The point we wish to make in this is, that in London's case, it paid to wait a few years and save seven or eight hundred thousand dollars.

Again reverting to the matter of the small town's water supply. If she has not sufficient fuuds at present to build expensive fresh water lines, or an expensive filtration plant, there are still a few courses which she may follow. For two or three thousand dollars she may be able to build a filter-crib in the bed of the river and pump the water from it. A filter-crib is built as follows: A hole some forty feet square is dug in the bed of the river, to a depth of eight or ten feet. In this is built a wooden crib, which is roughly boarded over. Upon the top of the crib is now placed two or three feet of broken stone, then two or three feet of sand and gravel. This brings it level with the bed of the river, The water filters down through the gravel and sand and is taken from inside the crib by the suction pipe which leads to the power house. This method was successfully used by Kensington, Pa., who obtained three million gallons per day and the filter-crib only cost about

$2500.

Perhaps, however, the river is too deep, and the construction of the filter-crib out of the question. There are still a couple of cheap schemes available. The city of Painsville, Ohio, has adopted the following method of obtaining pure water from Lake Erie: Wooden galleries or tunnels are built along parallel and close to the lake. The water from the lake filters into the structure and is pumped out. Over one million gallons are obtained in that way and the cost was only nominal when compared with a modern filtration plant.

Still another scheme which under the circumstances may prove advisable. Crystal City, Mo., adopted the following method, known as Horizontal Push Wells. A trench was dug beside the river and from this trench, by means of jacks, several eight-inch pipes, each fitted with sixty-five feet of strainers, were driven under the bed of the river. The water filters down through the bed of the river and into the pipes. The cost was small and the yield is 1,300,000 gallons per day, This scheme, of course, would not work well where the stream bed is of heavy clay.

The schemes outlined above for obtaining pure water do not compare very favorably with more modern methods, but when some cheap way out of a difficulty is necessary, they may often prove advisable.

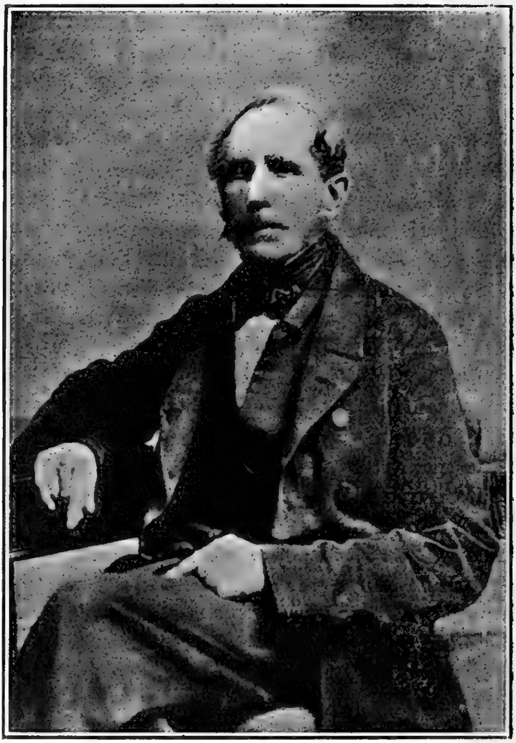
Some towns declare that they will never drink anything but spring water, and to that end build large retaining reservoirs to gather the flow from streams and springs. This is commendable, but it must not be overlooked that surface waters are demanding every year an increasing toll of death. In Germany, the law is that all surface waters must be filtered, and England has moved along similar lines. Although it is probably too early for Canada to take such steps, still the time will come, and at the present every effort should be made to see that the drainage area is well patrolled, and all sources of pollution promptly stamped out.

There is one comforting fact that should be touched on. As long as the average annual rainfall of the Maritime Provinces continues to be forty inches, there is no danger of any of our municipalities finding themselves in the awkward predicament of being unable to find sufficient water.

SCRAPS OF LOCAL HISTORY.

BY DR. J. McG. BAXTER.

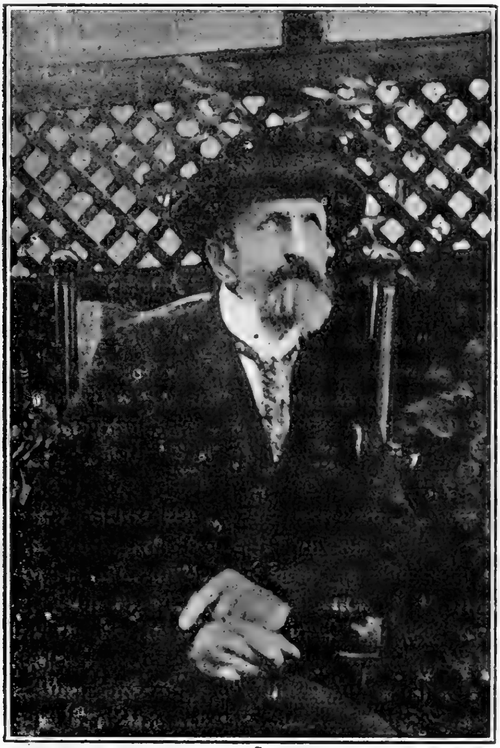
It is a good idea to gather up all the scraps of local history that one can obtain, interview the oldest inhabitants, pump them dry,



JAMES. A. PIERCE.

verify all you can of it and write it down, have it printed when you can and so petrify it for posterity. Nothing gives the Oldest

Inhabitant more pleasure than to recall and rehearse the days of his youth, and the incidents connected therewith, and his recollections are invaluable, for although he may be astray on dates and may embellish the incidents considerably, he is generally to



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be relied upon for personages and localities. The necessity of doing this at once is very strikingly exemplified in the following notes, as one of the parties giving evidence died two months after being interviewed and another ten days after.

The facts collected, if true, should fit exactly, each into its par-

FIRST PRINTING OFFICE ON THE NORTH SHORE.

ticular niche of the mosaic of the past, confirming its veracity. Looking at the matter in this light, I have ventured to write this article as a sequel to the article entitled "Francis Peabody, the Founder of Chatham," in Bulletin No. 6 of this Association. That article describes Chatham in 1800, this one a little later in its history. The spot where this article is being written is historic ground, and the accompanying plate gives it as it appeared in 1826. The hip-roofed building in the foreground had evidently been formerly a porter's lodge for the Cunard mansion, as a similar one stands yet at the other entrance of the semi-circular driveway that leads to Cunard's residence, now the Bowser House. This hip-roofed building was the first stationery store in Chatham, and was kept by James A. Pierce. It faced on Water street. It was elongated, and in the rear end was published the first newspaper on the North Shore, viz., "The Mercury," in 1826 and 1827. Jas. A. Pierce was a bandsman in an English Regiment disbanded in Quebec. He came to Halifax, where his sister was married to Alex. McLeod, wholesale liquor dealer, and afterwards to Miramichi, where he started this stationery store and afterwards became editor of "The Mercury", which he continued for only two years, when he built the other pitched roof building and started a printing office in it, and changed the name of the paper, calling it "The Gleaner" (1828), which was published for so many years by himself and afterwards by his son, J. J. Pierce. We give here the pictures of both.

They were both able and fearless writers. The father was once arrested, taken to Fredericton and imprisoned for a week or so, and tried before the bar of the House for "sassing the Government," and let off with a caution, I believe. They were both noted for being always "agin the Government," whichever side was in. I have before me an old copy of "The Gleaner" which reports a festival of St. Andrew's held on the 30th Nov., 1839, in which Dr. A. Key was President and Jno. Petrie and Robt. Cassels, Vice Presidents. Toasts—The Queen, St. Andrew, The Queen Dowager, Army and Navy, St. George, St. Patrick, the Governor General and North American Colonies; Sir Colin Campbell, Lieut. Governor of Nova Scotia; Sir John Harvey, Lieut. Governor of New Brunswick; Sir John Colborne, &c., &c.,—were drunk.

THE BARQUE "MOLLILAMO."

Directly across the street from the stationery store, on the bank of the river, stood the spruce tree to which Francis Peabody, the founder of Chatham, tied his vessel on his first arrival. Mention of this is made in our last Bulletin. On the wall of the "Gleaner" office can be seen in the plate an old handbill advertising a play by an amateur dramatic company of that time. All the actors, without exception, are now on another stage—"Mors nemine parcit."

One entrance to the semi-circular driveway to the Cunard residence, now Bowser House, can be seen on the plate, just beside the stationery store, while the other is about forty yards further up Water street and comes out between a similarly hip-roofed porter's lodge, now used as a sample room, and a magnificent elm tree, nine feet seven inches in circumference four feet from the ground, which was planted by the late Andrew Duncan on the day Queen Victoria was crowned, June 28th, 1838, and which is now one of the largest and handsomest shade trees in Chatham. Right opposite to this tree on the bank of the river was built the bark Mollilamo in 1875, by the late Alex. Morrison. She was the last large wooden sailing ship built in Chatham, except one, the "Clandeboye," built by ~~Wm.~~ H. Muirhead in the shipyard behind the Peabody house. The accompanying plate shows the Mollilamo being launched.

The Miramichi Natural History Association is starting an album of the celebrities of the past, and has at present pictures of:

Francis Peabody, founder of Chatham, 1800—41
Dr. Alex. Key, Chatham, 1816—51
Dr. Stafford Benson 1832—70
Dr. John Thompson 1832—84
Dr. J. Vondy, who volunteered to attend the ship fever patients on Middle Island, and fell a victim to the disease and died July 2nd, 18~~67~~.47
George Kerr, Cunard's Solicitor, —1871

The following are notes written from interviews with some of the oldest inhabitants:

The Custom House was first in Chatham, as described by Wm. Wyse; then at Bushville for the two towns, Newcastle and Chatham; then divided—one in Newcastle and one at Chatham, but the exact dates of these changes I have not been able to find out.

PAPER FROM WM. WYSE.

I left Scotland with my father on the 6th of April, 1834, being then only 16 months old, and arrived in Douglastown on the 12th of May. The ship we came in was the Wm. Dawson. We went to my uncle's, who lived in Douglastown at that time, and that village was one of the principal places of business on the river. The principal export was timber for the British market, but about five years later they commenced to ship deals in large quantities, especially at Blackville on the South West branch of the river. Gilmour & Rankin built a water mill at the site where the Dominion Pulp Mill now stands. It was built of stone said to have been brought out from Scotland. (On the bank of the river where it stood there are miles of beautiful freestone. and one of the wings of the Parliament Buildings at Ottawa was built of it. The walls of this mill were incorporated into part of the present Dominion Pulp Mill.—J. B.) My father built a bakery at Douglastown, but only stayed there one year, after which he moved to Chatham and opened a hotel on the site where the J. B. Snowball Co. store now stands, having a bakery in the basement. He continued in this business till 1840, and then built a new house in Duke st., the one where Mrs. Dr. McDonald now lives, having also a bakery attached, where he lived up to the time of his death, 1891. He and his wife lie buried in St. Andrew's Church burying ground.

In 1836 a steam sawmill was built on the Chatham side of the river, which was called the Cunard mill, with five gangs, but the engineer made a miscalculation, because, when they started it, they found they had not steam enough to drive them, and three gangs had to be removed before ordinary work could be done with them, and even then it was considered a big day's work when thirty to thirty-five thousand feet of deals was sawn and piled on the wharf. I often watched operations in this mill between 1837 and 1848, or the time of Cunard's failure. This was the way they worked it. Every log was rolled to the bed, which was just of such a length, and the ends were sawed off by a long cross-cut or breast saw, the blocks dropping through holes in the floor to be carted away for firewood, as is done to-day with the refuse. The Cunards were doing an immense business in Chatham. This mill was burnt down in 1867. Just east of her was the shipyard, where the Snowball Co's mill now stands, and there would be six to ten ships built there annually. At this time it was sailing vessels altogether that came to this port, and I remember having seen twenty ships in line coming around Middle Island, all following the leader, as pilots were scarce, and I have seen thirty to forty ships at once anchored opposite Chatham, loading timber, as few deals were then shipped.

I watched the men building the Peabody stone house in 1838. Old Andrew Currie was architect and builder, and a good job he made of it, as can be seen to-day, although one gallon of West India rum was served every day to the men while working. Peabody lived here three years, till his death in 1841, and then the next tenant was Gregory Layton, who ran a hotel there for a few years, say till 1851. Wm. Kelly (afterwards Hon. Wm. Kelly, M. P. P.) then carried on the hotel business there till about 1855, when the late Senator Muirhead bought it for a private residence and lived there till his death. His son-in-law, John Sadler, succeeded him. At his death it was rented by the Pine family, and again became a hotel. Then followed Mr. Stephen Cameron from Kent County, and at present it is run by Reuben Babineau as a hotel. An additional story in wood has been added, as the Babineau Hotel required more room to accommodate its clients. It is owned at present, I believe, by A. & R. Loggie of Loggieville.

When I was very young, about 1837 I think, I saw the largest pig that has ever been raised on the river. Gilmour, of Gilmour, Rankin & Co., sent it over from Douglastown on a large sled drawn by two of his farm horses. It was staked or boarded in on the sled, and stood about four feet high and weighed 1000 pounds. He said he sent it over to show the people what could be done here with good care and good feed and plenty of it. The land here at that time was very productive and feed plenty. Gilmour himself came over and the town authorities ordered a salute to be fired in his honour. This was done on Samuels' wharf, or what is now Benson's, behind the Benson block. When all was ready and the cannon loaded a man from the country by the name of "Big Jock C.", who had supped not wisely, but too well, interposed his authority and avoirdupois by perching over the touchhole and defied the gunner. This gunner was of the same nature and nationality as this convivial interloper, and was not to be thus thwarted in the discharge of his duty, so he took up a piece of dealend, and, pressing it as far under the obstructionist as he could, pried up so as partially at least to clear the vent, and touched her off. Up went "Big Jock," but he afterwards changed his mind and came down about ten feet out on the ice on the river, surprised and motionless, and was even pronounced dead, but after a copious spontaneous emesis he was resusciated, much to the satisfaction of the gunner and probably to his own. He afterwards enjoyed the best of health and died only very lately.

At this time only two members were representing the county at Fredericton, and great rivalry existed and bitter feeling between the North side and South of the river. The former was represented in the person of Alex. Rankin of Douglastown, and the latter by Joseph Cunard of Chatham. In 1838 three candidates were in the field—Wm. Cameron, a lawyer of Chatham; J. Ambrose Street, a lawyer of Newcastle, and Alex. Rankin of Douglastown. Street and Rankin were elected and sat till 1842, when John T. Williston of Chatham. Registrar, of Deeds, and mill owner at Black Brook, entered into the contest, backed by the Cunard party. The election was fairly quiet (only a few broken heads). Williston and Rankin were elected. Through Rankin's interest and influence with the Government at Fredericton a scrutiny was instituted, and Williston was unseated and the seat declared vacant. In 1843 came the election to fill this vacancy. Street and Williston were in the field, the former backed by Rankin, and the latter by Cunard. This was the fighting election.

The leading spirits at that time were Michael Dunn of Chatham and John Hea of Chatham and other lesser lights. These were the organizers. The polling was held at the shiretown, Newcastle, one day, at each other parish after that, and the grand total was declared on the last or fourteenth day again at the shiretown. This was always the programme at those times in elections, but on this occasion the Rankin party were not only forewarned but forearmed, as they had piles of stones placed at convenient places, covered with sods or grass, so as not to attract attention, and a cable stretched on stakes, so as to divide the courthouse entrance door, with the intention to have the Rankin voters go in on one side of this dividing rope and the Cunard voters on the other. The Chatham party were late in appearing, and did not arrive till 11 a. m. They took in part of the situation, and Hea gave the command in Irish, to clear away the cable, which was done instanter. They were about two hundred or three hundred strong. The Rankin-Street party, through Big Jim Bass, then got the order to charge, which they did, and the air was immediately full of stones, sticks and other missiles, and a battle royal commenced, but the Chatham party were overpowered at last and fled in different bodies—one through the woods, coming out that night about Lamont's mill; another also through the woods, but only came out next day at Mill Bank, and the third made directly back to their wharf, followed by the crowd of victorious Street men. They crowded on board the steamer St. George, Capt. Graham. There was a heap of coals lying on the wharf, which the Street party used as missiles, and when she arrived at Chatham there was four inches of coals all over the decks, mute witnesses of the battle. When the day came for the polling in Chatham, by mutual agreement of both parties the polling was held at Carney's farm, one mile out of town up the river, but for fear of reprisals both parties had reserves ready armed. Cunard's forces were stationed back of Chatham, near the residence of Dr. Pallen (now owned by R. A. Snowball), 1000 strong, and the Rankin forces on the green above Morrison's mill (now the Miramichi Lumber Co's rossing mill) about 500 strong, and mounted men galloped back and forth between the polling place and the reserves of both forces, a sort of signal moving telegraph, bearing news, but the day passed off quietly.

Then the following days, when the polling was up or down the river, steamers or sailing craft were used to convey voters and fighting men to the polls by both parties.

The day of the Siege. In some way a rumor was started that the Rankin party intended to ship a gang of fighting men to Chatham in reprisal to avenge some affront or irregularity which had occurred. They were said to intend turning certain voters out of doors with their families and tearing down their houses. This was a few days after the Chatham polling and I think on a Friday. The Chatham folks were not to be caught napping, so every one was astir bright and early and down on Peabody's wharf watching for developments, except those that were preparing the barricades. These consisted of two 14-inch squared timbers, one at the corner where the Canada House now stands and the other at the Golden Ball corner. Three cannon were lashed to these and loaded with scrap iron and spikes, and cart-loads of stones were dumped down there to form an obstruction or defence wall and furnish ammunition for the unarmed. These two barricades commanded perfectly the egress from Peabody's wharf, the only point where the enemy could well land. Peabody's wharf was crowded with people looking with anxious eyes over to Douglastown. I was among them. The women and children were sent out of town for safety. The morning was beautifully bright and clear, and the red shirts could be seen quite distinctly at Douglastown, embarking in eight or nine vessels. But now, a thunder storm, with lightning of unprecedented severity, set in with floods of rain and the wind veered to the east; but not a man left his post, and after the storm had partially passed, the vessels were seen heading down the river towards Chatham. The first tack fetched the ballast heaps, a mile above Chatham, the next to where Munro's mill now stands, and the third, Peabody's wharf. They came in very close, almost touching the wharf, evidently enjoying the fright they were giving us, and then stood off for Currie's on the other side. They were going down to a polling place down the river, Bay du Vin, or somewhere, and perhaps started the rumor themselves for fun.

At last the contest was over and Mr. Street was returned, but enmity between the parties was very bitter for a year or more, so that very few ventured to cross the river into the enemy's camp.

I saw a young man from the Rankin party, who had come over from Douglastown to Chatham, kicked and cuffed from Water st. to Coulson's slip, where the ferry boat crossed at that time, and very badly hurt.

A night or two after the election, some one went around after everybody had gone to bed, and marked the windows or doors with tar, of every Rankin voter or suspected sympathizer, and he was boycotted.

The Rev. Robt. Archibald, minister of St. Andrew's, wished to vote for Rankin, who was one the most liberal patrons of his church, but apparently did not dare to in town, so he went to

Derby to record his vote; but that did not make any difference, as the manse was stormed and considerable damage done. It was a little stone cottage that stood where the Miramichi Pulp and Paper Co's mill now stands, a little back from the street. His congregation was divided in politics, and the feeling was so strong that he concluded to resign and return to Scotland. I was present when he preached his farewell sermon, and my sympathies were with the Rankin party, and although young, I often carried their flag in processions and had occasionally to lay it down and fight for it. During the service a lady went out, and as she passed up Water st. she saw a party of men approaching, throwing stones down into the river. She rushed back to the door of the church and screamed at the top of her voice, "They are on us!" She evidently thought they were going to storm the church. The congregation rushed out, and went to see what was up. They found a party of the rough element of the Chatham party, keeping a jolly boat load of Rankin men from landing at the church. They called out to the people coming out of the church: "Go back to your service, but these men are not going to land." The feeling was so strong that the Government at the next session passed a bill giving Northumberland four members, so that there would be two from each side of the river.

The Cunards came to this part of the country some time about 1830. There were three brothers of them—Joseph, William and Henry. William did not stay here long. Joseph went into a general business, principally lumber, fish, timber and shipbuilding. Henry was his chief agent. He had outlying branches at Bathurst, Kouchibouguac, Richibucto, &c. He carried on shipbuilding at all these places, which helped to ruin him. Joseph was brusque in manner, but of a good heart. He was a large man, six feet in height and would weigh about 200 pounds. Henry was shorter and slighter, but both were active, energetic men.

Joseph Cunard, with coach and pair of horses, and coachman and footman in livery, attended St. Paul's church. He was married to a daughter of Judge Peters, who lived at Bushville, and who also drove to church with his family, with coachman and footman also in livery. Cunard lived in what is now the Bowser House, and had the grounds beautifully laid out with flower beds and ornamental trees, and peaco ks and different fancy fowl wandering about in the garden.

GENERAL HISTORY.

When I came here, the Custom House, a red building, 1½ stories,stood on the bank in front of Capt. Wm. Fenton's, between the road and the river, with a balcony on the East side, with a rough plank stairway to it, giving an excellent view down the river, so that you could see from there the ships when they came round Sheldrake Island. At that time ships, or rather what we called Geordie brigs, with large ports at the bows, loaded square timber, mostly. They loaded in the stream and the timber was taken out to them in rafts of ten to fifteen pieces at a time, towed out with raft boats from deposits on the shore at different places, and they took from two to three weeks to load a ship or brig. At that time the business part of the town was largely between St. Andrew's st. and Middle Island. The old Richibucto Road came out at St. Andrew's st. corner, and the present road, which diverged from it at Kerr's place in Napan, was not cut through and turnpiked until 1838. The great bulk of the timber business on the South side of the river at that time was carried on by Cunard and the Willistons of Bay du Vin, several brothers, who dealt with and depended upon Cunard for supplies and a market. The getting of the timber from Bay du Vin to town was quite an event and took from two to three weeks according to the direction of the wind. They were towed up along the shore by horses and oxen, and when they came to bights in the shore, like the one between Point aux Car and Pt. Cheval, they waited till the wind came in the right direction and then they put the horses up on the timber rafts and pulled across to the next point, while the oxen plodded around by the shore, through mud and mire. These delays, waiting for wind, were filled up by potations of Jamaica rum, so that the time did not hang heavy on their heads. On the arrival of the rafts at Chatham, the raftsmen's headquarters were at the Bremner Hotel, a two-story building that stood by the roadside, near the large willow tree in front of John and Philip Bremner's new cottage. The timber was placed in a boom, which extended from Bremner's to the front of St.

Andrew's church, inside of Middle Island. The return of the raftsmen to Bay du Vin, after they had delivered their timber and sufficiently primed themselves, was as good as a circus to us boys. Cunard himself, always on horseback, as likewise his outriders, half a dozen or so, galloped from point to point, shouting out their orders to the workmen. The chiefs of these outriders were "Galloping" Fraser and Jno. Germaine. Cunard was of a grasping disposition, and possessed himself of every thing that he could get hold of that he thought there was any money in, and in this way got hold of A. D. Shirreff's property on Middle Island

1831.

Rev. Jas. Thompson, who was pastor of St. Andrew's church, died, and the congregation, which was a mixed one of Kirk or Established Church followers and Free Church adherents, sent to Scotland for another Kirk minister. In the meantime the Free Church members sent to Nova Scotia Synod for a Free Church man to fill the vacancy, and Rev. Jno. McCurdy, afterwards D. D., of Onslow, N. S., was sent up. When he arrived the Kirk adherents had taken possession of the church, but the Free Church folks had the keys. When they came up on the first Sunday they found the church barred and had to hold their services in an unoccupied building in England's Hollow. During the next week the Free Church party took off all the fastenings and put on new locks. But late Saturday evening the Kirk folks took off these locks and put on new ones, and kept the keys themselves. When the Free Church party came on Sunday they were unable to get in and they announced a meeting to be held sometime that week to discuss the situation. The Kirk party determined to hold the fort and they hired an armed force of six or eight men and placed them in an unoccupied apartment up stairs, together with stoves, dishes, cooking utensils and provisions, to stand a siege if necessary. The Free Church party gave up the dispute then and decided to build a church of their own, and they built St. John's church in St. John st., which is now used as a gymnasium and hall by the Y. M. C. A., and chose Rev. Jno. McCurdy as pastor. Many of the Kirk people assisted them to build this church, although they never attended it. When the church was being finished there was a discussion as to what should be the ornament on the top of the steeple, when a Scotch blacksmith arose and suggested that "We mak' a rooster and pit it an the tap so that every time the win' blaes it can craw over the Kirk," which they did. The Rev. Robt. Archibald, Mrs. J. B. Snowball's father, came out from Scotland and took charge of the Kirk from 1832—43.

The failure of Cunard occurred in 1848. They built annually eight to ten vessels in Chatham, and three or four in each of the other places where they had branches; employed ten or fifteen clerks here, and four or five hundred men in ship building and mills. They had a large cookhouse for two or three hundred men, situated near where the old gashouse stood on the south side of Pleasant st. Cunard had also a large brick making establishment, with pits and kilns, near there, towards Duke st., where Wm. Smith's and Michael Murray's houses now stand.

Middle Island was at that time the depot for packing and shipping gaspereaux for the West Indies. One of their old wharves lately appeared (Oct. 4th, 1910), above water at a very low tide at the South East corner of the Island. The fishing sheds, which were on the North East corner of the Island, were made of scantling, boards and plank and were of sufficient size to hold 1000 barrels of gaspereaux at a time. These were contained in tanks in the centre of the sheds, with a driveway for carts for conveying the fish on each side. The fish were shovelled with wire shovels from the carts into the tanks. This business was taken over by the Cunards from A. D. Shirreff, who had previously carried it on. The fish were caught by seines run out from the North East and South East corners of the Island, which when full and the tide falling were drawn ashore by horses. Thousands of barrels of these fish were sent by schooners directly to the West Indies, the return cargoes being rum and molasses.

1848. At this time the business was going on in full blast, just as usual, when a rumor got wind, when the mail arrived, that the Cunards had failed. After a short time Cunard came out, booted and spurred, on a large horse, at full gallop to his office door, where the postoffice now stands. He lived in what is now the Bowser House. The news of the failure quickly got wind, and people in thousands flocked into Water st., from the office to the mill, labouring under the impression that they were all ruined, as

Cunard, they thought, almost owned them. Cunard was closely pressed by the clamorous crowd. He put spurs to his horse and drove him through the crowd. Those that did not get out of his way were run over. Galloping to the mill, then back to the office, paying no regard to those that threatened his life. The crowd threatened to break open the stores and help themselves. Cunard was unarmed at this time. Suddenly he wheeled and called me, who was standing on a packing case in front of Wm. J. Fraser's store, where Hoffman's is now. He then came over to me and told me to run up to my father's and tell him to load the pistols and bring them down, which I did, running up the back street. When I returned, he rode up to me, and, as I gave him the pistols, he put one in each boot leg, and turning said: "Now let me see the man that will shoot Cunard." Then he galloped down to the mill and returned, no one molesting. Towards evening the crowd scattered.

After that the cry was, "To the West," and whole schooner loads of men, packed as close as they could crowd, left for Quebec during the winter of '48 and the year 1849.

W, WYSE.

A. D. Shirreff, father of the late A. D. Shirreff, merchant, of Chatham, and John Shirreff, late Sheriff of Northumberland County, lived and kept a brewery on the bank of the little stream where the Miramichi Pulp Co's dam is, a little behind the late Wm. England's house. It was he who first obtained Middle Island from the Government and started the mackerel and gaspereaux fishing there. He became involved in some way with the Cunards, who seized and appropriated the island and the fisheries. Shirreff claimed to have been wronged in some way, and when on his death-bed he vowed vengeance. Wm. Wyse's father was a great friend of his, and called to see him in his last sickness. He noticed a couple of pistol barrels sticking out from under his pillow, and asked him what these were for, and he said, "For Cunard. I'll shoot him yet." Wyse remonstrated and urged the impropriety of such thoughts and him on a sick and perhaps deathbed, and coaxed him to make him (Wyse) a present of the pistols, which he eventually did. These were the very pistols that Cunard had in his bootlegs when galloping up and down town.

Daniel Ferguson, late of H. M. Customs, thinks the failure occurred in 1847, but that could hardly have been, as that was the year that the ship or bark Loostock arrived with typhus fever aboard and Cunards owned the island then, and Jno. Brown's story tells (see Bulletin No. 6) of Cunard's horses pasturing on the island five years after. He probably errs on the other side, or these were horses belonging to the estate after Cunard had failed. I have no way just at present to state positively the exact year, but I think likely Wyse is right. The way that Cunards did business seems to have been so loose that it is not much wonder they failed. Stories are still in circulation here that seem to prove this. For instance, a Napan man came in with a quarter of beef and sold it to five different clerks, getting paid in each instance, before he eventually delivered it at the storehouse. It would require a good business to stand much of that kind of work.

They assigned to Robt. McCalmont, Sir Samuel Cunard and Thos. C. Allen, manager of the Commercial Bank, Newcastle.

The late George Kerr was Cunard's lawyer, and all their business was done through the Commercial Bank. George Kerr, before his death in 1871, paid off every dollar of their debt and cleared the estate. I give below a paper from Thos. Currie, of Mill Bank or Moorfields rather, which verifies a good deal of what has been written above. Thos. Currie is a very old man, but smart and bright physically and mentally, and still does his daily work.

THOS. CURRIE'S STATEMENT.

I was 85 years of age on the 26th of May, 1911. Peabody used to fish gaspereaux in Half Moon Cove at Mill Bank, where the Dominion Pulp Mill now is, and other places along the shore where nets could be conveniently hauled up. He had his shipyard where Snowball's mill now stands, and built his ships there. He afterwards sold this shipyard to Joseph Russell, the father of George Russell, of Blinkbonnie. This Joseph Russell taught the shipbuilding craft to Wm. Sinclair, Thos. Stevenson, Jno. Harvey, Andrew Mason, John Cochran, Donald McQuarry, &c. His wife kept a boarding house for the men on the shipyard grounds, in a long double-house that stood near the line of what was afterwards Cunard's mill grounds. Robt. Brown was ship's blacksmith, he that afterwards lived in Lower Newcastle. This boarding house was afterwards moved down and stood until lately in England's Hollow. I was a boy at this time and went to school to one James Henderson, an uncle of my own, who kept school in the little schoolhouse that is still standing on the brow of the hill, below Donald Fraser's. Joseph Russell afterwards sold this shipyard to Joseph Cunard, and himself moved to Beaubear's Island, buying a shipyard from Fraser & Thom there. He died, and is buried there on the island. Cunard carried on shipbuilding on a large scale in this Russell shipyard in Chatham until his failure in 1848. Donald MacLachlan, and his uncle Jno. MacLachlan, built boats in the yard for his ships until he failed, and then they went to Pictou, but Donald returned afterwards and did business in Chatham until his death.

After Cunard's failure, Mason built ships here for Johnston & Mackie, for some time. Then Jacob C. Gough, M. P. P., built there until 1872, when the late Governor J. B. Snowball built his mill which now stands there.

After Cunard's failure Mason and myself built a schooner together and we took eighteen passengers in her to Boston. They were glad to get away from here, as there was nothing doing here at that time, everything being very flat.

About Middle Island: A. D. Shirreff, the father of John and Adam Shirreff, lived in England's Hollow, and had a distillery there on the bank, on the east side of the Pulp Company's dam. He got or bought what is now called Middle Island, from the Admiralty, and established a large fishing business there, with fish sheds and tanks, on the northeast corner of the island, which we called Barataria, in memory of Sancho Panza's Island. He got in debt to Cunard, and the island passed from him to Cunard. There was a wharf at the southeast corner, the remains of which showed up at a very low tide in 1910. After Cunard, the Hon. Wm. Muirhead got the island and sold it to the Dominion Government about 1872 or '73. It was, I believe, in Cunard's possession in 1847, when the ship fever patients were there. I remember that time very well. The first ship that was quarantined was Loostauck, the second was the Richard White. Dr. Key was quarantine physician at that time. The bark Bolliver came in next and was going right up to Gilmour & Rankin's to load, and when hailed was not for stopping, but kept on her course. Dr.

Key was a little man and very passionate, and he went into A. D. Shirreff's and got a gun from him and fired at the ship, putting the ball in the mainmast. She hove to and he put her also in quarantine. I think there was ship fever on board. She lay there about twelve or fifteen days.

THOMAS CURRIE.

JAS. H. CURRIE'S STORY.

I was 84 on the 28th January last. My father came from Dumfries, Scotland, about 1818 or '20. His business was stone mason, and his name Andrew. It was he that built the Peabody and Jno. T. Williston houses. The Williston house was the old stone postoffice. He built also the Pallen building. I was born in this country. I was only about three years old, I think, when he built the Peabody house. I saw Cunard the night he left town, when he failed. He left at twelve at night. I have often been told by my father of the Miramichi fire. It burned all Moorfield. The church stood in front of the graveyard on the main road. I have often seen the stone foundation, but there is nothing left now but the graveyard. Mrs. McMurray, who was formerly a Lyons, remembered the fire well and has often spoken to me of it. My father got into a canoe on the Chatham side of the river, the morning after the fire, and came across to this side and went out to the back lots. He lived at that time on a little farm that he had bought from Peter Taylor, the lot below England's in the original Chatham grants. He found a man and woman, Kilpatrick by name, on the side of the road, dead, where there is now a fence around their graves on the road out to George Creighton's. Beside them lay a leaf of the Bible, and he brought that home with him and gave it to Rev. Jas. Thompson, and he preached from it the next Sunday, "The Lord hath kindled a fire against his people." In reference to the fever ships. My father kept his cows over here where I live, not at Moorfield, and I had to come over in a canoe twice a day to milk the cows and pass the fever ship each time. I took the fever from them. Dr. Key was the doctor, and he ordered all hands out of the house, except my mother, who stayed to nurse me. The rest of the family came over here to a camp we had here and stayed. I was well acquainted with Dr. Vondy, who died of fever, on the island. Andrew

Duncan used to pass our house every morning with a great load of coffins for the dead who died during the night. (He that afterwards drove stage to Newcastle.)

MRS. JAS. CURRIE.

My maiden name was Gray. I was born in Lower Napan. I have often heard my mother and father speak about the Miramichi fire. My grandfather and father, then a little boy, were living on the Woods place, next farm to E. Hutchison's. He was then eleven years old. The night of the fire he, Dr. Thompson and Samuel Thompson were together down the road on this side of the river, and were trying to get down to grandfather's on the Woods place, but it got so dark they could not follow the road. They then joined hands and one walked in the gutter. They met a woman who advised them to stay at her house till morning or they would lose themselves in the dark. They did so, and my father fell asleep sitting on the bed, as they had very few chairs. The next thing he knew was the old woman calling out if there was anybody in the house, for God's sake to come out as it was afire.

There is a story which, although not having occurred in New Brunswick, still it took place on our coast and in the immediate vicinity, viz., in the Baie de Chaleur, which I have copied from the Montreal Family Herald and Weekly Star of May 31st, 1911, which I thought might interest some of our readers and is worth preserving. It is the wreck of the Colborne: "In 1838—the year of the second uprising in Lower Canada—the most conspicuous figure in Canadian public life, also the most powerful man in the country, was Sir John Colborne, known a few years later as Lord Seaton, Commander-in-Chief of the forces. It was his strong hand that broke the insurrection of the preceding year, and it was his watchfulness and the disposition of the troops made by him, that stamped out the flames of the second uprising as soon as they burst forth. Thwarted and disgusted Lord Durham threw up the administration of the Government in the autumn of 1838, and returned to England. Sir John Colborne thereupon became administrator of the Government, and a few months later was appointed Governor General.

"Early in the summer of 1838, Sir John sent to England for a considerable quantity of silver plate for the use of his Canadian household, which he maintained on a scale in keeping with his high position. In due course, the plate was purchased in London and placed on board a bark, which, by a rather remarkable coincidence, bore the name of the great man in Canada to whom the silver was being sent. The bark was called the Colborne, a vessel of 350 tons, belonging to parties in Hull, England, commanded by Capt. Kent, an experienced seaman, and sailing on this occasion out of London for Quebec and Montreal. The story of that voyage forms one of the darkest sea tragedies of Eastern Canadian waters. The Colborne never reached port. She was lost in the Baie de Chaleur, and of the 54 souls on board all except twelve found watery graves. Most of the valuable cargo was lost, and a part of it was Sir John Colborne's silver plate. On the Gaspe coast, and near the scene of the wreck, is a little fishing village known as L'Anse-au-Gascon, and here for many years lived one of the survivors of the disaster, Mr. Joseph Jones Acteson, a Justice of the Peace and one of the principal men of the place. His graphic and absolutely reliable account of the wreck has been preserved by Sir James Le Moine, the well-known historian and literateur of Quebec. In its essential features Mr. Acteson's story is here told.

SHIP STRUCK HEAVILY.

"The bark Colborne set sail from London on the last day of August, her first port of call to be Quebec. Her cargo was unusually rich, consisting of British merchandise, wines, spirits and spices. Sir John Colborne's valuable silver plate, and ten boxes of specie, each containing £1000, some consigned to banks, but most belonging to the Government, and intended to be used in paying the troops. The crew numbered 17, and of the passengers there were 38, among whom were Capt. James E. Hudson of the British army, his wife, five daughters and six sons; Mr. Wm. Walker of the Royal Navy, brother-in-law to Capt. Hudson; Mr. W. Scobel, of Hamilton, Ont.; Mr. Hawkins of Toronto, and Mr. George Manly, Deputy Sheriff of Quebec. Those were the days of slow voyages, and six weeks had passed when the Colborne entered the Gulf of St. Lawrence. The tragic chapter opened on October 15th, a foggy day. Towards evening a light was sighted, and the captain maintained that the light was on the Island of Anticosti, although he was assured that no light was then kept there. As a matter of fact, the light was that of Perce on the southeastern shore of Gaspe, and instead of entering the St. Lawrence River, the Colborne was making her way along the dangerous northern shore of the Baie de Chaleur. A great and a fatal mistake had been made in reckoning the ship's course, and the disaster in which it resulted was now close at hand. Shortly before midnight, related Mr. Acteson, while Capt. Kent and Capt. Hudson were taking a glass of wine together in the cabin, the watch was called; and while aloft reefing topsails, one of the hands sung out, 'Breakers ahead!' Before the ship could be put about she struck heavily, starting sternpost and unshipping rudder. In an instant there was a tumult on board. In their night clothes, women and children rushed to the deck in a state of frenzy, seizing on all the wearing apparel they could at the instant lay hands upon, to clothe themselves and their little children. The pumps were at once tried and there was found to be already in the hold eight feet of water, and it was rising rapidly. In the moment of peril Capt. Kent seemed to have been as inefficient as he had been in laying the ship's course, for when the mate asked permission to cut away the masts and get the boats out, the Captain replied that there was no danger and that the masts should not be cut

THREW ALL ON DECK INTO THE SEA.

"Although the rudder was gone, by shifting the sails the ship was got into deeper water. Finding that the ship was filling fast, an attempt was made to beach her on a shelving rock, but the attempt failed through want of a rudder, although when she first struck she was not more than a stone's throw from the shore. The wind freshened, and within half an hour the ship struck again, and fell over on her side. This threw all on deck into the sea. The women, wild with terror, the poor dear children, said Mr. Acteson, whom we sailors used to play with on deck, uttering piercing cries. Acteson and five other sailors managed to get into the jolly-boat, which was amidship and had served as a roof to protect some poultry housed in the long boat. At that moment the ship was struck by a huge wave which turned it completely over, and Acteson was thrown into the water. I gradually rose to the surface, said he, when my first thought was to rid myself of my coat, but it was no use trying. I made for the ship's yards, as she was on beamends, and with three others, who had previously been with me in the jolly-boat when she capsized, I got into the longboat, which was between the masts in the water. After clearing the long boat from the rigging, we tried to reach the wreck to pick up some of the crew or passengers, but, having lost our oars, we had to drift at the mercy of the waves With some boards found in the longboat, we rigged a kind of aft sail by sitting with our backs to them. This kept the boat's head to the sea. Thus we drifted about all night, which was bitterly cold. Two of Capt. Hudson's sons, who were on board, would likely have perished from cold and exhaustion had we not protected them by sitting down on them. We were in the neighborhood of the ship and could hear all night particularly loud and melancholy cries on board. They came from a powerful young sailor who never ceased moaning until he sank exhausted, about dawn, uttering, even under the waves, a loud scream for help ; but none came to him.

DRIFTED ABOUT ALL NIGHT.

"The mere chance which brought this unfortunate youth on board the Colborne seemed to add to the tragic nature of his fate. It seems that while the Colborne was taking on her cargo at London, two lads belonging to the crew and hailing from Hull, where the ship was owned, deserted, and were lost in the London crowd. By so doing they saved themselves from perishing in the Baie de Chaleur. On the day of the sailing, and just as the ship was casting off from her dock, a lad came alongside and offered to ship as a sailor. His offer was at once accepted. It was just possible for him to jump from the dock to the moving ship. And so he embarked on the ill-fated Colborne. It was this wretched lad who clung to the rigging all night, crying out in anguish for help that could not come, until overcome by cold and exhaustion, his hold upon the ropes relaxed and he was swept away by a remorseless wave. It is now 33 years since I heard this cry of despair, said Mr. Acteson in recounting the horrors of that awful night, and many a time have I wakened from my sleep, horrified, fancying I heard the same awful screams. Acteson and his companions in the longboat drifted about all night, carried out and in, and up and down the coast, the sport of the wind, the waves, and the tide, for without oars they could not make headway against either. When the grey, cold October morning dawned, some fishermen from L'Anse-au-Gascon put out, and coming up to the longboat succeeded in towing it safely into shore. Several of the shipwrecked crew of the longboat were quite overcome with exposure and the horrors of the night, and had to be carried up to the fishermen's cottages, where all were cared for with the greatest kindness. It was Monday night or early on Tuesday morning, when the Colborne was cast away, and until the following Saturday the wind blew heavily and the sea ran high. During all this time the Colborne, thrown over on her side, or beam ends, and water-logged, drifted about, sometimes receding from the shore with the tide, and then blown in again, and carried up and down the shore, past the scene of the disaster.

BODIES PICKED UP ALONG THE SHORE.

"On Saturday the storm abated. News of the wreck had spread far and wide along the coast, and a large number of fishermen and others had gathered at the scene. As soon as the conditions would permit, they put out in their boats and succeeded in towing the wreck into Harrington Cove, about two miles distant from Port Daniel. All this country is commonly spoken of as part of the great peninsula of Gaspe, but Port Daniel and L'Ance-au-Gascon, where the wreck occurred, are in the eastern extremity of the County of Bonaventure. After the wreck was towed into the harbour, the bodies of a number of the sailors were recovered from the tangled rigging, aad also the body of Capt. Kent; while the body of Capt. Hudson and that of his brother-in-law, Mr. Walker, and those of his two children, were picked up along the shore. Of the 54 souls on board, those saved were the second mate, eight seamen two sons of Capt. Hudson, and one steerage passenger. It was afterwards reported that the body of Mrs. Hudson drifted across the Baie de Chaleur and was picked up off the New Brunswick coast, and that in the clothing were found six hundred pounds in bank notes. A considerable part of the Colborne's rich cargo was washed ashore, the waves even throwing up five of the heavy boxes filled with silver specie. Among the wreckage were silver plate, church ornaments, cases of costly wine, silks, massive furniture, besides heaps of wreckage that had once formed part of the fittings of the ship. The season was far advanced and the shores of the Baie de Chaleur were then much more difficult of access than they are to-day. Some of the wreckage was disposed of for the benefit of the owners or the insurers, but probably the greater part was taken possession of by the people of the locality and turned to their own use. This was especially the case with respect to such articles as furniture, and to-day along the coast in the neighbourhood of L'Anse-au-Gascon and Harrington Cove, can be found in the humble cottages of fishermen, massive oak sideboards and chests of drawers, beautifully carved and mellow with time. They came out of the Colborne and were part of the wreckage. It is related that some persons on the spot, claiming authority, set out to count the silver in the chests cast ashore by the waves or fished from the hold of the wreck. The coins, it is said, were counted several times, but, strange to relate, the amount grew smaller each time the specie was counted. As soon as the Government at Quebec heard of the disaster, an officer and guard were sent down to Harrington Cove with orders to stop the counting and bring the money chests up to the Capitol. Such in outline is the tragic story of the Colborne, a dark enough story to be sure, and yet it is lightened with one bright gleam of romance. In the brave little band of fishermen, who, on the morning after the wreck, pushed out and brought safely to shore the longboat and its half perished passengers, was a man named Chedor. Acteson was cared for at Chedor's house and came to look upon the place as home, and the head of the household as the man who saved his life. Chedor had a daughter. Let the sequel be told in Acteson's own words: 'I am now 57 years of age (in 1871) and have resided on the coast ever since, having married Isabella Chedor, the daughter of the man who rescued me the morning after the wreck.' The shipwrecked Englishman became the son-in-law of his rescuer, cast in his lot with the wife's people, and spent the remainder of his many years near the scene of the tragedy of the sea that changed the whole current of his life. He was long one of the most prominent and highly respected members of the community and many of his descendants are to be found there to day. The graves of Capt. Kent and of Capt. Hudson and of several members of his family are in the churchyards of Paspebiac and Port Daniel and beside them also rest the remains of several of the more obscure victims of the ill-fated Colborne."

Since writing the article for Bulletin No. 6, I have come into possession of original papers and correspondence from parties quarantined on Middle Island at the time of the epidemic of typhus and they throw a good deal of light on the conditions existing on the island at that time. They are from Dr. Vondy, Joseph Cunard, and Miss Vondy, but being private and personal they cannot be given here, but suffice it to say they show cowardice, neglect, or inefficiency, or all three, where we would least expect it, habitations a disgrace to the authorities, and attendants dishonest. The patients, and Dr. Vondy himself, suffered more than we will ever know, and who knows but that the conditions were largely responsible for so many deaths. One letter, dated June 21st, 1847, contains the following: "Tell Pierce (Jas. A. Pierce, editor of the Gleaner) that thirty-five persons have died on the island up to this date, and if the weather does not keep fine it is hard to say how many there may be, as every building on the island admits the rain." These papers all agree in spelling the name of the craft Loostauk, and we have,

1st, Mrs. Hawbolt's note mentioned in Bulletin No. 6, of the arrival of the ship (?) Loostauk, having left Liverpool with 467 passengers, of which 117 died at sea.

2nd. "Capt. I. Thane of the ship (Loostauk) is hereby authorized to land on Middle Island—Nixon, one of his passengers.

Given under my hand,

Miramichi, this 15th day of June, 1847.

A. KEY, H. O."

3rd. "Admit the mate and one of the crew of the ship (?) Loostauk, June 16th, 1847.

A. KEY, H. O."

With the following attached:

To Dr. Vondy:

The Capt. taking sails, &c,, to erect a tent for mate, which I trust will meet with your sanction.

A. K.

4th. Dr. Vondy will please allow all the passengers of the brig Richard White and any of the crew that are sick—to land on Middle Island.

Given under my hand,

Miramichi, this 18th day of June, 1847.

A. KEY, H. O.

Poor Dr. Vondy's courage and humanity cost him his life. Bene est, serve bone et fidelis. After Dr. Vondy's death an effort was made to get Mrs. Hawbolt (then Elizabeth Vondy) off the island, by her brother, Thos. Vondy, Jr. (lately postmaster here), and the following is a letter from Joseph Cunard to him in reference to it:

Chatham, July 8th, 1847.

Mr. Thos. Vondy, Jr.

Dear Sir: Before and since I received your note I had seen Dr. Key and since then I have sent Dr. Thompson's brother to him on the subject of your communication, and, I am sorry to say, nothing can be done. I have just received a letter from Mr. B. Miller and regret I cannot afford him any encouragement. I should be glad to serve in the matter if in my power.

Yours,

JOS. CUNARD.

This B. Miller was Benjamin Miller, an uncle of Miss Vondy's. The originals of these letters are preserved in the museum of the Miramichi Natural History Association. There was, so far as I can find out, only one newspaper published in Chatham at that time. It was called the Gleaner and was edited by James A. Pierce, father of the late J. J. Pierce, and the following notes are taken from the issues of that date:

Ship Loostauk, Capt. Thane of Dublin, 600 tons, from Liverpool, bound for Quebec, out 7 weeks, 467 passengers, 117 died on passage, 100 now unable to help themselves.

Entered at the Custom House, July 3rd, Loostauk, Grimsby, Liverpool, clearance not noted, but arrived at Quebec 28th July.

Bark Bolivar, seven of crew with typhus fever. Bolivar landed a number of passengers at Newfoundland. Bolivar cleared on 25th July.

The Richard White had eight passengers and two of crew sick. Cleared at Customs on July 13th.

Brig John Hawkes from Limerick, 120 passengers, all well. Capt. Richard.

In History and Geological Record of the first settlers of Colchester Co., N. S., by Thos. Miller, I find the following in re Miramichi Fire:

"On the 7th October, 1825, there was the great fire in Miramichi in which 160 persons perished, 595 buildings were burned, and 875 horses and cattle were lost. The total of property destroyed was estimated at £994,092 and 8000 square miles of country laid waste. In Great Britain, United States and British Colonies about £174,428 were subscribed for the relief of the sufferers." —J. B.

REPORT.

1911–1912.

The Miramichi Natural History Association, having completed its fifteenth year, begs leave to report as follows:—

We have never had a more successful year than the past one. Our average attendance at our weekly lectures now averages one hundred, and the interest in the subjects presented steadily grows, the pupils from the High School taking particular interest in them. Quite a large number of our old members have married, moved away, or died, but now new ones have joined, so that our roll is about the same. A large geological cabinet, 32 x 6 feet, has been added, and a large vacancy in one of the wall cabinets finished out, as well as a large addition to the library shelving. There has been presented to us, by the kindness of the Local Government, a fine specimen of a bear, which is a valuable addition to our museum. A large number of strangers who have visited our rooms to inspect the collection, which they had heard of, expressed much surprise that so much had been done in so short a time. When some persons will walk two miles and others drive twenty to attend the lectures, it is a pretty good index of the interest taken. Our roll stands about as follows:—

Life members,	6
Honorary members,	3
Members,	57
Associate members,	30
Corresponding members,	9

TREASURER'S REPORT.

Balance from last report,	$102 16	
Government Grant,	100 00	
Dues and sale of Bulletins,	14 55	
Donation,	5 00	221 71

EXPENDITURE.

Printing Bulletin,	89 18	
Cases and furniture	47 95	
Insurance on building,	27 50	
Lamp for reflectoscope	12 00	
Current expenses	14 36	190 99
Balance on Hand		$ 30 72

LECTURES.

Feby.	14th	Annual Meeting, business.	
Feby.	21st	C. J. Mersereau,	Woodcraft.
Feby.	28th	Dr. Marven,	Anæsthetics.
Mar.	7th	Miss Helen Brown,	Franchise for Women.
Mar.	14th	Business.	
Mar.	21st	J. Baxter,	Rest.
Mar.	28th	J. Nicol,	Jupiter.
Apr.	4th	Dr. McCully,	The old Order Changeth.
Apr.	11th	Business.	
Apr.	18th	Arthur Brown,	Tolstoi.
Apr.	25th	Rev. J. M. MacLean,	Origin and art of Pottery.
May	2nd	Rev. J. M. MacLean,	Pottery in England.
1912.			
Jany.	9th	J. Baxter,	Gulf and River St. Lawrence.
Jany.	16th	G. B. Fraser,	Trip across Norway.
Jany.	23rd	D. P. MacLachlan, M. P. P.,	Hawaiian Islands.
Jany.	30th	D. P. MacLachlan, M. P. P.,	Hawaiian Islands.
Feby.	6th	J. L. Stewart,	Lakes Ontario and Erie.
Feby.	13th	Rev. J. MacLean,	Lakes Huron and Superior.
Feby.	20th	J. Baxter	Yellowstone Park.

DONATIONS.

Gauging Rod used by Mr. Adam Kerr (100 years old),	Mr. P. Connors.
Turkish Coin, iron paint material, Plants from the Holy Land,	Mr. J. Feinbrook.
Nova Scotia half cent, Siamese Coin,	Miss B. M. Creighton
Two old English Coins,	Mr. J. D. Creaghan.
Rock Crystals from Little South West Miramichi,	Mr. R. G. Forsythe.
Fossil,	Mr. C. A. C. Dearden.
A number of peculiar stones,	Capt. Matthews.
Wolframite or Tungstite,	Mr. R. A. Lawlor.
Two old Canadian Coins,	Mr. John Johnstone.
Egg laid by a chicken one month old,	Mr. John Hawkes.
Jaw of Walrus from Miscou Island, Samples of Coal from Miscou Island,	Rev. J. Valentine.

DONATIONS TO THE LIBRARY.

1911–1912.

Ottawa Naturalist, Vol. 24, Nos. 10 & 11.
Canadian Entomologist, Vol. 3, No. 2.
Books on Natural History and Geology in all its branches.
Catalogue No. 43, 1911.
Geology of the Nepigon Basin, Ontario, Dept. of Mines, Ottawa.
Memoir, No. 1.
Preliminary Memoir on the Laws and Mordensksold Rivers coal district, Yukon, No. 5.
The Edmonton Coal Field, Alberta, No. 8.
New Species of Shells, No. 14.
The American Museum Journal, Vol. II, No. 2.
Report of the Department of Mines, 1909–1910, Ottawa.
Instrumental Survey of the Shore Line of the Extinct Lakes, from the Department, Ottawa.

Triangulation of Vancouver Island.
Report of Geological Recognizance of Western Quebec.
Report and Map No. 9 of Attawapistkat River, Lake Temiscaming.
Clay and Shale Deposits, Nova Scotia.
Report of Survey of Big Horn Coal Basin.
Report of Trenton Echinoderm Fauna, Ontario.
Proceedings of the Academy of Science, Philadelphia.
Forest Fires in Canada, 1910, Dept. of the Interior, Ottawa.
Hardy Apples for the Canadian North West, Dept. of Agriculture.
Bulletin of the New York Botanical Gardens.
Proceedings of the Portland Society of Natural History.
Numbers of the Canadian Antiquarian and Numismatic Society.
The Geologist, Albion, New York.
Biblical and Chemical Contribution from the Layard Library.
Bulletin of the Minnesota Academy of Science.
Botanical Bibliography of Canada, by D. A. H. McKay.
Report of the Provincial Hospital, St. John, N. B., 1909.
Report of the University of Illinois, U. S. A,
Chemical and Biological Survey of the Waters of Illinois River.
Quarterly Journal of the University of Dakota, 1911.
Studies of the University of Colorado.
Report of the Entimological Society of Ontario.
Proceedings of the Iowa Academy of Science, Vol. 17.
Report of the Metropolitan Museum of Art, New York.
The Glasgow Naturalist, Glasgow.
Transactions of the Natural History Association of Glasgow.
Edmonton Coal Fields, Alberta
Report from the U. S. Museum, 1910.
Report from Smithsonian Institute.
New Species of Shells, by John Macoun.
American Museum Journal, New York.
Catalogue of Birds and Plants from Portland, Maine.
Arsenic as an impurity in drugs, from the Inland Dept.
A new race of Miciotus.
Quarterly Journal from North Dakota.
Bulletin of Minnesota Academy of Science.
A number of copies of "Herbarium" from Leipsic, Germany.
Vermont Bulletin, University of Vermont.
Migratory Movement of Birds, Department of Agriculture.

Report of Tropical Research Labratory from Gordon Memorial' Khartoum.

24 Volumes of Books (some old), from Mr. W. Robertson.

OFFICERS AND MEMBERS OF COUNCIL.

Patron—His Honour Lieut. Governor Tweedie.
President—J. L. Stewart.
Vice Presidents—G. Stothart and D. P. MacLachlan, M. P. P.
Treasurer and Corresponding Secretary—J. Baxter.
Secretary—G. B. Fraser.
Curators—J. D. B. F. Mackenzie, G. Stead, J. Nicol, John Johnstone, and the Warden of County Council.

It is only right to state that although the Treasurer's report shows $30.72 on hand, there stands against that bills as follows, yet to be paid:

Alcohol Preservative Fluid, etc.,	$14 23
Truckage,	42
Coal,	1 35
Additional cases for specimens,	44 80

MIRAMICHI NATURAL HISTORY ASSOCIATION REPORT.

1912-1913.

The Miramichi Natural History Association, having completed its sixteenth year, begs leave to report as follows:

The last year, ending Feb. 11th, 1913, has been phenomenally successful. In the winter of 1912 the Association threw open its doors twice a week—on Fridays to the school children, and on Tuesdays to adults—both days free of cost, giving lectures and magic lantern views, and the audiences averaged 150 school children on Fridays and 175 adults on Tuesdays. Great interest was aroused, and much good, we think, was done, but we found the children hard to control, so, at the commencement of 1913, we returned to the Tuesday night's meetings for adults, and selling membership tickets at the usual price of regular membership, viz., members $1.00 and associate members 50c. These tickets give all the privileges of regular members, the buyers having votes and permission to attend all meetings, etc. This has largely increased our membership and shut out the unruly parties, and yet our hall is well filled. The public approve of the change and give us every encouragement.

Our roll stands as follows:

Life members,		6
Honorary members,		3
Members,		75
Associate	"	53
Corresponding	"	9
	Total	146

TREASURER'S REPORT.

Balance from last report,	$ 30 72	
Government Grant,	200 00	
Dues, Sale of Bulletins and Tickets,	81 20	
Donation,	10 00	
		321 92
EXPENDITURE.		
Cases and Furniture,	$ 59 55	
Insurance on Building,	28 50	
Painting Roof	28 40	
Current Expenses,	70 57	
		187 02
Balance on hand,		$134 90

With this balance we expect to pay for the Bulletin now in press, and we have also in view putting a cellar and furnace under the building, as the stove we have is quite insufficient to make the building comfortable for the audiences, even down stairs, and the museum is very cold in winter for inspection.

LECTURES.

1912.			
Feb.	20	Dr. J. Baxter,	Yellowstone Park.
"	23	" "	" "
"	27	Rev. G. Wood,	Alberta and British Colonies.
Mar.	1	Dr. J. Baxter,	" " "
"	5	Jas Nicol,	Yosemite Valley.
"	8	Dr. J. Baxter,	" "
"	12	Dr. Marven,	Jamaica and Porto Rico.
"	15	Dr. Baxter,	" "
"	19	" "	Paris.
"	22	" "	Egypt.
"	29	" "	Waterways of Canada.
Apr.	2	" "	" " "
"	5	" "	Newfoundland and Labrador.
"	9	F. E. Neale,	" " "
"	12	Dr. Baxter,	Italy.
"	16	R. A. Lawlor,	"
"	23	Dr. Baxter,	Scraps of Local History.
"	30	"At Home" by the Association.	
1913.			
Jan.	21	James Beveridge,	Pulp Industry of Canada.
"	28	D. P. MacLachlan,	History and Culture of Tea.
Feb.	3	A. Knechtel,	Conservation of Forests.
"	11	Dr. Baxter,	Mosquito in Disease.

DONATIONS.

Carboniferous Fossil from Windsor, N. S.,	G. Stead.
A permit to a Sea Captain to land, written and signed by Dr. Key,	Miss A. Vondy.
An Invitation to Beaubear's Island from Mr. and Mrs. Joseph Russell to C. Hawbolt, 1841,	Miss A. Vondy.
Revolving Book-case,	W. Robertson.

Young Alligator, stuffed,	E. Hutchison,
Old Book, Old Musical Instruments,	Robert Murray,
Marmoset, mounted,	W. P. Eaton,
Wood Sparrow, stuffed,	J. H. Pallen, Jr.
Pair of Chinese Chopsticks,	Mrs. Creighton, Halifax.
Stone Hammer, Indian Pipe, Chinese Pill,	A. Mackenzie.
Three Old Axes and Small Lead Anchor from Bartibogue Island,	James A. Rundle.
Pair of Pattens, Piece of Poplar Tree gnawed by Beavers,	James Johnston.
Hen's Egg, of a Curious Shape,	W. J. Moran.
Old German Pipe,	A Friend.
Cocoon of Emperor Moth,	John J. Jardine.
Year Book of Department of Agriculture,	Dr. Baxter.
Report of the National Geographical Society,	M. S. Adams.
Odd Volumes of History of England,	" "
Odd Volumes of History of China,	" "
Two Numbers of Acadiensis,	Dr. Baxter.
Numbers of The Gleaner, 1839 and 1840,	" "
The National Geographic Magazine,	S. Adams.
National Waterways,	" "

EXCHANGES.

A Copy of Report of the Philadelphia Museum.
Report of the Australian Museum.
A Number of the Canadian Entomologist.
Report of Missouri Botanical Garden.
A number of Volumes of Reports and Bulletins from Government at Ottawa.
Manufacturing in Philadelphia, 1690–1912.
Bulletin of the New York Botanical Gardens.
Bulletins of the Lloyd Library, Cincinnati, U. S. A.
Bulletin of the Entomologist Society.
Report of the Boston Society of Natural History.
Records of Australian Museum.
The Canadian Journal.

History of New Brunswick by J. D. Lawrence.
Quarterly Journal of University of Dakota.
Transactions of the Warren Academy of Science, Pennsylvania.
Annual Report of Victoria Hospital at Fredericton, N. B.
Two Copies of Review of Reviews.
Proceedings and Transactions of the Nova Scotia Institute of Science.
23rd Annual Report of the Missouri Botanical Garden.
Ottawa Naturalist, Volume 26, No. 10.
Numbers of the Quarterly Journal of the University of Dakota.
Volume 45 of the Canadian Entomologist.
Catalogue of Americana and Natural History, No. 3, Jan 1913.
Decennial of the New York Zoological Park.
The Canadian Entomologist, April, 1912.
Three Numbers of the University of Pennsylvania.
The Museum Journal.
Three Numbers of the Glasgow Naturalist.
Numbers of the American Midland Naturalist.
Preliminary Geological Map of Gowganda Mining Division, District of Nipissing, Ontario.
Map of Manitoba.
Map of Saskatchewan.
Map of Alberta.

OFFICERS AND MEMBERS OF COUNCIL.

Patron—His Honour, Hon. L. J. Tweedie, D. C. L.
President—D. P. MacLachlan.
Vice Presidents—Col. J. D. B F. Mackenzie, George Stothart.
Corresponding Secretary and Treasurer—J. Baxter, M. D.
Secretary—G. B. Fraser.
Curators—James Nicol, W. Robertson, A. J. Loggie. Dr. Marven.
Additional Members of the Council—Geoffrey Stead, A. Adams, J. L. Stewart and the Warden of the County Council.

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