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ARTICLE I.

PRELIMINARY NOTICE OF THE ETCHEMINIAN FAUNA OF NEWFOUNDLAND.

By Geo. F. Matthew, D. Sc., LL.D.

Read February 7, 1899.

For comparison with the known forms of the Etcheminian terrane in New Brunswick and as a guide to other species which may be discovered in it, the author describes here briefly, and figures the species which have been found in the Etcheminian rocks of Newfoundland.

BRACHIOPODA.

Obolella c. f. chromatica, Billings. Pl. I., fig. 1.

See *O. chromatica*, Bill., Palæoz. Foss., vol. i., p. 7, fig. 7, *a.* to *d.*

A small Obolella, resembling the above species, was met with. The surface is granulated, but shows undulations of growth and faint obscure radiating lines.

Kutorgina granulata, n. sp. Pl. I., fig. 2, *a.* to *d.*

Another little shell, but with a straight hinge line, occurs. The surface is minutely granulated; concentric striæ and faint radial lines are visible. *Size*—Length, 4 mm; width, 6 mm; depth of ventral valve, $1\frac{1}{2}$ mm.

This species is smaller than *K. cingulata* and differs in ornamentation. It is about the size of *K. pannula*, but has not the diagonal cancellation of that species.

GASTEROPODA.

Scenella c. f. reticulata, Billings.

c. f. *Scenella reticulata*, Bill. Palæoz. Foss., vol. ii., pt. i., p. 77, (no figure).

Some shells were observed which appear to be of this species of Billings. The ornamentation is of sharp thread-like radiating ridges, which, without break, cross over fine striæ of growth. *Size* of the aperture, 7x9 mm.

Scenella c. f. retusa, Ford.

Scenella c. f. *retusa*, Ford. Am. Jour. Sci., 3 ser., vol. v., p. 213 figs. 2 *and b* (page 214).

Another species occurs, smaller than *S. reticulata*, and distinguished by its ornamentation. The radiating ridges are broader than in this species and both radiating and concentric ridges are obscured by a more distinct granulation of the surface.

RANDOMIA, n. gen.

This genus does not differ in form from Palæacmæa, but it is characterized by strong radiating ridges, which cross the cencentric ridges and prominent undulations of growth, that mark the shell. Mr. E. O Ulrich says that the species of Palæacmæa have only concentric lines

Randomia Auroræ, n. sp. Pl. I., figs. 3 *a* to *c*.

This is one of the most characteristic species of the Etcheminian ; and a species, probably the same, occurs in the St. John Basin of Eopalæozoic rocks. The surface is marked by very fine, sharply raised lines, radiating from the apex toward the margin ; about six are found in the space of one millimetre. *Size*—Opening of the shell 20x25 mm.; height 11 mm.

The very prominent ridges, straighter dorsal line, and fine radia ting striæ distinguish this species from *Stenotheca (?) rugosa* and *S. (?) paupera*, Bill.

Parmophorella (?) paupera, Bill. sp.

Stenotheca paupera, Bill. Pal. Foss., vol. ii., pt. i., p. 77 (no figure).

A few examples occur which agree with this species. The shells are compressed laterally, indicating that it had a narrow, oval aperture.

PLATYCERAS TRANSVERSUM, n. sp. Pl. I. figs. 4 *a* and *b*.

This is one of a group of three species of small gasteropods, occasionally met with at Smith Sound. They are found buried in the calcareous mud of the upper limestone, and also within the tubes of Hyolithes, etc., where they probably concealed themselves after the death of the animals which formed those tubes.

The surface of all those species is minutely granular, and in none does the curve make a complete whorl, but the umbo projects too far to allow the shell to be classed with Palæacmæa or Parmophorella. *P. transversum* is considerably larger than the other two, and is distinguished by its fine, closely set growth lines.

PLATYCERAS RADIATUM, n. sp. Pl. I., figs. 5 *a* and *b*.

This is proportionately a longer species with more projecting umbo. It is distinguished by about a dozen fine, narrow, sharp ribs on the dorsum, radiating from the umbo.

This differs from any described Cambrian or Ordovician species. It approaches the genus Heliconopsis, Ulrich and Scofield; but its strongly curved back and projecting umbo separate it.

PLATYCERAS CYMBULA, n. sp. Pl. I., figs. 6 *a* and *b*.

Distinguished from the preceding by its smooth surface, and from the first by its sub-carinate dorsum, and less concave slopes in the anterior region.

LAMELLIBRANCHIATA.

MODIOLOPSIS THECOIDES, n. sp. Pl. I., figs. 7, *a* to *c*.

Only the right valve is known; it is remarkable for its long, narrow shape and ear-like anterior end. When this is concealed, the shell is easily mistaken for a Hyolithes, the form of the posterior end and the sculpture of the surface, being like the dorsal side of a tube of that genus. The shell is about 9 mm. long and 4 mm. wide.

ANNELIDA.

UROTHECA, n. gen.

This genus based on chitinous tubes from the Etcheminian and Cambrian is described in an article to be communicated to the Royal Society of Canada, May 1899.

THECOTHECA PERVETUS, n. sp. Pl. I., fig. 8.

Only the distal end of this tube is known, and that pressed flat in the stone so that the form of the orifice is not seen. *Size*—Length of the part preserved 35 mm., width 3½ mm.; rate of tapering, 1 in 17 mm.

HELENIA GRANULATA, n. sp. Pl. II., figs. 7, *a* to *e*.

Small, much flattened, curved tubes, the curve not in one plane, but the tube somewhat twisted. The tubes enlarge towards the aperture so that in 10 mm. of the length the width is doubled. Width of the orifice 2½ mm. Surface minutely granulated.

The form and curve of the fragments of these tubes cause them to resemble those of the genal and pleural spines of trilobites, but we have found nothing resembling the cheeks or head of trilobites in the bed where these fragments are found.

HYOLITHELLUS MICANS, Billings, (pars). Pl. II., figs. 1., *a* to *d*.

These appear to be much smaller than the limit of size assigned by Mr. Billings for his species. But I surmise that objects similar to these have been included under his name. *Size*—The longest are 20 mm. with a width of 1 mm. The surface, though shining, is not quite smooth, but is minutely granulated. These objects appear to be clustered in the shale, as though they were gregarious, or were attachments of larger organisms.

HYOLITHELLUS (?) FLEXUOSUS, n. sp. Pl. I., fig. 9.

A small slender tube of which the proximal end is very slender, straight and hyaline. This enlarges somewhat abruptly into a terete, opaque tube, which is curved in one or more planes. Rate of taper of the known part 1 in 20 mm.

This species differs from *Hyolithes lævigatus*, Linrs., (Torellella, Holm.) in its circular form and calcareous substance.

The slender, cylindrical, hyaline tube in which this species begins was possibly membranaceous; if chitinous it was extremely thin.

COLEOIDES TYPICALIS, Walc. Pl. II., fig. 2.

Objects which appear to agree in all respects with this species are common with Hyolithellus, from which some can hardly be distinguished; they have a length of 10 mm. and a width of 1½ mm.

ORTHOTHECA PUGIO, n. sp. Pl. II., fig. 4 *a* to *d*.

An elongated, thick shelled species having the tube somewhat flattened on the dorsal side, and arched longitudinally toward the ventral side. The known part of the tube is about 27 mm. long, with an orifice of 6 mm. The whole length would be about 40 mm. if the shell preserved its taper and were not decollated.

This species is like *Hyolithes communis*, Bill, but has no "dorsal lip." From *O. DeGeeri*, of the Swedish Cambrian, it differs in its rounded dorsal side and granulated surface. *O. Johnstrupi*, of the same country, has a more slender form and different sculpturing.

ORTHOTHECA SICA, n. sp. Pl. II., figs. 5, *a* to *e*.

This species which is of about the same size as *O. pugio*, may be distinguished by its smoother surface, more triangular section and more distinct surface striæ.

MUTATION. Pl. II., figs. 6, *a* and *b*.

This in place of a gradually rounded ventral side shows a flattening of the middle quarter of that side. In this it approaches *H. quadricostatus* Shaler and Fœrste, of the Attleboro fauna, but is a true Orthotheca, while the latter by its form is a Hyolithes.

ORTHOTHECA STILETTO. Pl. II, figs. 3, *a* and *b*.

A small, slender, straight species, with a very tenuous tube. It has a concave dorsal side, and a rounded, convex ventral side. Rate of tapering about 1 in 8. The dorsal side has fine, closely set striæ of growth just visible with a strong lens.

This species is near *O. affinis*, Holm, of the Paradoxides beds of Sweden, but is not half the diameter and has a more elongate form.

ORTHOTHECA BAYONET, n. sp. Pl. III. fig 1 *a* to *f*.

Tube very thin and with concave slopes on three sides, two of which are ventral. The dorsal side is concave in the middle and convex towards the angles. Each ventral slope is convex toward the middle of the ventral side and concave toward the dorsal edge. Longitudinally the tube curves toward the ventral side, especially toward the apex.

Sculpture.—The outer surface is finely granulated, and traversed by fine transverse striæ.

This tube was very fragile and is found in fragments, of which the largest indicates an aperture of 8 mm. Taper of the tube 1 in 5.

This species differs from *Hyolithes Americanus* in the absence of a lip, and in having the lateral angles more acute than the median angle of the ventral side. It differs from all Orthothecæ described by Walcott (under Hyolithes) in its angular form. It differs from all those described by Holm in the acuteness of the lateral angles, and by the concave form of the ventral slopes near those angles.

This form of Orthotheca seems not to have survived the Etcheminian time, as no similar one is found in the Cambrian.

HYOLITHES EXCELLENS, Bill. Pl. III., figs. 3, *a* to *i*.

This is the leading species of the Etcheminian fauna of Smith Sound. It is a true Hyolithes of advanced type, in which a part of the ventral surface has passed over to the dorsal side. It thus belongs to the "*Magnidorsati*" section of G. Holm, which this author considers the higher section of Hyolithes, sens. strict. In *H. excellens* the proximal part of the tube has a more triangular section than the distal, and this is seen to be due to the two sides of the tube here possessing their original integrity of form, and no portion of the ventral has passed over to the dorsal side. Hence this species at first was among the Equidorsati, but in growing to maturity became a Magnidorsatus.

HYOLITHES RUGOSUS, n. sp. Pl. III. figs. 4, *a* and *b*.

A small, slender species, having the dorsal side flatly rounded, and gently curved towards the ventral side longitudinally.

The ventral side is marked by prominent transverse ribs, which are closely set on the lower part of the tube, but in the upper fifth are more distant. Surface minutely granulated. Length 11 mm.; width about $3\frac{1}{2}$ mm.

Mr. Walcott has described an object similar to this, but smaller, as *Hyolithellus micans*, var. *rugosa*; it differs in having a longitudinal striation between the ridges of growth, where this species has only a granular surface.

CRUSTACEA.

APTYCHOPSIS TERRANOVICUS. Pl. III., fig. 5

Each valve of this little crustacean has an oval lenticular form with the widest part one-third from the anterior end. The hinge has

a strong fold which is more than two-thirds of the whole length of the shield. The lower and posterior border has a distinct marginal fold. The front border is angulated, but no rostral piece is known.

mut. ARCUATA. Pl. III., fig. 6.

This form is somewhat smaller, is rounded in front, and the shape is more elongate.

The surface in these little shells is granulated and there are traces of concentric grooving. The largest is about $3\frac{1}{2}$x2 mm., the mutation about 3x$1\frac{1}{2}$ mm

SUMMARY.

The peculiarities of this fauna as distinguished from the Cambrian are the following:

1. Great preponderance of the tube worms (*Hyolithidæ*, etc).
2. Absence or rarity of trilobites.
3. Minuteness of the Gasteropods except Capulidæ.
4. Minuteness of the Brachiopods.
5. Minuteness of the Crustaceans.

The two special types of the Etcheminian fauna are, among the Hyolithidæ *Orthotheca bayonet*, and among the Gasteropoda *Randomia Auroræ*. The minuteness of the Lamellibanchs is not peculiar to the Etcheminian as the Cambrian species are not much larger.

DESCRIPTION OF THE PLATES.

PLATE I.

FIG. 1. *Obolella* c. f. *chromatica*, Bill. Ventral valve, mag. $\frac{3}{1}$. See p. 189.

FIG. 2. *Kutorgina granulata*, n. sp. *a* Ventral valve; —*b* Dorsal valve; both mag. $\frac{3}{1}$; —*c* Dorsal (?) mould of, —— *d* Ventral, hinge seen from behind. Both mag. $\frac{5}{1}$. See p. 189.

FIG. 3. *Randomia Auroræ*, n. gen. et sp. *a* Side view, restored from two examples; —*b* Same seen from above; —*c* Smaller entire shell. All natural size. See p. 190.

FIG. 4. *Platyceras transversum*, n. sp. *a* Side view; —*b* Same seen from above. Mag. $\frac{3}{1}$. See page p. 191.

FIG. 5. *Platyceras radiatum*, n. sp. *a* Side view; —*b* Seen from above. Mag. $\frac{4}{1}$. See p. 191.

FIG. 6. *Platyceras cymbula*, n. sp. *a* Side view; —*b* Seen from above. Mag. $\frac{4}{1}$. See p. 191.

FIG. 7. *Modiolopsis thecoides*, n. sp. *a* Interior of the right valve;—*b* Section near the hinge; —*c* Section near the posterior end. All mag. $\frac{4}{1}$. See p. 191.

FIG. 8. *Urotheca pervetus*, n. sp. Distal part of the tube. Nat. size. See p. 192.

FIG 9. *Hyolithellus flexuosus*, n. sp. Proximal end of the tube. Mag. $\frac{6}{1}$ See p. 192.

PLATE II.

Fig. 1. *Hyolithellus micans*, Bill. *a* A group of paired tubes; —*b* Another group; —*c* A third group, all mag. $\frac{11}{1}$;—*d* Groups of the tubes in association with Orthotheca bayonet. Nat. size. See p. 192.

Fig. 2. *Coleoides typicalis*, Walcott. Part of a tube. Mag. $\frac{10}{1}$. See p. 192.

Fig. 3. *Orthotheca stiletto*, n. sp. *a* The tube; —*b* Section at the aperture, both mag. $\frac{4}{1}$. See p. 193.

Fig. 4. *Orthotheca pugio*, n. sp. *a* A tube decollated; —*b* Form of aperture;—*c* Section at the decollation; —*d* A smaller example, side view; —*e* An operculum, possibly of this species. All mag, $\frac{8}{1}$. See p. 193.

Fig. 5. *Orthotheca sica*, n. sp. *a* Decollated tube, ventral side; —*b* Form aperture; —*c* Another tube with more rounded angles;—*d* Form of the aperture. All mag. $\frac{2}{1}$; —*e* An operculum, possibly of this species. Mag. $\frac{2}{1}$. See p. 193.

Fig. 6 *Orthotheca sica*, quadricostate mutation; *a* Ventral view of the tube; —*b* Section at the aperture. Both mag. $\frac{2}{1}$. See p. 193.

Fig. 7. *Helenia granulata*, n. sp; *a* Side view of the tube; —*b* Front view of another tube. Both mag. $\frac{2}{1}$; —*c* Section of the second tube. Mag. $\frac{4}{1}$; —*d* Large end of a tube, mag. $\frac{2}{1}$; —*e* Section, mag. $\frac{4}{1}$. See p. 192.

Plate I

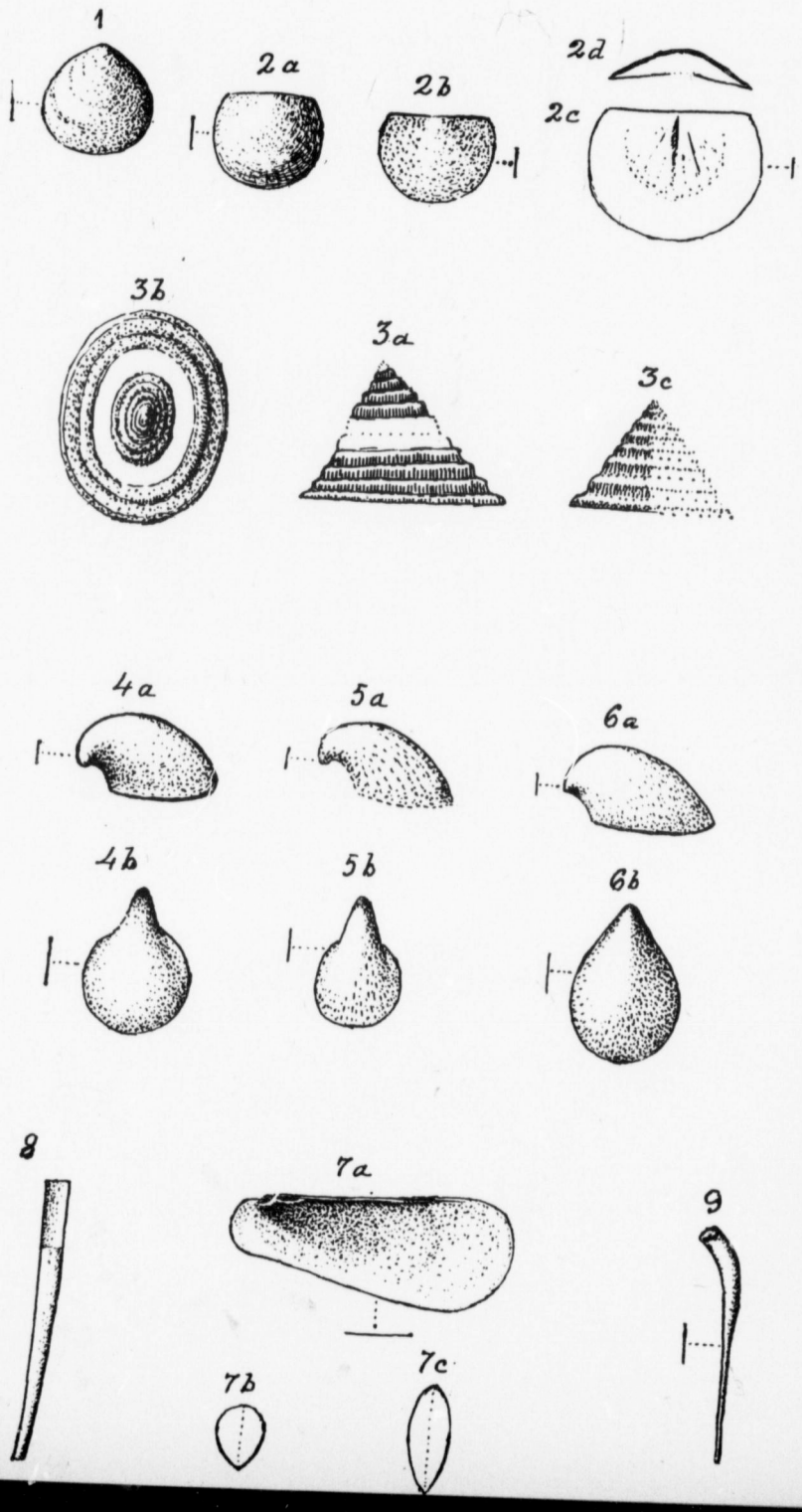


Plate II

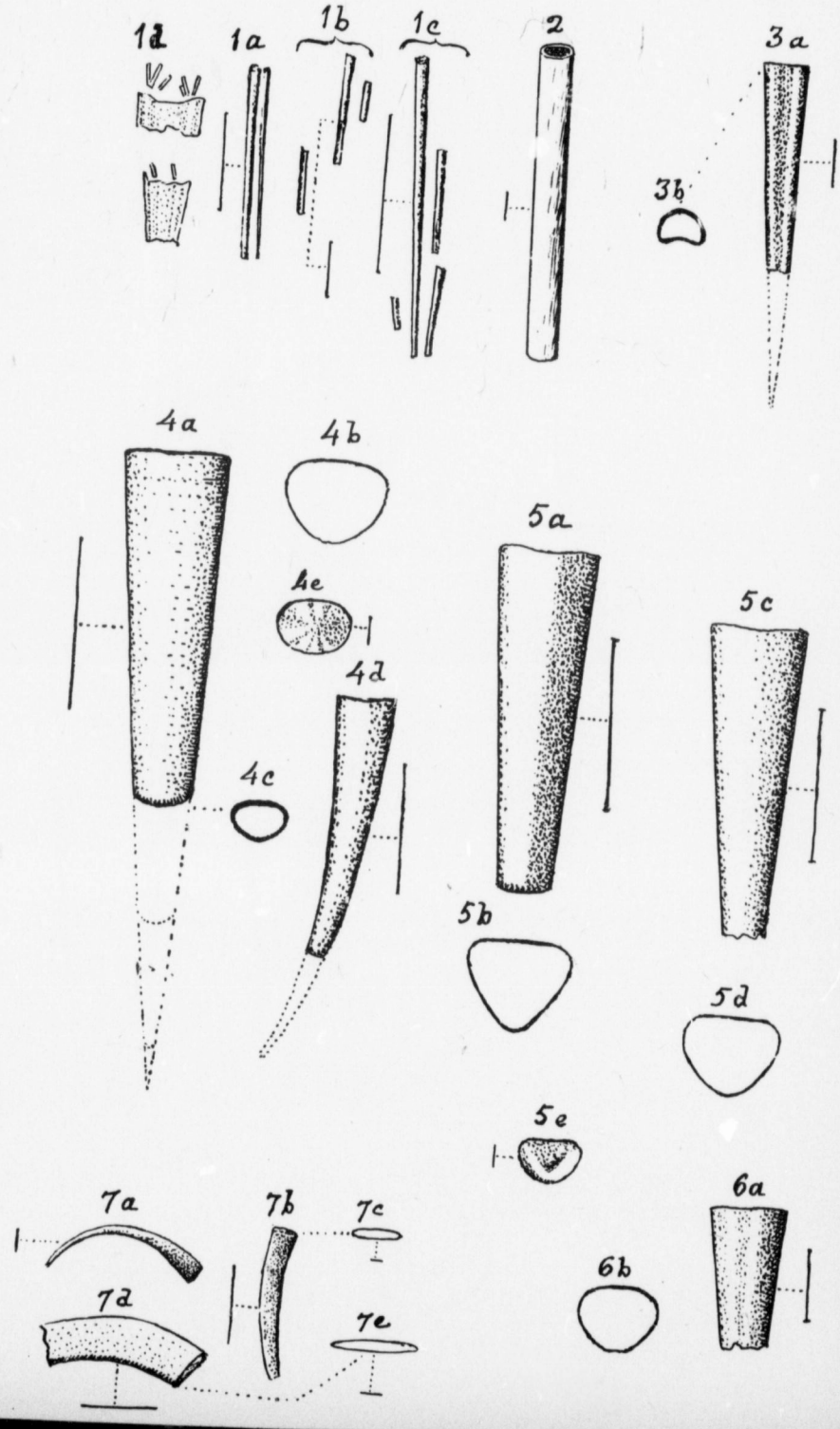


Plate III

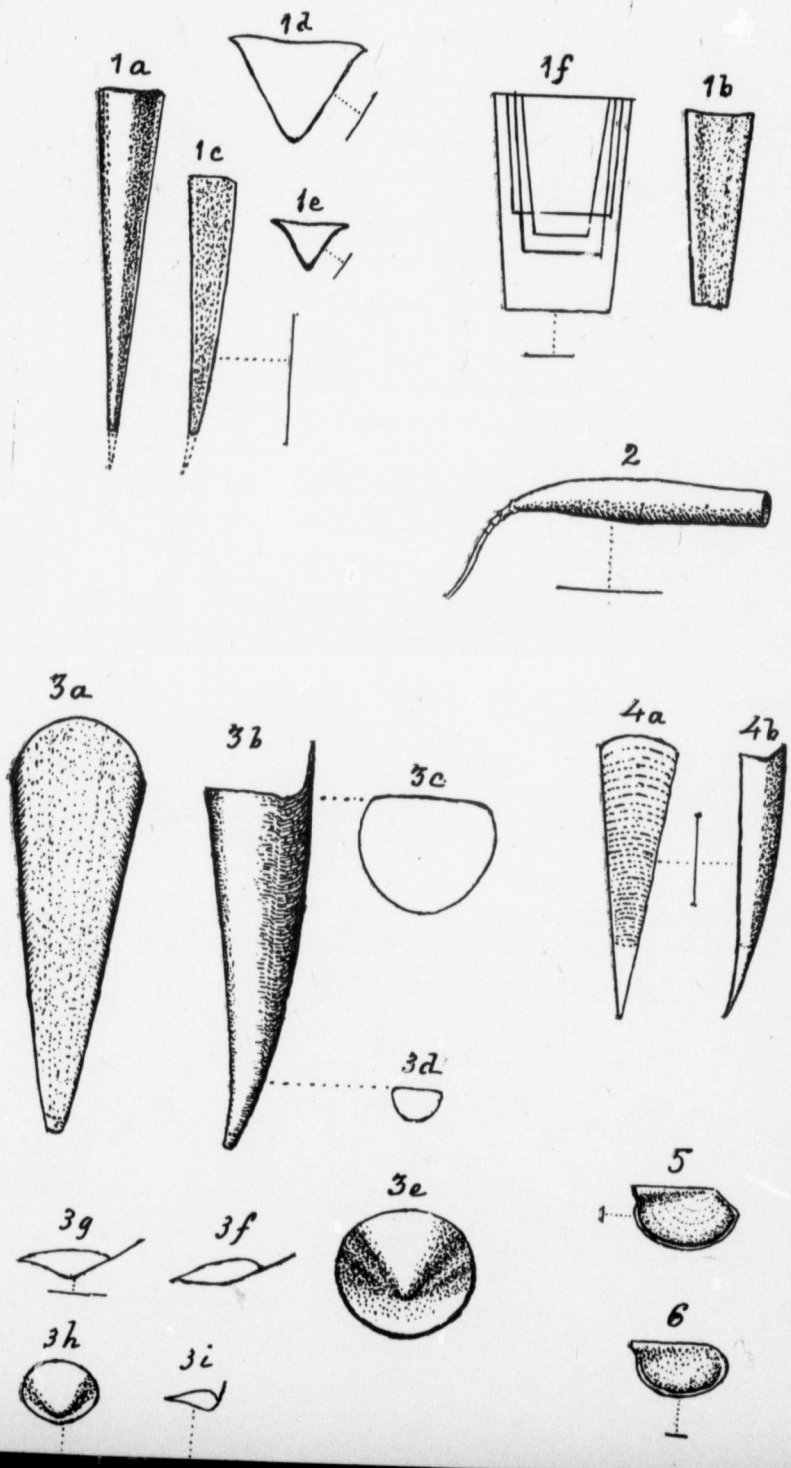


PLATE III.

Fig. 1. *Orthotheca bayonet*, n. sp. *a* The tube, ventral side; —*b* A tube showing the dorsal side; both nat. size; —*c* Side view of a small example, mag. $\frac{2}{1}$; —*d* Form of the aperture of the tube; —*e* Section toward the small end, both mag. $\frac{2}{1}$; —*f* Outline of the distal end of several tubes, to show the taper; mag. $\frac{2}{1}$. See p. 193.

Fig. 2. *Urotheca*. A small species of the Mt. Stephen fauna, figured, to show the larval tube of the young worm; mag. $\frac{3}{1}$. See p. 191.

Fig. 3. *Hyolithes excellens*, Bill. *a* Dorsal side of the tube; —*b* Side view;—*c* Form of the aperture;—*d* Section near the small end; —*e* Operculum of this species; —*f* Outline of side view; all nat. size; —*g* Side view of a young opercule; —*h* A still smaller opercule, probably of this species; —*i* Side view of same, the three mag. $\frac{2}{1}$. See p. 194.

Fig. 4. *Hyolithes rugosus*, n. sp. *a* Dorsal side of tube; — *b* Side view of tube; both mag. $\frac{2}{1}$. See p. 194.

Fig. 5. *Aptychopsis terranovicus*, n. sp. Side view of right valve; mag. $\frac{4}{1}$. See p. 194.

Fig. 6. *Aptychopsis terranovicus*, mut. *arcuata*. Side view of right valve; mag. $\frac{4}{1}$. See p. 195.

P. S.— In the above article is described briefly the Etcheminian Fauna in the locality where it shows to best advantage. Those who wish to know the stratigraphical relations of the rocks which contain it, are referred to the Annals of the New York Academy of Science, Vol. XII., No. 2, pp. 41–56.

ARTICLE II.

PRELIMINARY NOTICE OF THE ETCHEMINIAN FAUNA OF CAPE BRETON.

By G. F. Matthew, LL.D., D.Sc., F.R.S.C.

(Communicated by permission of the Director of the Geological Survey of Canada, 3rd of October, 1899.)

The following brief notice of the new fauna recovered from the Etcheminian rocks of Cape Breton is presented for the information of those who are working in the oldest fossiliferous deposits; and is collateral to a similar notice of the Etcheminian fauna of Newfoundland presented to the Society in the early part of this year.

The physical conditions and history of the Etcheminian deposits in Cape Breton are very closely parallel to those in New Brunswick. In both regions there was volcanic action in districts adjoining the areas where the sediments of this age accumulated; or there were exposed areas of volcanic deposits (ashes, etc.,) from which much of the sediment was derived. This is a more noticeable condition in the Lower Etcheminian of Cape Breton, than in that of New Brunswick; but the Upper Etcheminian of both regions had a very similar physical history.

Appended to this notice (See Plate IV.) are two sections of the Cape Breton Cambrian and Etcheminian, from which the relations of the two terranes in that region will be seen, and from which it appears that the Cambrian of that island rests sometimes on the Etcheminian, and at others directly upon the older felsites and syenites which form prominent ridges of land on that island.

As regards the Cambrian it is to be noted that these sections show *no Lower Cambrian* nor have the faunas of this part of the system (Paradoxides and Protolenus) been recognized in Cape Breton. The fauna which is found in the lowest sandstones and shales above the basal conglomerate of the Cambrian, appears to be Upper Cambrian; certainly all the faunas above the latter pertain to the upper horizons.

It is therefore more reasonable to expect a discordance of strata in this region between the Cambrian and the Etcheminian than in the region of New Brunswick where the Lower Cambrian is present.

The conditions for the preservation of fossils seem to have favored more the region of Cape Breton, for there we have a fuller fauna than in New Brunswick.

Though fossils are also more abundant in the Etcheminian of Newfoundland than in the last named province, that fauna is quite dis-similar from the one in Cape Breton. This latter fauna has a facies similar to that of the Protolenus Zone in New Brunswick, if we eliminate the trilobites from the latter. In fact every genus in this new fauna has its counterpart in the Protolenus Zone; but when it comes to a comparison of species, we cannot find one that is common to the two faunas. Hence we must believe there is a greater difference in age than at first sight appears.

It is to be remarked however, that if the sequence of similar physical events were contemporary in the two regions, the most characteristic part of the known fauna of the Etcheminian in New Brunswick lies below the fossiliferous zones in Cape Breton from which came the fossils described in the following pages. Hence this fauna might be expected to show a closer relation to that of the Protolenus beds than any other Etcheminian fauna, described, especially if we regard also the similar physical conditions which environed the two faunas.

DESCRIPTION OF THE FOSSILS.

Lingulella Gregwa, n. sp. Pl. I., figs. 1*a* to *f*.

This species has a long acuminate beak to the ventral valve like *Lingulepis pinniformis* of a later fauna, but the dorsal valve is quite different; its central group of scars is advanced far to the front, as in Obolus, and in connection with this feature a flattened band traverses the centre of this valve; this flattened area is narrower than that of *Mickwitzia monilifera* and *Obolus major*, and it is a smaller species than the latter.

Sculpture.—The surface of the valves of this species has a dull appearance, and under the lens the ornamentation is resolved into irregular concentric beaded ridges.

Size.—Length of ventral 12 mm., width 9 mm. The dorsal valve is 3 mm. shorter than the ventral.

This species is like *Lingulella acutangulus* Roem. of the Upper Cambrian of Texas, but is larger and differs in the more acuminate apex of the ventral valve, etc.

LINGULELLA TUMIDA, n. sp. Pl. I., figs. 2*a* to *c*.

A small round, thick-shelled species, of which only the ventral valve is known. It resembles an Obolella in form, but has a corneous test, and a pedicle groove.

Sculpture.—The surface of the shell is marked by rounded concentric ridges, some of which show a beaded crest.

Size.—Length 6 mm., width 5 mm.

Lingulella Martinensis, of the Protolenus Zone, is something like this in form, but is much larger. *Lingulella Ella*, H. & W., of the Middle Cambrian of the West, is like this in size and outline, but the surface markings are finer.

We now come to two species whose reference to the genus Lingulella is doubtful, because we have not recognized the pedicle groove, and because especially as regards the second, the form, etc., is suggestive of Lingula rather than Lingulella.

LEPTOBOLUS (?) COLLICIA, n sp. Pl. I., figs. 3*a* to *e*.

A small oval species somewhat pointed in front. Margins flattened, especially in the posterior half. Remarkable for the peculiar spoutlike flexure at the front of the dorsal valve, acquired in the later stages of growth. A corresponding pair of grooves appears in the anterior part of the ventral valve. This peculiarity of form simulates the sinus of the articulate Brachiopoda.

Sculpture.—This consists of fine concentric ridges, visible only with the aid of a lens. These sometimes anastomose.

Size.– Length 10 mm., width 6 mm.

LEPTOBOLUS ATAVUS, n. sp. Pl. II., figs. 1*a* to *f*.

Shell calcareo-corneous. Ventral valve somewhat pointed behind. Hinge area very small and obscure, not more than a tenth of the length of the valve. Margins of the valves arched downward all around, except at the apex of the ventral valve. The median depression of the dorsal valve indicates that the central group of muscles are set far forward in that valve, as they are also in the ventral valve.

Sculpture.—Somewhat obscure fine concentric striæ, visible with a lens, are present on all parts of the valves. A very fine granulation also can be seen. The outer layer of the shell, which carries the ornamentation, is calcareous.

Size.—Length 5 mm., width, $3\frac{1}{2}$ mm.

This species is of about the same size and geological age as *Lingulella ferruginea*, Salter; but if Davidson's figure is correct that species had a hinge area twice as long as this. It may be further observed that Davidson has included in this species forms from much higher zones of the Cambrian (Dolgelly group, etc.), but the characters are so vague that any small oval species might be referred to *L. ferruginea*. We are subject to the dilemma of choosing between two or several species which by form and size represent *L. ferruginea*, but which by other characters are found to be distinct from each other; hence, if one is *L. ferruginea*, the others are not.

Lingulella Granvillensis, Walcott, of the New York Cambrian, is of about the same size as this, and approaches it in form, but the moulding of the interior of the dorsal valve differs.

Palæobolus, n. sub-gen.

Distinguished from Obolus proper by the close approximation of the vascular trunks, as shown by their impression on the ventral valve, and by the forward direction of its branches. The callus of the visceral cavity of this valve is correspondingly narrow (therefore the muscle scars are also approximated). Yet the valve is round as in Obolus.

In default of more exact criterea, we have adopted here and elsewhere the following characters for distinguishing Obolus from Lingulella,— roundness of outline, short cardinal area and depressed beaks, advanced position of muscle scars in the valves, and strong arch of the vascular trunks in the ventral as well as the dorsal valve. There is, however, a more important distinction, which, in consequence of imperfect preservation of the valves, can seldom be observed, that is, the position of the secondary muscles of the central group in the ventral valve, as compared with the great muscle of that group. In Obolus they are *lateral*, but in Lingulella *anterior* to the great muscle. This shows a radical difference of structure between the two genera. It will be observed that the relation of these muscles is as yet unknown in Palæobolus.

PALÆOBOLUS BRETONENSIS. Pl. II., figs. 2*a* to *i*.

Oblately orbicular. Valves evenly rounded from the centre, except that the borders are flattened at the sides and front. Both dorsal and ventral valves somewhat pointed at the umbo, which is depressed in both valves. *Interior of the ventral.*—This has a broad hinge area and a triangular pedicle groove. The visceral cavity has two pairs of diverging ridges, which mark the advance of the lateral muscles during the growth of the shell. Between the outer and the inner pair originate the vascular trunks, which in going forward throw off branches at an acute angle. *Interior of the dorsal valve.*—This valve has a broad, transversely striated hinge area. The visceral cavity is traversed by two pairs of diverging ridges, more widely divergent than those of the ventral valve; there is also a strong median septum along the middle of the valve. The central group of muscle scars are about a fifth from the front of the valve.

Sculpture.—The whole outer surface, except close to the umbo, is ornamented with sharp concentric ridges which occasionally anastomose; these ridges have fine, faintly marked, radiating striæ on their posterior slopes, and are obscurely crenulated along their crests.

Size.—Length 15 mm., width 17 mm. Dorsal valve somewhat shorter than the ventral.

The Obolus nearest this in age is *O.* (*?*) *major*, of the Upper Etcheminian in New Brunswick; that species, however, is larger, and does not have the concentric ridges, on the only example of it which is known. None of the European Oboli have the sharp ridges which mark the surface of this species, and they all belong higher in the geological scale. *Obolus* (*Mickwitzia*) *monilifera*, Linrs., has a flattened dorsal valve, and thus differs from this species.

ACROTHELE AVIA, n sp. Pl. III., figs. 1*a* to *h*.

Calcareo-corneous. A rather large species with oblately oval valves, thick, horny, shell substance within, and a thin, calcareous crust without.

Outwardly the ventral valve differs little in shape from the ordinary types of Acrothele of the Protolenus and Paradoxides beds; internally, however, it is characterized by a single in place of the paired pits in front of the foraminal opening, and by strong vascular trunks and branches.

The dorsal valve has radiating ridges on the lateral slopes—a character unique to the species. The interior of this valve has, at the umbo, the usual "nail-like process," as Prof. Hartt called it, viz., the median ridge, on each side of which are impressions of the umbonal and lateral muscles. The group of central muscles are somewhat in front of the middle of the valve. Faint impressions of vascular, and of radiating ridges, are also visible.

Sculpture.—The surface of the valves is marked by fine, irregular, concentric rounded ridges, that frequently anastomose. These ridges are more regular in their course on that part of the shell which is near the margins.

Size Length 9 mm., width 10 mm. or more.

ACROTRETA PROAVIA, n. sp. Pl. III. figs. 2*a* to *f*.

Shell substance calcareo-corneous. Ventral valve obliquely conical, with a prolonged beak. Cardinal area narrow; a tubercle below the foramen, which opens behind the beak. The beak of this valve has a heavy overhang beyond the aperture (nearly half its width). The dorsal valve is orbicular, convex, but somewhat flattened towards the front, the interior has two strong muscular pits near the hinge line, spreading vascular impressions, and a broad low median septum.

Sculpture.—A strong lens reveals a series of concentric striæ on the surface of the shell, of which there are about twenty in the space of a millimetre. A still stronger magnification brings to view a granular ornamentation; occasional rows of coarser granules are seen to be parallel to the concentric striæ.

Size.—Length of ventral valve 2 mm., width 1½ mm. The dorsal valve is 1½ mm. long.

This species differs from all others in its overhanging apex. From having this form the ventral valves are found lying prostrate on the layers and when their dark shining inner layers are exposed look very like the conical teeth of fossil fishes.

They also are not unlike a long conical Lingulella, and may show us a step by which the genus Acrotreta was differentiated from some such form as Lingulella.

Bradoria* n. gen.

In the Protolenus Fauna are two species of Ostracods, which for want of other known relationship were referred to the genus Primitia. It would appear, however, that in this genus the sulcus which extends from, or near the hinge, downward, should be subcentral. In these two species it is not so, and the depression such as it is, is at or near the anterior end of the hinge line—moreover one of these species (and probably both) is marked by a prominent tubercle, which, from the smoothness of its summit, is supposed to be an organ of vision. It would appear now that these species are representatives of an ancient group of Ostracods which has several specimens in the underlying Etcheminian beds. Though having the general form of Primitia, Primitiella and Aparchites, they do not have the median pit or sulcus of the first, the shallow median depression of the second, or the perfectly smooth valve of the third. Their most marked character is the prominence or tubercle just at the front end of the hinge line. Some of the species have close behind this tubercle a short vertical furrow, scarcely extending clear of the tubercle; or the furrow may pass around the tubercle. In the five species referred here, the marginal furrow is obscure, or invisible along the lower margin.

The known species are nearly of the same size (about 2½ to 4 mm. long) and the surface of the valves is distinctly pitted, tuberculated, or wrinkled.

The following new species come under this genus *B. scrutator*, *B. vigilans*, *B. rugulosus*. It includes also *Primitia oculata* and probably *P. aurora* of the Protolenus Fauna.

Bradoria scrutator, n. sp. Pl. IV., figs. 1*a* to *c*.

Valves ovate, with straightened hinge-line, which is more than half of the length of the valve. Furrow short, immediately behind the ocular tubercle. Hinge bordered by a narrow, sharp ridge. Ocular tubercle nearly marginal, and just in front of the hinge. Marginal furrow obscure, extending around the lower margin of the valve.

---

*Named from the Bras d'Or, a salt-water lake occupying the interior of Cape Breton.

Sculpture.—The whole surface is covered with closely set conspicuous pits that are finer toward the hinge-line, where they have a linear arrangement.

Size.—Length 3 mm., width 2 mm.

This species is a little larger than *B. oculata* of the Protolenus Zone, from which it is easily distinguished by the surface ornamentation; the sculpturing is more like that of *Isochilina ventricosa* of the same zone, but that species is much larger.

BRADORIA VIGILANS, n. sp. Pl. IV., figs. 2*a* to *c*.

Outline of the valves ovate with a straightened hinge line, which is about half of the length of the valve. Ocular tubercle at the front of the hinge line, and surrounded by a shallow groove. The margin is gradually rounded at the front, and below, and project somewhat behind, hence it is nearly straight to the hinge.

Sculpture.—Surface marked by closely set granulations, that become finer toward the hinge line and ocular tubercle, and graduate into a series of sub-parallel anastomosing ridges at the posterior quarter of the valve.

Size.—Length $3\frac{1}{2}$ mm., width $2\frac{1}{4}$ mm.

Distinguished from *Aparchites conchiformis* of the Protolenus Zone by its smaller size and prominent tubercle; and from *A. secunda* by the tubercle and the coarser ornamentation, etc.

BRADORIA RUGULOSA, n. sp. Pl. III., figs. 3*a* to *d*.

A sub-orbicular species, with outline straightened along the hinge line. Ocular tubercle somewhat prominent and situated a little below the anterior end of the cardinal line, which is about half of the length of the shell. There is a faint furrow behind the tubercle nearly parallel to the hinge line, and a shallow pit just in front of the tubercle. A narrow, obscure marginal rim appears at the posterior margin of the valve.

Sculpture.—The lower slopes and posterior half of the valve are covered with fine anastomosing ridges, concentric to the upper side of the valve; toward the top and front of the valve these ridges become obscure and the surface of the valve is granulated.

Size.—Length $2\frac{1}{2}$ mm., width nearly as great.

This little species is easily distinguished from the others by its circular outline and rugulose surface, which simulates that of certain trilobites.

SCHMIDTELLA (?) PERVETUS, n. sp. Pl. IV. figs. 3*a* to *c*.

Only the right (?) valve known. It is moderately arched and without furrows, and its greatest fulness is in the upper half. The hinge margin, which is more than half of the length of the valve is formed by an infolding of the edge, without a furrow. No marginal fold was observed.

Sculpture.—The surface is covered with minute pits closely placed the raised spaces between the pits become so prominent on the lower part of the valve that the surface seems tuberculated ; towards the lower and the posterior (?) edges, these tubercles are arranged in rows so that there the valve seems covered with obscure ridges, parallel to the margin ; at the opposite side of the valve, toward the hinge, the pits become very fine, and the surface of the valve has a shining appearance.

Size.—Length, 3 mm. Width, $2\frac{1}{2}$ mm.

This species differs from *S. cambrica* of the Protolenus Zone in the less protuberent centre of the valve, and the narrower and straighter infolded border of the hinge line. The marginal fold also is more distinct in *S. cambrica* which does not have the concentric marginal ridges of this species.

SCHMIDTELLA, ACUTA, n. sp. Pl IV., figs. 4 *a. c.*

Valve tumid. Hinge line somewhat more than half of the length of the valve marked by a narrow fold and furrow that extends most of its length. Valve about as wide as long, somewhat acutely pointed at the lower margin. A narrow marginal fold extends along one side of the valve to the pointed end. Greatest protuberance of the valve in the upper half, and towards the hinge the arching of the valve turns suddenly in towards the cardinal line.

Sculpture.—The surface is smooth, somewhat shining, and covered with minute pits or granulations, uniformely distributed.

Size.—Length, $2\frac{1}{4}$ mm. Width, 2 mm.

This species, by its smooth surface and pointed form recalls the genus Beyrichona of the Protolenus Fauna, but it has not the flattened area near the hinge that marks that genus, and is more flattened in lower part of the valve.

From *S. pervetus* this species is distinguished by its finer ornamentation and pointed lower margin ; and from *S. cambrica* by its

smoother surface and narrow fold at the cardinal line. No Silurian Schmidtella has the pointed valve of this species.

DESCRIPTION OF THE PLATES.

PLATE I.

FIG 1. *Lingulella Gregwa*, n. sp. —*a* Ventral valve; *b* interior of same; —*c* Section of same; —*d* Dorsal valve; —*e* mould of interior of same; *f* Section of same. All mag. $\frac{3}{1}$. See p. 199.

FIG. 2. *Lingulella tumida*, n. sp. *a* Ventral valve; *b* mould of interior of same; —*c* Longitudinal section of same. All mag. $\frac{4}{1}$. See p. 200.

FIG. 3. *Leptobolus (?) collicia*, n. sp. *a* Ventral valve; *b* Dorsal valve; —*c* Interior of a broken ventral valve. All mag. $\frac{4}{1}$; —*d* Another ventral, showing the callus of the visceral cavity, mag. $\frac{3}{1}$; —*e* Section of the two valves, mag. $\frac{4}{1}$. See page 200.

PLATE II.

FIG. 1. *Leptobolus atavus*, n. sp. —*a* Ventral valve; —*b* Mould of the interior; —*c* Longitudinal section of same; —*d* Dorsal valve; —*e* Mould of the interior. All mag. $\frac{6}{1}$. —*f* Portion of the outer surface of the shell. Mag. $\frac{10}{1}$. See p. 200.

FIG. 2. *Obolus (Palæobolus) Bretonensis*, n. subgen. et sp.; —*a* Ventral valve; —*b* Interior of same; —*c* Longitudinal section; —*d* Dorsal valve; *e* Interior of same; —*f* Longitudinal section. All mag. $\frac{2}{1}$; —*g* Portion of outer surface of the shell, mag. $\frac{5}{1}$; —*h* smaller portion, mag $\frac{10}{1}$; —*i* Section of the two valves, mag $\frac{2}{1}$. See p. 202.

PLATE III.

FIG. 1. *Acrothele avia*, n. sp. *a* Portion of a ventral valve; *b* Longitudinal section of same. Both mag. $\frac{6}{1}$; —*c* Interior of a ventral valve; —*d* Dorsal valve; —*e* Longitudinal section of same; —*f* Interior of a dorsal valve. The four mag. $\frac{3}{1}$ —*g* Enlargement of the outer surface of the

middle of a dorsal valve; —*h* Enlargement of the surface of the lateral slope of the valve. The two mag. $\frac{10}{1}$. See p. 202.

FIG. 2. *Acrotreta proavia*, n. sp. *a* Ventral valve, upper side; —*b* same, lower side; —*c* same, side view; —*d* Dorsal valve; —*e* Mould of a dorsal valve; —*f* Side view of a dorsal valve. All mag. $\frac{10}{1}$. See p. 203.

FIG. 3. *Bradoria rugulosa*, n. gen. et. sp. *a* Side view of right valve; —*b* Outline from the front; —*c* Outline from the cardinal side; all mag. $\frac{6}{1}$; —*d* Outer surface of the valve; mag. $\frac{10}{1}$. See p. 205.

PLATE IV.

FIG. 1. *Bradoria scrutator*, n. sp. *a* Side view of the left valve; —*b* Vertical section; —*c* Transverse section. All mag. $\frac{6}{1}$. See p. 204.

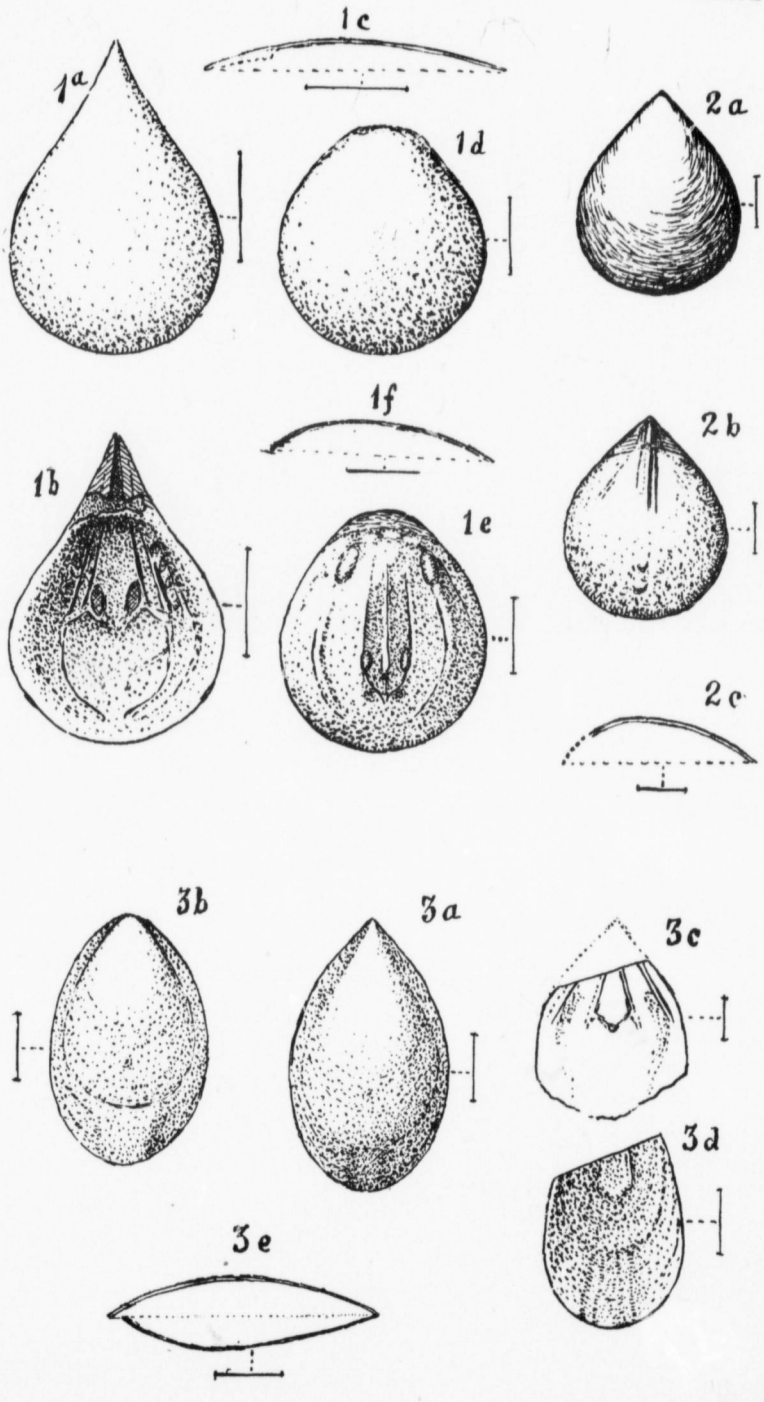
FIG. 2. *Bradoria vigilans*, n. sp. *a* Side view of the right valve; —*b* Outline, front view; —*c* Outline, cardinal view. All mag. $\frac{6}{1}$. See p. 205.

FIG. 3. *Schmidtella pervetus*, n. sp. *a* Side view of (the right?) valve; —*b* vertical section; —*c* transverse section. All mag. $\frac{6}{1}$. See p. 206.

FIG. 4. *Schmidtella acuta*, n. sp. *a* Side view of (right?) valve; —*b* Vertical section; —*c* Transverse section. All mag. $\frac{8}{1}$. See p. 206.

ERRATA TO THE PRECEDING ARTICLE.

Page.	Line.	
193	21	For "STILETTO, read STILLETTO.
194	5	For "lip," read projecting lip.
195	15	For "trilobites," read Trilobites.
195	16	For "Capulidæ," read Patellidæ.
195	21	For "Lamellibanchs," read Lamellibranchs.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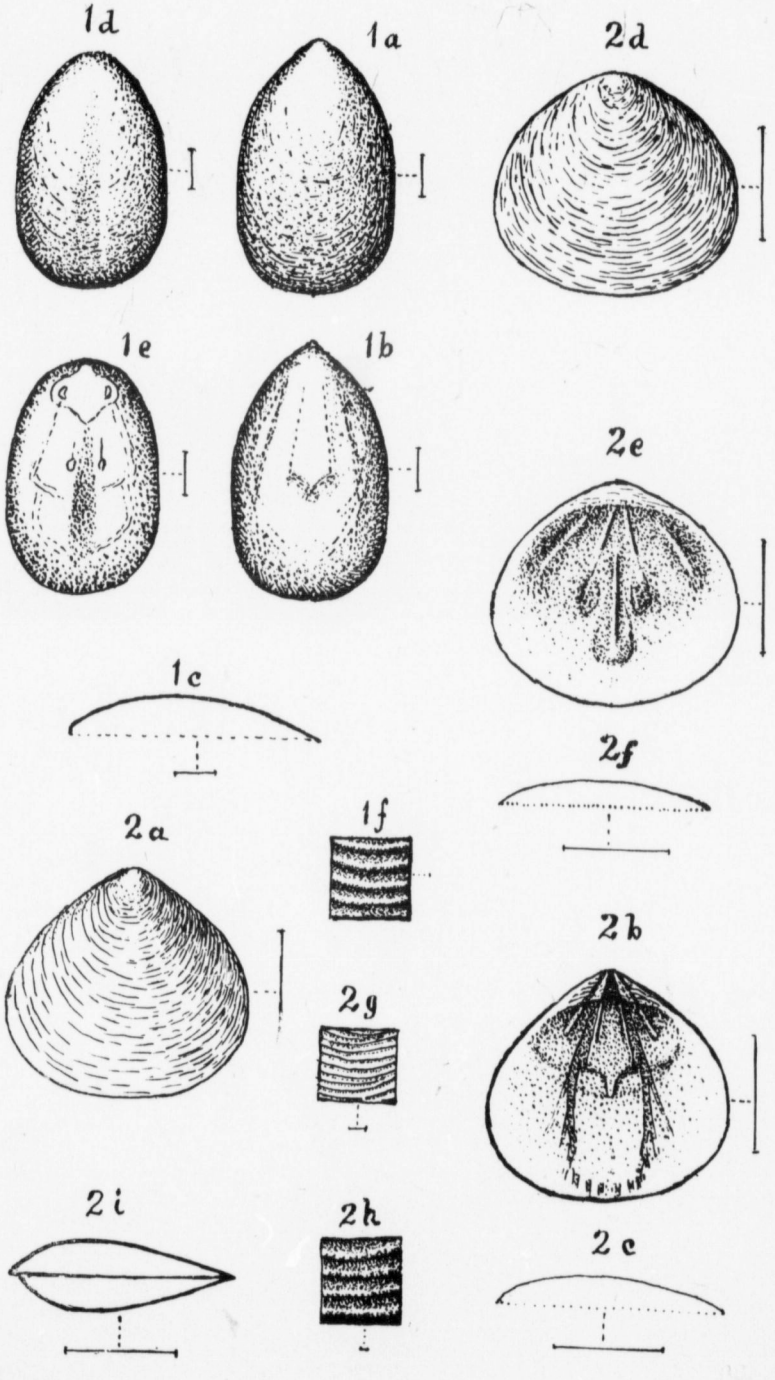
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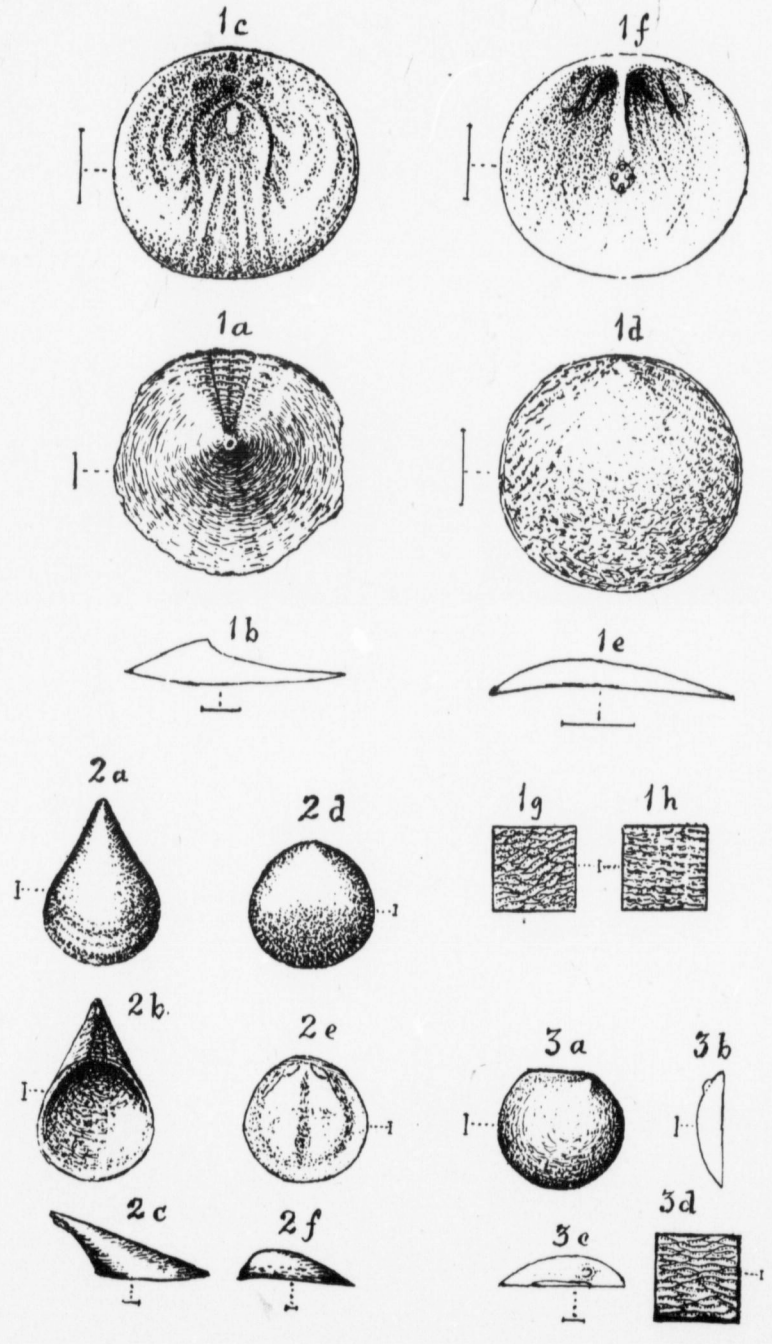
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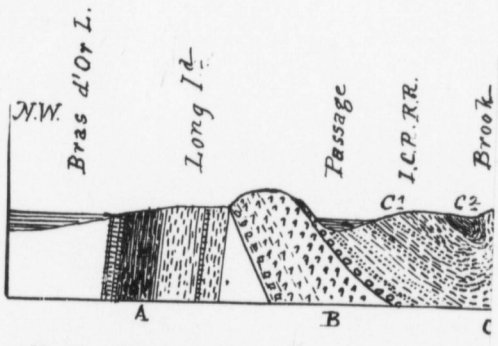
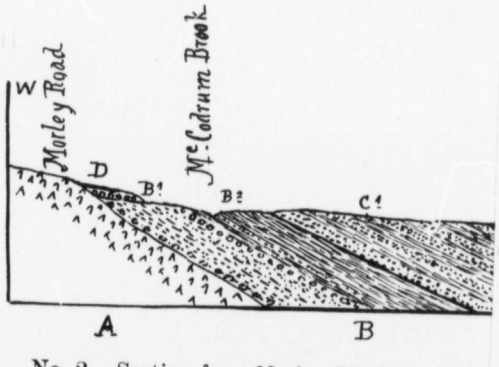
SECTIONS OF THE CAMBRIAN
IN CAPE BRET

Showing their relation to each other
palæozic rocks.



No. 1.—Section at Long Island, Bras d'Or I
rentian limestone, schist, etc.—B, Volcanic eru
brian.—D, Prepalæozoic Syenite.—C¹ Olenus Zor



No. 2.—Section from Morley Road to Maric
ton.—A, Volcanic eruptive (felsite).—B, Etchen
—D, Lower Carboniferous—B¹ Lower Etchemini
—C,¹ Olenus Zone.—C,² Peltura Zone.

SECTIONS o

Showing thei
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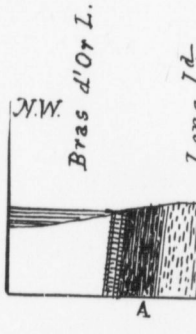

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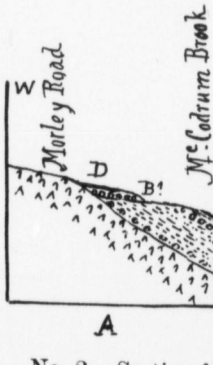
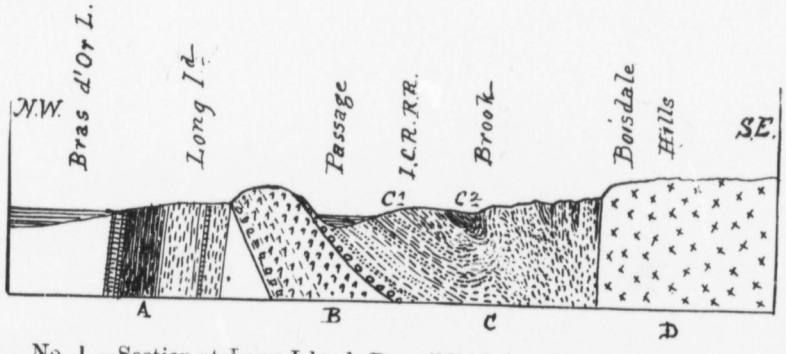


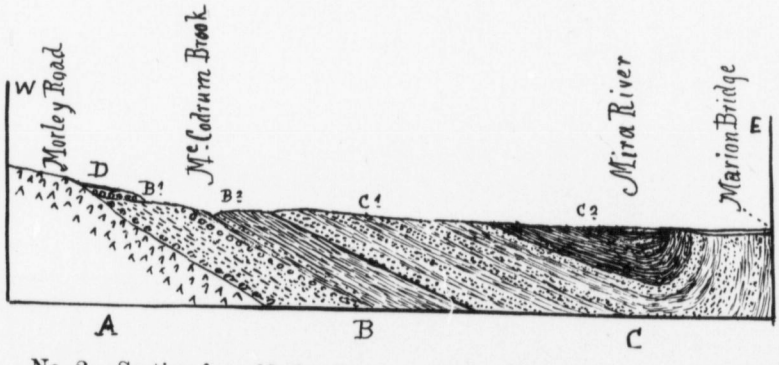
No. 2.—Section f
ton.—A, Volcanic eru
—D, Lower Carbonife
—C,¹ Olenus Zone.—C

SECTIONS OF THE CAMBRIAN AND ETCHEMINIAN IN CAPE BRETON

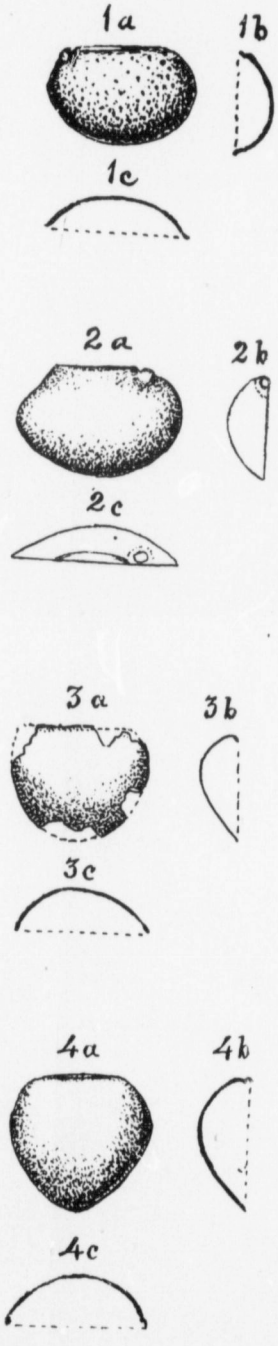
Showing their relation to each other and the underlying Prepalæozic rocks.



No. 1.—Section at Long Island, Bras d'Or Lake, Cape Breton.—A, Laurentian limestone, schist, etc.—B, Volcanic eruptive (felsites etc.)—C, Cambrian.—D, Prepalæozoic Syenite.—C¹ Olenus Zone.—C² Peltura Zone.



No. 2.—Section from Morley Road to Marion Bridge, Mira R. Cape Breton.—A, Volcanic eruptive (felsite).—B, Etcheminian terrane.—C, Cambrian.—D, Lower Carboniferous—B¹ Lower Etcheminian.—B,²Upper Etcheminian.—C,¹ Olenus Zone.—C,² Peltura Zone.



ARTICLE III.

THE NOCTUIDÆ OF NEW BRUNSWICK.

INTRODUCTORY LIST.

By William McIntosh.

Read November 7th, 1899.

The following list of New Brunswick Moths, with the exception of the Jacquet River and Chatham records, is the result of the past three years collecting in the vicinity of St. John.

In the preparation of this list I am much indebted to Dr. James Fletcher, Ottawa, Dr. R. Ottolengui, New York, Mr. Albert F. Winn, Montreal, and Dr. Herman Strecker, Reading, Pa., who have determined my specimens and given me valuable assistance in my entomological work.

I am under obligation to Mr. Winn, not only for identifying a number of specimens, but also for a very interesting list (in MS.) of Moths taken at Jacquet River in July and August, 1886. All the Jacquet River records are taken from Mr. Winn's list.

The Chatham records are from Mr. J. D. B. F. Mackenzie's List of the Moths of Miramichi (Proceedings of the Natural History Society of Miramichi).

Thanks are due also to Mr. Philip J. R. McIntosh, who kindly placed his collection in my hands for examination.

Family THYATIRIDÆ.

Thyatira scripta, Gosse.

Common at light during June and July.

Pseudothyatira cymatophoroides, Gn.

Two specimens taken at light July 10th and 22nd (1897). Also at Jacquet River.

Pseudothyatira cymatophoroides var expultrix, Grt.

A few specimens taken every year from July 16th to August 2nd. Also at Jacquet River.

Leptina doubledayi, Gn.

One specimen taken June 13th (1898).

Family NOCTUIDÆ.

Demas flavicornis, Smith.

Three specimens, June 26th and 28th.

Raphia frater, Grt.

Two specimens, July 20th and 28th (1898).

Acronycta morula, G. & R.

Chatham.

Acronycta innotata, Gn.

Quite numerous during June and July. Also taken at Jacquet River.

Acronycta populi, Riley.

One or two specimens taken at light.

Acronycta vulpina, Grt.

One taken at light.

Acronycta americana, Harr.

Several specimens taken at light in July. Also reported from Jacquet River and Chatham.

Acronycta dactylina, Grt.

A few specimens taken each year ; but not at any time abundant.

Acronycta impressa, Wlk.

Two specimens taken during the present year.

Acronycta superans, Gn.

Jacquet River.

Acronycta dissecta, G. & R.

Jacquet River.

Harrisimemna trisignata, Wlk.

One perfect specimen at light August 2nd (1899)).

Microcœlia fragilis, Gn.

Two taken July 20th (1899).

Chytonix palliatricula, Gn.

One specimen captured at light July 18th (1899).

Rhynchagrotis chardinyi, Bdv.

Several taken during the present year. Also at Jacquet River.

Rhynchagrotis minimalis, Grt.

One specimen (1898).

Rynchagrotis placida, Grt.

One at light in July.

Rhynchagrotis alternata, Grt.

This species is usually abundant on Willow blossom in April and May.

Adelphagrotis prasina, Fabr.

Very common at light during July. Also taken at Jacquet River.

Platagrotis pressa, Grt.

Taken in limited numbers in July. Also at Jacquet River.

Eueretagrotis perattenta, Grt.

One specimen taken at light in July.

Pachnobia salicarum, Wlk.

This species is quite numerous on Willow blossom in April and May.

Agrotis ypsilon, Rott.

This Moth is exceedingly common, dozens being taken at light in a single evening. Also taken at Jacquet River.

Peridroma occulta, Linn.

This species, is quite numerous at light on old walls, fences, etc. Reported from Jacquet River.

Peridroma astricta, Morr.

One or two specimens taken in July.

Peridroma saucia, Hbn.

A few specimens taken during the past season—August.

Noctua baja, Fabr.

Abundant at light in August. This species varies considerably; some specimens are ashy gray, while others are pale reddish brown. Also taken at Jacquet River.

Noctua normaniana, Grt.

Several at light July and August.

Noctua c-nigrum, Linn.

This is one of the most common Moths in this locality—July to October. Also reported from Jacquet River.

Noctua jucunda, Wlk.

One at light in July.

Dr. Strecker, referring to the specimen sent for identification, says: "A very decidedly marked example; I never saw one so richly colored or distinctly marked; but I do not doubt it is this species."

Noctua phyllophora, Grt.

Three specimens taken during the present year.

Noctua rubifera, Grt.

One taken late in July.

Noctua fennica, Tausch.

Twelve or fourteen specimens taken during the past three years.

Noctua plecta, Linn.

A limited number taken in June, July, and early in August. Also at Jacquet River.

Noctua collaris, G. & R.

Two specimens taken at light—July.

Noctua haruspica, Grt.

Abundant at light in July. Also taken at Chatham.

Noctua clandestina, Harr

Jacquet River.

Feltia subgothica, Haw.

Not uncommon at light during August. Also taken at Jacquet River and Chatham.

Feltia herilis, Grt.

A few specimens yearly ; not so abundant as the preceding species.

Feltia venerabilis, Wlk.

Several at light during the present year. Also at Jacquet River and Chatham.

Porosagrotis mimallonis, Grt.

One taken August 13th.

Carneades quadridentata, G. & R.

Two specimens taken, August 26th (1899.)

Mr. Strecker informs me that heretofore he has only seen this from the West.

Carneades fumalis, Grt.

One at light.

Carneades pitychrous, Grt.

Chatham.

Carneades messoria, Harr.

Jacquet River.

Carneades lutulenta, Smith.

Very numerous at light for about a week in August (1898-99).

Carneades mollis, Wlk.

A few specimens of this beautiful Moth taken at Willow blossom in May. Also a number of what appears to be a darker form taken at light.

Carneades decolor, Morr.

One at light.

Carneades tessellata, Harr.

Quite numerous at light early in July.

Carneades ochrogaster, Gn.

Very abundant at light in August. Three forms of this variable insect is common here.

Carneades redimicula, Morr.

A few specimens taken at light during the first week in August.

Mamestra nimbosa, Gn.

This beautiful Moth is taken in limited numbers at light in August. Also at Chatham.

Mamestra imbrifera, Gn.

Two at light.

Mamestra purpurissata, Grt.

Several taken at light in August.

Mamestra detracta, Wlk.

Two taken July 20th (1899).

Mamestra radix, Wlk.

Two taken at light near Gagetown.

Mamestra canadensis, Smith.

In Prof. J. H. Smith's Catalogue of Noctuidæ, New Brunswick is the only locality given for this Moth. We have no local record of its capture.

Mamestra subjuncta, G. & R.

Four specimens taken July 12th, 15th and 27th.

Mamestra grandis, Bdv.

One taken early in October (1899).

Mamestra trifolii, Rott.

One taken at light July 10th (1897).

Mamestra picta, Harr.

A few taken at light during the present year—July.

Mamestra lubens, Grt.

Three taken in 1897 ; and one at light July 18th of the present year.

Mamestra assimilis, Morr.

One taken by Philip McIntosh July 18th (1899).

Mamestra latex, Gn.

Chatham.

Mamestra adjuncta, Bdv.

A few specimens at light in June and July.

Mamestra legitima, Grt.

Two specimens taken at light early in July.

Mamestra lilacina, Harv.

One taken by Philip McIntosh July 2nd (1899).

Mamestra renigera, Steph.

A few specimens taken every year. Also reported from Jacquet River and Chatham.

Mamestra olivacea, Morr.

During July and August this species is very common at light. Also taken at Chatham.

Mamestra lorea, Gn.

Jacquet River.

Hadena passer, Gn.

A few taken at light during the latter part of July.

Hadena remissa, Hbn.

Two or three specimens taken each year from the 8th to 20th of July.

Hadena vultuosa, Grt.

Two taken July 22nd (1898) and August 1st (1899).

Hadena finitima, Gn.

One at light July 1st (1899).

Hadena dubitans, Wlk.—(Sputatrix, Grt.)

Common at light under logs and in crevices during August. A very light form of this species is abundant here.

Hadena impulsa, Gn.

Two taken July 6th and 11th (1898-99).

Hadena devastatrix, Brace.

This species is quite common during July, August, and the first part of September. Also reported from Jacquet River and Chatham.

Hadena arctica, Bdv.

This beautiful insect is so common in Jnly and August that it is a nuisance at light; also taken at bloom resting on fences, etc. Reported from Jacquet River.

Hadena verbascoides, Gn.

A few taken at light in July.

Hadena bridghami, G. & R.

Taken in limited numbers late in July and early in September.

Hadena minuscula, Morr.

One specimen taken August 14th (1899).

Hadena modica, Gn.

A few taken at light early in August.

Hyppa xylinoides, Gn.

Not uncommon at light in July. Also at Chatham.

Trigonophora periculosa, Gn.

Three specimens taken in August (1898–99). Also at Jacquet River.

Trigonophora periculosa (var. v-brunneum), Grt.

Jacquet River.

Brotolomia iris, Gn.

Very abundant during the last of June and early in July.

Euplexia lucipara, Linn.

Two specimens at light July 15th and 26th (1899).

Nephelodes minians, Gn.

Common at light, in crevices, etc.—July and August.

Tricholita signata, Wlk.

Three or four specimens taken in August.

Helotropha reniformis, Grt.

One taken on bloom August 17th (1898).

Hydrœcia velata, Wlk.

Extremely common from July 25th to September 20th.

Hydrœcia nictitans, Linn.

Very abundant at light; flying during the same season as Velata. Also at Jacquet River.

Hydrœcia nictitans (var. erythrostigma), Haw.

Taken at light during the entire month of August, but not so abundant as the preceding species.

Hydrœcia medialis, Smith.

One taken September 2nd (1898).

Hydroecia cerussata, Grt.

Several taken every year, but not at any time abundant.

Leucania pallens, Linn.

A few specimens taken yearly in July. Also at Jacquet River.

Leucania extincta, Gn.

Several taken in the middle of July (1899).

Leucania insueta, Gn.

Two taken in July (1899). Also at Jacquet River.

Leucania commoides, Gn.

Several at light during July and August. Also at Chatham.

Leucania unipuncta, Haw.

This species is taken every year, but does not appear to be very numerous.

Leucania pseudargyria, Gn.

Jacquet River.

Caradrina multifera, Wlk.

Jacquet River.

Amphipyra tragopoginis, Linn.

Abundant at light from the 12th to 30th of August.

Orthodes puerilis, Grt.

Two specimens taken in July (1899).

Crocigrapha normani, Grt.

One taken May 20th (1899).

Tæniocampa furfurata, Grt.

Several specimens taken in July (1899).

Tæniocampa alia, Gn.

Not uncommon at Willow blossom in May.

Cosmia paleacea, Esp.

Several taken at light early in September.

Pyrrhia umbra, Hbn.

Very abundant for about a week during the latter part of June.

Orthosia conradi, Grt. (?)

Jacquet River.

Xanthia flavago, Fabr.

Two specimens taken in 1897.

Cirrœdia pampina, Gn.

Chatham.

Scoliopteryx libatrix, Linn.

One taken by Philip McIntosh. Also reported from Chatham.

Scopelosoma devia, Grt.

One taken by Philip McIntosh May 15th, 1898.

Xylina disposita, Morr.

Several taken in May (1898).

Xylina ferrealis, Grt.

Two specimens taken in May (1898).

Xylina bethunei, G. & R.

One taken by Philip McIntosh May 1st, 1899).

Xylina laticinera, Grt.

Three specimens taken in May 1898.

Xylina thaxteri, Grt.

One May 10th (1898).

Colocampa nupera, Lint.

Three or four specimens taken during the past three years.

Cucullia convexipennis, G. & R.

Taken in limited numbers in August.

Cucullia asteroides, Gn.

A few taken in June.

Cucullia intermedia, Speyer.

Common at light June and July. Also reported from Jacquet River and Chatham.

Aletia argillacea, Hbn.

Abundant at light in September and the earlier part of October. On the 11th of October, 1897, this species appeared in immense numbers.

Abrostola urentis, Gn.

A few taken in July. Apparently rare.

Deva purpurigera, Wlk.

Two specimens taken by Philip McIntosh.

Plusia ærea, Hbn.

Three taken in July 1898.

Plusia aeroides, Grt.

Much more abundant than the preceding species. Also taken at Jacquet River.

Plusia balluca, Geyer.

Only two or three specimens taken each year.

Plusia contexta, Grt.

Jacquet River.

Plusia putnami, Grt.

Not common ; taken at light in July and August.

Plusia mappa, G. & R.

Taken in limited numbers in July.

Plusia bimaculata, Steph.

A very common species ; taken in July August and September. Also at Jacquet River and Chatham.

Plusia precationis, Gn.

Abundant from June to October. During the present year this species was common on blossom until November 5th.

Plusia flagellum, Wlk.

(Syn. monodon-insolita.)

A few specimens taken each year in June and July.

Plusia brassicæ, Riley.

Only one or two taken at bloom in August.

Plusia mortuorum, Gn.

Very common at light and bloom in July and August. (Dr. Ottolengui states that this species is "erroneously called u-aureum in American collections.") Also taken at Jacquet River.

Plusia retangulum, Kirby.

Dr. Ottolengui informs me that this species, known as mortuorum in American collections, is really Kirby's retangulum. This Moth is exceedingly common at light and on bloom, July, August, and early in September. Also taken at Jacquet River.

Plusia octo-scripta, Grt.

Common at light and bloom, July, August, and early in September.

Plusia falcifera, Kirby.

Seven or eight specimens taken from July 30th to September 7th.

Plusia selecta, Wlk.

(Syn. viridisignata, Grt.)

Four taken in August.

Plusia epigæa, Grt.

Not uncommon at light and bloom in July and August.

Plusia ampla, Wlk.

Only three or four specimens taken during the past three years—August 4th to 11th.

Plusia simplex, Gn.

A few taken at light and bloom. Also at Jacquet River and Chatham.

Calpe Canadensis, Bethune.

One specimen taken on bloom July 15th (1899).

Heliothis armiger, Hbn.

One taken September 15th (1899).

Alaria florida, Gn.

Two taken in August (1897).

Metathorasa monetifera, Gn.

Two specimens taken in July (1897-98).

Erastria apicosa, Haw.

Jacquet River.

Drasteria erechtea, Cram.

Abundant from June to October. Also at Jacquet River.

Drasteria erichto, Gn.

Several taken with erechtea in June.

Euparthenos nubilis, Hbn.

Known to occur in this locality, but not taken by the writer.

Catocala cerogama, Gn.

One taken in August (1899).

Catocala ultronia, Hbn.

Several taken every year—August and September. Also at Chatham.

Catocala illa, Cram.

Two specimens taken September 12th and 16th (1898).

Catocala parta, Gn.

Several are known to have been taken in this locality some years ago.

Catocala unijuga, Wlk.

A few specimens taken during the latter part of August Also at Jacquet River.

Catocala concumbens.

Not uncommon ; taken at light and sugar in August and September.

Catocala relicta, Wlk.

This beautiful insect is not uncommon in this locality. August and September.

Catocala antinympha, Hbn.

Chatham.

Catocala cœlebs, Grt.

One specimen taken by Philip McIntosh.

Parallelia bistriaris, Hbn.

One taken July 16th (1898).

Homoptera lunata (var. edusa), Drury.

One specimen taken resting on a wall June 4th (1897).

Ypsia undularis (var. aeruginosa), Gn.

A pair taken resting on trees.

Epizenxis æmula, Hbn.

A few specimens taken late in August (1899).

Hypena scabra, Fabr.

Chatham.

FAMILY BREPHIDÆ.

Brephos infans, Mœschl.

In April this interesting Moth was quite numerous in groves of small birch trees near the city; but only two specimens were taken.

ARTICLE IV.

THE BUTTERFLIES OF NEW BRUNSWICK.

By William McIntosh.

(Read November 7th, 1899).

In Bulletin No. XVII, pages 114–121, I gave a list of the butterflies of this province as far as known to me. During the past season a number of additional species have been captured near St. John; these will be found in the following supplementary list. Mr. Albert F. Winn, of Montreal, also sent me some very interesting notes on butterflies taken at Jacquet River, New Brunswick, in 1886. Among Mr. Winn's captures are two species not recorded in my former list; these are also noted below:

Phyciodes nycteis, Double-Hew.

(Charidryas nycteis).

One specimen taken at Welsford, July 1st.

Thecla titus, Fabr.

(Mopsus, Hubn. Strymon titus).

Two specimens captured in the Nerepis valley in July.

Feniseca tarquinius, Fabr.

Three specimens of this curious little butterfly were taken during the past summer, July 16th and 31st.

Lycæna couperii, Grote.

Taken at Jacquet River by Mr. Winn. "Was quite common during early July; one stray specimen August 8th."

Pamphila manitoba, Scud.

(Erynnis manitoba).

"A few taken towards the end of August" by Mr. Winn at Jacquet River.

Pamphila metacomet, Harris.

(Euphyes metacomet).

Not uncommon at Welsford and Westfield in July and early in August.

Eudamus pylades, Scud.

(Thorybes pylades).

This species was quite abundant at Welsford, Nerepis and Quispamsis during the past summer.

NOTES.

Melitæa phaëton.— On July 1st I had the pleasure of taking a number of perfect specimens of this beautiful butterfly.

Melitæa harrisii.— Over forty of this species were taken in about two hours on July 1st. Worn specimens were plentiful in the same locality July 15th. On August 1st (my next visit) they had entirely disappeared.

Mr. Winn, speaking of this species, says: "One specimen, taken end of July, flying before 5 A. M.

Grapta gracilis.— Mr. Winn refers to this species as follows: "I can confirm occurrence in New Brunswick, having taken a few specimens during the latter part of August.

Two specimens were taken by the writer July 15th (1899).

Pieris napi.—Mr. Philip McIntosh found this species quite abundant on the Belleisle in July. The following is quoted from Mr. Winn's notes: "Pieris oleracea (napi.) Was then (1886) abundant at Jacquet River, but doubtless has decreased proportionately as Pieris rapæ increased, as it has done elsewhere."

Colias interior.— This species still continues to be our most common yellow. Colias philodice not being abundant until late in the season.

ARTICLE V.

NOTES ON THE NATURAL HISTORY AND PHYSIOGRAPHY OF NEW BRUNSWICK.

By W. F. Ganong, Ph. D.

23.—The Forestry Problem in New Brunswick.

(Read March 7th; revised December, 1899.)

The greatest natural source of wealth of New Brunswick lies in her forests. These are steadily deteriorating. The public is uninformed and hence indifferent as to their fate. These three facts constitute a forestry problem of the gravest character, and one vastly important to the future of this province.

Probably there is no other part of the earth's surface that originally bore a nobler forest on a land so richly watered. Some of the most valued timber trees of the northern temperate zone grew in New Brunswick, and completely clothed her hills and valleys from her farthest inland waters all around to the sea. Every part of the province is penetrated by streams which, while swift, are never torrents; and these by the melting of the abundant snows of winter are made passable for the lumber which thus may be carried cheaply into the many large rivers, and down these to fine harbors at their mouths. Immense tracts in the province are admirably adapted for tree growing, and are useless for any other known purpose. Thus has Nature provided in New Brunswick the conditions for a great industry, and thus does she point out our most profitable occupation for the future, when lumbering must be based upon forestry, which consists not in the hunting of trees but in their cultivation.

In the meantime, however, New Brunswick forests are being irretrievably damaged. I do not now refer to defects in forest regulations, systems of cutting, stumpage, etc., for I know nothing about this subject. I have inferred, however, from the numerous newspaper writings of the late Edward Jack, who knew these matters so practi-

cally and thoroughly, that our general system of forest management is far from provident. But there is one deadly enemy of our forests whose worst visitations can never be entirely recovered from, and that is the great forest fires. It is not only the timber they destroy that makes these fires so bad, for in a generation or two it may be partially restored, but it is the permanent injury they do to much of our soil whereby its capacity to produce trees for the future is permanently lessened or even practically destroyed. Where naturally the soil is thin, as it is over the rocky hills underlying much of our forest land, the roots and other organic matter binding it together is utterly burnt out by the great fires, and the rain washes the earth off into the streams, leaving behind but the naked rocks, hostile to vegetation. Most of that soil was placed there originally by the ice of the glacial period, and has ever since been held in position by its continuous covering of vegetation; once removed it can be restored only with the most extreme slowness. An awful example of this practically permanent destruction is to be found in an area many miles square on the upper Lepreau river; the still standing rampikes and great stumps show how fine a forest once clothed this land, which now is but a stony desert that not for generations, and perhaps never, can again bear trees. Here is a tract of country that might to-day be yielding a revenue to the province and supporting a considerable village at the mouth of the river, but it lies waste and useless because a fire twenty years ago was not stopped in time. This is an extreme case, but large areas in the province have suffered in but little less degree. The prevention of forest fires is the first problem of forestry in any country, and it has to be solved not only by stringent laws upon railroads, lumbermen, hunters and settlers, but also by a ranger service, a corps of men whose business it is to watch for fires in the dangerous season, and to extinguish them at their beginning. The ranger service may well be combined with that of fish and game wardens, and even with some phases of lumber surveying.

But in addition to loss of timber and permanent injury to the soil, there are yet other losses suffered through the deforesting of a country.* Aside from the still unsettled question as to the effect of forests upon

* The reader who wishes further information upon these subjects will do well to turn to the publications of the Division of Forestry of the U. S. Department of Agriculture, including their recent "Primer of Forestry" and articles in the Year Books of the Department, and also to the reports of the Maine Forestry Board.

the amount and regularity of annual rainfall (both of which, as many students think, are increased by the presence of forests, to the great advantage of the farmer) it is everywhere known that the removal of forests leads to great fluctuations in the water level of rivers, periods of extreme low water alternating with destructive floods. This not only interferes with navigation upon the smaller rivers, but greatly lessens the value of their waterpowers, a subject certain to become of great practical importance in the near future, since, as the leading authorities agree, the improvements in the conduction of power by electricity are sure to make natural sources of power again of value. Destruction of forests, too, destroys their game-producing power, and the fish-producing power of their streams, and hence removes their attraction to wealthy sportsmen whom New Brunswick is doing her best to attract. Yet other losses, sentimental as well as economical, which a people may suffer with loss of their forests, will occur to all.

Deforesting may, of course, occur in other ways, and lead to the same losses, though these are far less in degree than fires entail. Land cleared for cultivation, though partially kept intact by the farmer's crops, suffers slow deterioration, but this loss is unavoidable and slight in proportion to the gain. Especially reckless lumbering sometimes lays an area well nigh waste, allowing of similar deterioration, particularly since such places are very liable to fires. At the present day the forests are threatened by a new danger—the rapacity of pulp-mills, which take lumber even as small as five inches diameter, and hence practically clear the land where they operate, leaving little to grow into timber for the future. No pulp-mill should be allowed to operate in New Brunswick in a way to deforest any piece of land, for a speedy profit of this kind will be dearly paid for in the future. The only wise method in forestry management is to keep a forest intact, and this can be done only by a system of rotation in cutting, by which the larger trees alone are removed, the smaller being left to grow. The prevention of forest fires, and a wise system of cutting, would make the annual lumber crop as certain and as continuous as the agricultural crop. This would give permanence to settlements in the lumber districts and increase the prosperity and contentment of our people. What would it not mean to Charlotte county to-day if her lumber had not been recklessly cut away and her best lands badly burnt over?

It will be a long time yet before tree-planting will pay in New Brunswick, though some day it will. There is one situation, however, in which I think a certain amount of cultivation would pay in the near future. In St. John and Charlotte counties, and in lesser degree in other parts of the province, are many abandoned farms growing up in trees. Left to themselves these trees are oftener than not of worthless sorts, and grow so densely as greatly to injure one another in the struggle that ensues. If pine and the best spruce were established on these lands, and kept thinned out, they would in time yield ample returns, returns that no individual can afford to wait for, though a government, with its borrowing capacity, can. Care should be taken in future, too, not to grant for settlement land that is better suited for trees than for agriculture.

Under so purely democratic a government as that of New Brunswick, no legislature can afford to take steps not backed by public opinion. Any movement entailing much present expense for a distant return would undoubtedly be condemned by the people. If, however, the great importance of this subject to the future of the province were generally understood, the people could be trusted to respond in its favor as they have for education and other great interests. It is, however, the duty of the government to take the first step, which should be towards the acquisition and dissemination of knowledge upon the subject of forestry in all its aspects and in its relation to allied interests, such as game preservation, fishing licenses, water-powers, location of settlements, etc.; and, following this, should come the formulation of a broad plan for the economic management of these great public interests. The experience of other countries shows that such wide-reaching investigation must be made independent of the exigencies of local politics, which can be done only by placing the whole subject in the hands of a commission, unpaid except for expenses, composed of the most public-spirited and able citizens. Surely New Brunswick is not so poor that she cannot command this service from her sons.

24.— Cost of a Topographical Survey of New Brunswick.

(Read April 4th, 1899).

In a former note upon this subject (No 14), I pointed out that a survey of New Brunswick upon the plan and scale of that of Massachusetts would cost at least $351,000, and probably much more,

perhaps $500,000. Mr. Henry Gannett, Geographer of the United States Geological Survey, and the leading American authority upon this subject, in acknowledging the receipt of a copy of the afore-mentioned note, writes me as follows: "Referring to what you say concerning a survey of the province, let me suggest that a scale of about two miles to an inch is sufficiently large for present requirements. This is the scale which we are using in this country for the greater part of our territory and find it, on the whole, most satisfactory."

"The expense of a survey for this scale, including all the operations incident to the production of the manuscript maps amounts on an average, to about $5.00 to a square mile, which for the area of New Brunswick, will be about $140,000, which is not a prohibitive price to pay."

A very complete, and of course authoritative, account of the methods of conducting topographical surveys and of constructing topographical maps is given by Mr. Gannett, in his "Aims and Methods of Cartography" recently published by the Geological Survey of Maryland (Special Publication, Volume II., Part IIIa, 1898), and this work is invaluable to all interested in this subject.

A topographical survey of New Brunswick must in time be undertaken, and so great will be its scientific and economic benefits that this Society should use its utmost influence to have it begun as soon as possible.

25.—What is the Highest Land in New Brunswick?

(Read April 4th; re-written December, 1899.)

In former notes of this series (Nos. 5 and 19), it was pointed out that two hills compete for the honor of being the highest in New Brunswick, namely: Big Bald Mountain on the South Branch of Nepisiguit, and another unnamed mountain three miles south of Mount Sagamook near Nictor Lake. The latter of these two, I shall, for reasons to be given in a later note (No. 30), call Mount Carleton.*

The height of Big Bald was measured in 1880 by Mr. Ells, and

* I find that I was probably mistaken in my supposition (Note 19) that this mountain was the one to which the name Bald originally and properly belonged. It is Sagamook which is called Bald by the guides and others, and on the early plans. Mount Carleton appears hitherto to have been entirely unnamed.

found to be 2,500 feet, as given in his Geological report. The geological map marks it, however, as 2,700 feet; but as Mr. Ells is the only one who has measured it, the greater height upon the map appeared to be an error. Mr. Chalmers, however, has recently written me as follows: "So as to settle the question of the height of Big Bald Mountain, South Branch Nepisiguit, as far as it is possible to do so with the aneroid, Mr. Ells and I have gone carefully over his notes and barometric readings again. He has two sets of readings, one taken while going up river from Bathurst Harbour, the other taken when returning. Observations were made regularly every day, and at the camping grounds morning and evening several times. Working out the figures both ways we find the results to be very close, *and the mean elevation of Big Bald Mountain to be 2,715 feet above sea level.*" This gives a definite basis for the height of 2,700 feet commonly assigned to that mountain.

Some new facts as to the height of its rival, Mount Carleton, are here to be presented. In August last, I climbed and measured it. I made it by direct measurement with aneroid 112 feet higher than Mount Sagamook, and this I made by a mean of two measurements, 1,633 feet above Nictor Lake. Nictor Lake I made by a mean of fourteen measurements, all corrected from simultaneous readings at Fredericton, (see later Note 31) 837 feet above sea level. This would make Carleton 2,582 feet above the sea level. I have reason to think, however, that this result is considerably too low. I have found that my barometer moves slightly sluggishly, and moreover other good measurements of Nictor Lake and Sagamook Mountain have given considerably higher results. Thus Mr. Chalmers gives the height of Nictor Lake as 878 feet, and Sagamook as 1659 higher. On this basis Carleton would be 2649 feet. There is, however, another set of measurements of lake and mountain which cannot be disregarded, the more especially since they were made with mercurial barometers, which are much more reliable than aneroids. In 1839 a series of such measurements, checked by comparison with a fixed station at Grand Falls, was carried across the province by way of Nictor Lake, by a Mr. Wightman, employed by the British government in connection with the elucidation of the highlands of the boundary disputes, and the results are given in full in the Blue-book, "The North American Boundary," 1840. All of his measurements however, while relatively accurate, are absolutely

too low, and we must apply to them a correction of fully 100 feet.* As the mean of many careful observations he made the surface of Nictor Lake 777 feet above the sea, *i. e.*, with the correction 877 feet. He made Bald Mountain (or Sagamook) 2496 feet, *i. e.*, 2596 with the correction. If to this we add the 112 feet which Carleton surpasses Sagamook or Bald, we have as the height of Carleton 2708 feet, which is very close to the 2715 of Big Bald.

If one were to take Hind's correction of 123 feet for Wightman's results, instead of the 100 here adopted, it would make Carleton 2731 feet, thus surpassing Big Bald considerably. I by no means think, however, that reliance can be placed upon these latter figures, but they at least should make us cautious in forming a judgment as to which is the higher mountain. Big Bald and Carleton must be very near the same height, with the probability in favor of Big Bald. The relative heights could be best settled by a comparison of careful theodolite measurements made from the summit of each upon the summit of the other.

26.—On a Division of New Brunswick into Physiographic Districts.

(Read May 2nd, 1899.)

Whoever attempts a systematic description of any class of facts or phenomena, or treatment of phases of local history, for the whole of New Brunswick, must feel the need for some natural and recognized

* Wightman's figures are too low, because it was assumed that the levels along the St. John, from Fredericton to Grand Falls, made in 1826 by Foulis, were correct, whereas they are inexplicably erroneous and low. Hind (Geological Report, 1865, 31) has shown that this is the case, and arguing from levels taken by Graham in connection with the survey of the north line in 1842, and from those on the Royal Road, he reasons that Foulis' figures are about 123 feet too low. Other measurements by Wightman himself show a discrepancy between head of tide above Fredericton and high tide on Bay Chaleur of 77 feet, which is explained by the report as due to high tide level at Fredericton being 80 feet above high tide level at St. John. This we now know is erroneous, for Duff has shown (this Bulletin, XV. 69) that mean tide at Fredericton is only about 14 feet above mean tide at St John, and hence high tide level is about the same at both places. But I think Hind puts the correction for Wightman's error too high, for I think Graham's figure of 419 feet for the river above the fall is too high. It is higher than the Royal Road levels. Graham, moreover, gives the monument at source of the St. Croix as 538 feet above mean tide at Calais ; later measurements of the surface of Grand Lake (from which there is continuous deadwater to the monument) based I believe on railroad levels, given on the geological map, make it only 499 feet. Probably we would be safe in giving a correction of 100 feet to Wightman's figures, though if we wished to be extra conservative we might restrict it to the correction supplied by Wightman himself in his difference of 77 feet above high tide in Bay Chaleur, plus 3 feet to reduce the latter to mean tide, that is, in all 80 feet.

division of the province into districts. In a work now nearing completion I have had to make such a division, and thus have given some study to the subject, with the following results. For a detailed natural division the counties, with their artificial boundaries, are not available; and the geology, with its correlated topography, is too irregular and complicated. We do find, however, a convenient and fairly natural division in the river systems, which for historical purposes is especially suitable, since they have powerfully influenced the distribution of settlements. But if we attempt to separate these systems by lines drawn along their watersheds (as is done on the accompanying map, fig. 1), we see at once that in a general way there is a correspondence between counties and river systems. This is, of course, no mere accidental coincidence, but is the result of a true causal relation, for the principle that has determined the setting off of our counties has been that of grouping them around the river basins and running their boundaries along the watersheds.* It will obviously be convenient in making our natural divisions to pay as much attention as possible to the familiar county divisions, and hence the boundaries of the latter may well be used to settle doubtful points in the natural divisions. There are two cases in which it is profitable to use the county divisions to determine details of the natural divisions —first, in the points of separation of the systems along the sea coast (for here the county lines have been very wisely chosen), and second, in the secondary division of the large St. John system. The geology also, in doubtful cases, may be called to aid. Taking into account all of these factors, the river system districts of New Brunswick would appear to be as follows, and as traced on the accompanying map. Natural divisions should obviously be known by indigenous names, for which, happily, convenient Indian names are available.

I. *The Passamaquoddy (or Charlotte) District.* Includes the basins of all rivers from the Cobscook to Point Lepreau.

II. *The Woolastook (or St. John) District.* Includes the entire St. John System and the smaller rivers from Point Lepreau to Martins Head.

* That river systems and counties do not correspond yet more closely is due to three causes:—First, county lines are, for convenience of running and marking, best made straight, while watersheds are crooked; second, the geography of the province was imperfectly known when some of the lines were established by law, and hence they do not run as it was supposed they would; third, some of our rivers run so far across the province and head so near the basins of others, it is practically more convenient to allow their heads to fall into other counties. Such is the case with the St. Croix and Magaguadavic, Washademoak and Salmon River, Miramichi, and Restigouche.

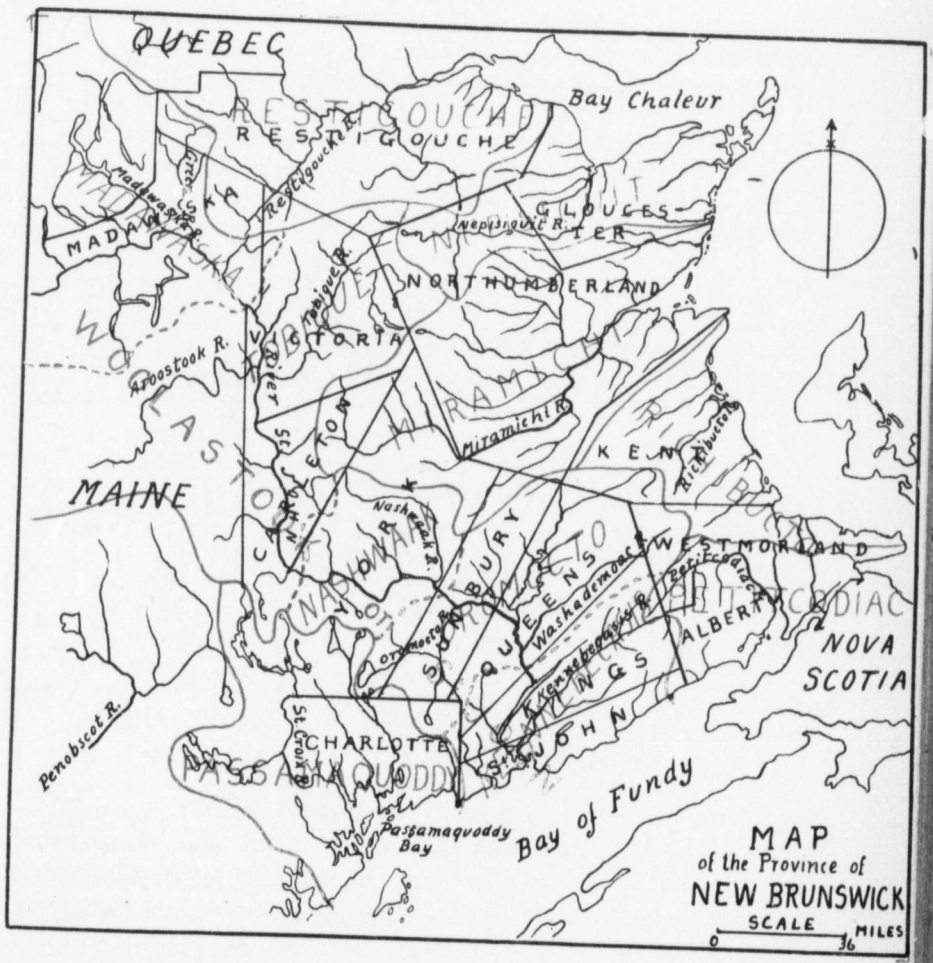

QUEBEC
RESTIGOUCHE
Bay Chaleur
Restigouche R.
GLOUCESTER
Nepisiguit R.
NORTHUMBERLAND
Tobique R.
VICTORIA
Aroostook R.
CARLETON
Miramichi R.
KENT
Richibucto R.
MAINE
Nashwaak R.
YORK
SUNBURY
QUEENS
Washademoak L.
Kennebecasis R.
Petitcodiac R.
WESTMORLAND
ALBERT
KINGS
NOVA SCOTIA
Oromocto R.
St. Croix R.
CHARLOTTE
ST JOHN
Penobscot R.
Passamaquoddy Bay
Bay of Fundy
MAP
of the Province of
NEW BRUNSWICK
SCALE
0
36
MILES

FIG. 1.

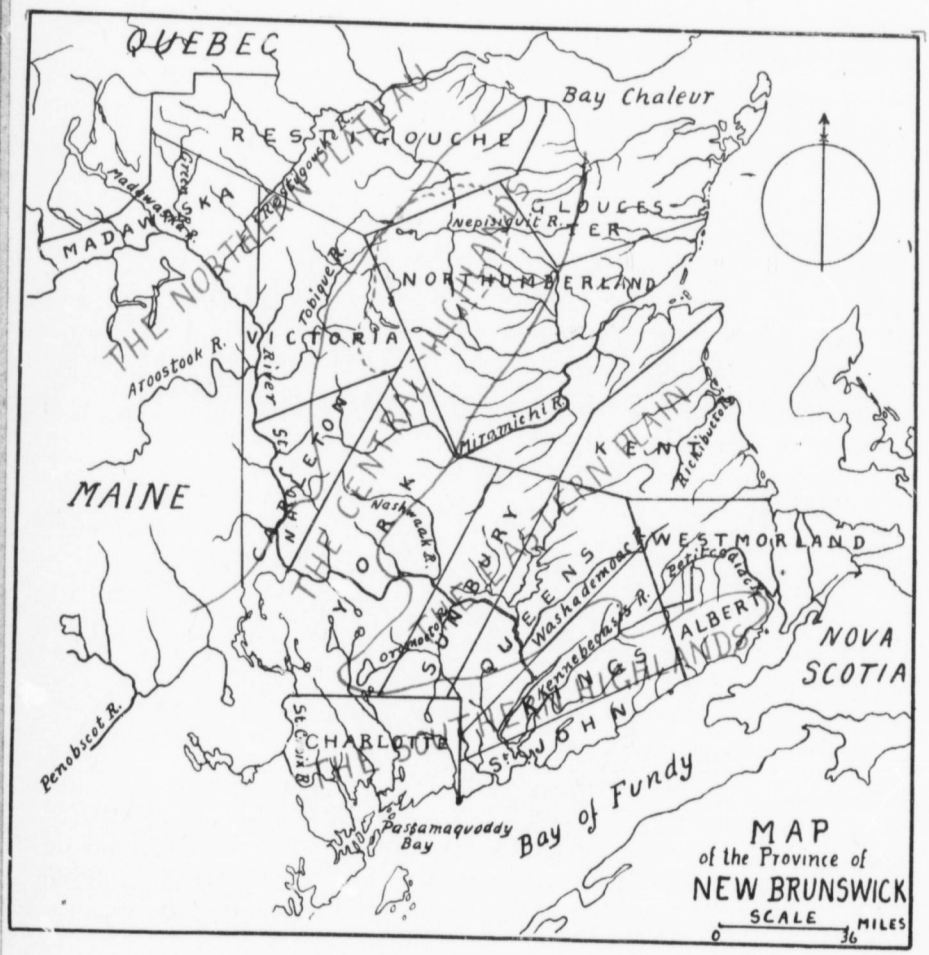

QUEBEC
Bay Chaleur
RESTIGOUCHE
GLOUCESTER
Nepisiguit R.
NORTHUMBERLAND
MADAWASKA
Madawaska R.
Restigouche R.
Tobique R.
VICTORIA
Aroostook R.
MAINE
CARLETON
YORK
Nashwaak R.
Miramichi R.
KENT
Richibucto
SUNBURY
QUEENS
Washademoak R.
WESTMORLAND
Petitcodiac R.
ALBERT
KINGS
NOVA SCOTIA
Penobscot R.
CHARLOTTE
St. John R.
St. John
Passamaquoddy Bay
Bay of Fundy
THE NORTHERN HIGHLANDS
THE CENTRAL PLATEAU
THE EASTERN PLAIN
THE SOUTHERN HIGHLANDS
MAP
of the Province of
NEW BRUNSWICK
SCALE
0
36
MILES

FIG 2.

Since however it is far too great to be treated as a unit, it may be subdivided as follows :

A. *The Madawaska Sub-district.* Includes all north of a line separating Grand River and Little River, crossing the St. John at Grand Falls, and separating the Fish River and Aroostook system.

B. *The Tobique (or Carleton-Victoria) Sub-district.* Includes all north of a line separating Becaguimec from Nacawicac and Nashwaak, and Eel River from Sheogomoc, crossing the St. John on the edge of the granite at Middle Southampton.

C. *The Nashwaak (or York Sub-district.* Includes all north of a line between the Little River and Nashwaak systems and between the Oromocto and Longs Creek, crossing the St. John with the County line.

D. *The Oromocto (or Queens-Sunbury) Sub-district.* Includes all north of a line between Belleisle and Washademoak and between Nerepis and Oromocto, crossing the St. John with the County line.

E. *The Kennebecasis (or St. John-Kings) Sub-district.* Includes all south of the preceeding to the Bay of Fundy.

III. *The Petitcodiac (or Westmorland-Albert) District.* Includes the basins of all rivers falling into the Bay of Fundy and Baie Verte from Martins Head to Cape Tormentine. The County line might seem a more logical division between this and the Woolastook district, but Martins Head is so much more natural that it would seem better to adopt it as the division point.

IV. *The Richibucto (or Kent) District* Includes the basins of all the rivers from Cape Tormentine to Point Escuminac.

V. *The Miramichi (or Northumberland District).* Includes the basins of all rivers from Point Escuminac to Barreau Point (between the Tabusintac and Tracadie.)

VI. *The Nepisiguit (or Gloucester) District.* Includes the basins of all rivers from Barreau Point to Belledune Point, including Miscou and Shippegan.

VII. *The Restigouche District.* Includes all north and west of Belledune Point. Belledune Point gives a more natural division than Little Belledune Point, near which the County line starts.

The above division of the province by river basins will probably be found most useful for purposes of detailed description of provincial phenomena, and of local history, etc.; but a more strictly natural one, taking account of the geology and accompanying topography, will be needed for some purposes. Unfortunately, as stated above, our geology appears too complicated to admit of a very detailed division of the province upon this basis. A general natural division is, however, possible, as shown on figure 2. Although the geological boundaries

are fairly distinct, the accompanying topography is not, and, hence, sharp lines are impossible, and the boundaries shown on the map are only approximate. The divisions may be named as follows :

I. *The Northern Plateau*, including the great Upper Sllurian Area of the Northwestern part of the Province, with Lower Carboniferous outliers on its margin in places, forming mostly a great peneplain 800 to 1000 feet above the sea.

II. *The Central Highlands*, of Archaean Felsites and of Granite, bordered by Cambro-Silurian Slates, consisting of irregular ridges, forming the axis of the Province, and culminating in the high hills, 2000-2700 feet above the sea, between the headwaters of the Tobique, Nepisiguit and Miramichi.

III. *The Eastern Plain*, of Carboniferous bordered by Lower Carboniferous sandstones. This is a peneplain, is highest in its western part and slopes off to the eastward where it is low and level.

IV. *The Southern Highlands*, also of ridges of Archaean Felsites and of Granites intermixed with Silurian and Devonian rocks reaching heights up to 1400 feet, and merging in Charlotte with the Central Highlands. This may perhaps better be called *The Southern Ridges.*

27.— On a marked Browsing-effect observed near St. Stephen.

(Read May 2nd, 1899).

Five miles below St. Stephen, on the peninsula between the St. Croix and Oak Bay, is a high granite hill, called locally Dickie's Mountain. It is notable for the supurb view it commands, and is recorded in the Society's Bulletin as the best mapped hill in New Brunswick (Bulletin No. XVII, page 123). The top is largely bare rock, but bears here and there small spruces, many of which attract attention through their unusual form, for they are hour-glass shaped, or at times like two cones, with the base of one resting upon the apex of the other (see the third in the accompanying Figure 3). The lower cone is the most symmetrical, extremely dense, and always approximately of the same height, as the axe introduced into the three figures will show. The upper cone may be absent altogether, or developed in various degrees, and is always loose in structure, and quite like any other spruce. One is at first inclined to ascribe the appearance to clipping by man, or to some growth conditions peculiar to the locality, but it is no doubt a marked kind of browsing effect. The place is a sheep pasture, and these animals probably bite off the young terminal

buds in spring, forcing the plants to branch profusely, as a hedge does when clipped. This is confirmed by the broken appearance of the tips of the branches. The sheep browse as high as they can reach, but finally the main terminal bud gets beyond them and thenceforth develops

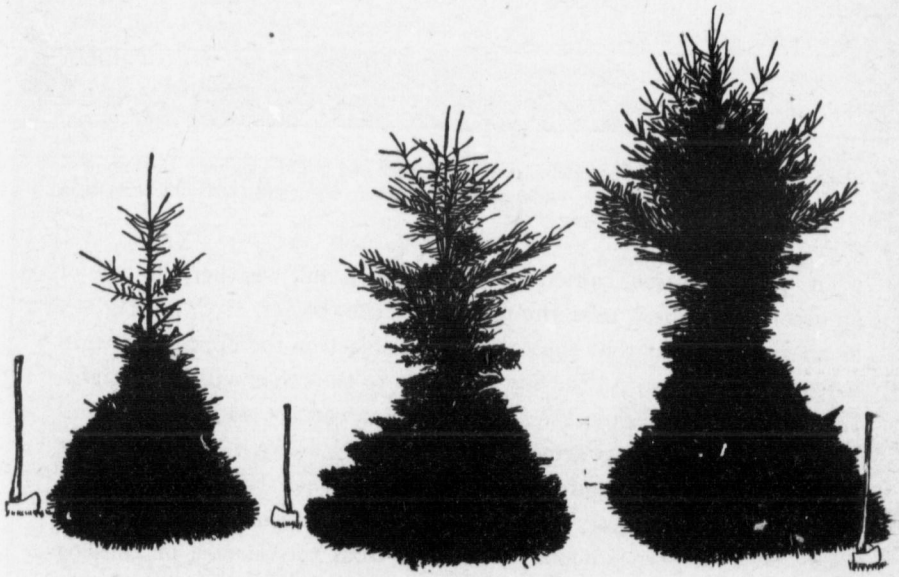


FIG. 3. Browsing effect upon spruces.

normally. Three stages in the development of the upper cone are shown in the three accompanying figures which are traced from photographs, and therefore are accurate. No doubt this effect is common enough, though I have seen it in but two or three other places, and never so perfectly as here.

28.—AN OPTICAL ILLUSION ON THE PEAT BOGS OF CHARLOTTE COUNTY.

(Read June 6, 1899)

In a paper on "Raised Peat-bogs in New Brunswick," published two years ago (Trans. Royal Society Canada, new series, III, sec. iv, 150) I pointed out what seemed to be a rising and sinking of the surface of the Lepreau bog to an extent of several inches, under the influence of weather conditions which I could not determine. The only rule about the movement seemed to be this, that it rose in bright and fell in dark

weather. In a letter dated July 1st, 1898, Dr. C. Weber, of Bremen, Germany, a distinguished authority on Peat-bogs, gives me an entirely different, and doubtless correct, explanation of the phenomenon which he illustrates by the accompanying figure (Fig. 4). He shows that it

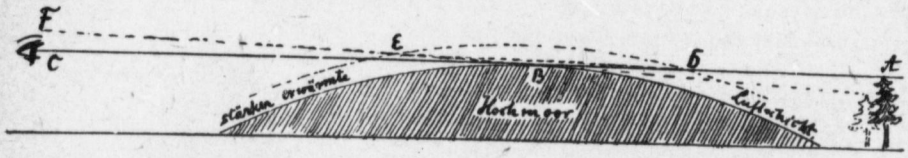


FIG. 4. Diagram of rays over a raised peat bog in dark and bright weather. Hochmoor = raised bog : B = its highest part. Stärker erwärmte Luftschicht = more strongly warmed layer of air.

is an optical illusion, caused as follows: if in dull weather, the eye of an observer standing near the margin of the bog (*i. e.*, C. in Fig. 4), be at such a height that the top of some object on the opposite margin is just visible, (*i. e.*, A) the ray from one to the other will be straight. If now, the sun appears, the layer of air in contact with the bog will become more strongly warmed than the layers above it, and hence it will become rarified and less refractive. When the ray from the object reaches this layer, it passes into a less dense medium and hence bends from the perpendicular, *i. e.*, away from the surface of the bog (*i. e.* from *b* to E). In issuing from this layer, it re-enters the denser layer, and hence it will be bent towards the perpendicular, and therefore still farther upward from the surface (*i. e.*, from E to F). Consequently the ray will pass over the head of the observer (to F), who, finding it necessary to rise vertically some inches to again see the object, naturally thinks the bog itself has risen.

29.—ON THE PHYSIOGRAPHY OF THE NICTOR LAKE REGION.

(Read December 5th, 1898).

At the eastern head of the Tobique River, in the north of the New Brunswick Highlands, lies Nictor, fairest of New Brunswick lakes. It is absolutely wild, unvisited save by an occasional sportsman or naturalist, and may be reached only by a several-days' canoe journey. It is unsurveyed, wrongly mapped, and scientifically little known. For these reasons, the following observations, made during two visits

to the lake in 1898 and 1899, will doubtless be acceptable; and because of the great interest of the place, I shall try to make my account monographic.

History. The lake makes its first appearance in historical records upon Franquelin's fine map of Acadia, of 1686, (Fig. 5, A). He does not name the lake, though he marks the portage to Nepisiguit (Oniguen is the Maliseet *Oonegun*—a portage), and he names the Little Tobique, *Nipisigooichich*, or Little Nepisiguit, probably its

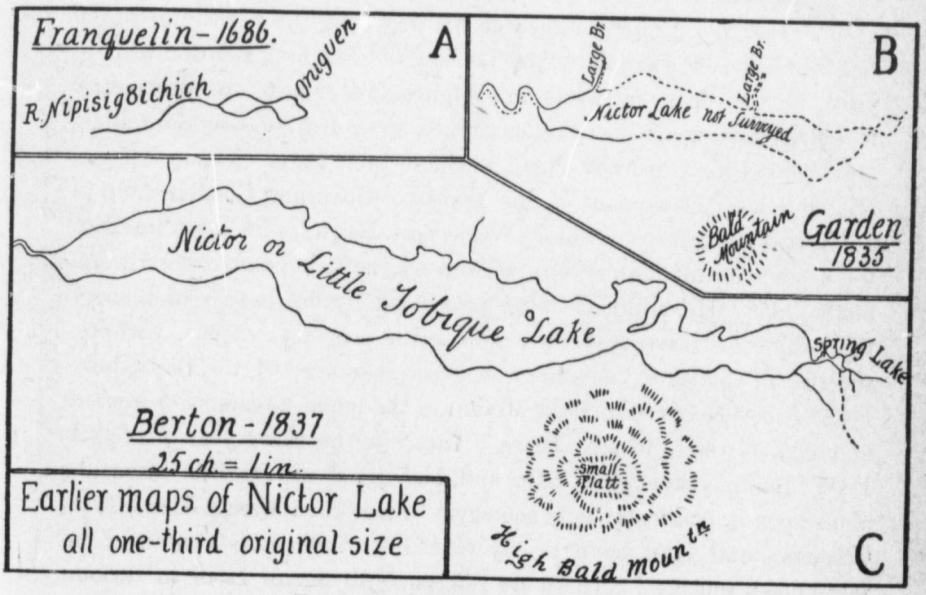


FIG. 5. Early Maps of Nictor Lake.

Micmac name. How remarkably this map influenced all others of this region for over a century, I have elsewhere traced.* The lake next appears, though very imperfectly, upon the fine engraved Baillie and Kendall map of 1832; but it was first sketched by a surveyor in 1835, when Garden made the MS. map shown herewith (Fig. 5, B). In 1837 Deputy Berton made the MS. sketch shown in Fig. 5, C, which is the original of every published map of the lake down to the present day. In August, 1899, I made a survey of the lake, the first

* Trans. Royal Soc. Canada, new ser., III., ii., 364, where the New Brunswick part of the map may be found.

ever made, resulting in the accompanying map (Fig. 6). I used a fair prismatic compass, and a simple home-made apparatus on the stade principle for measuring distances; the general shape must be nearly accurate, though its proportions may be somewhat in error.*

The lake must have witnessed events of no small interest, but these are unwritten and lost. It was one of the most ancient and frequented highways across the province, and has seen the passing of warriors, hunters, missionary priests, traders, grand seigniors, governors and scholars. It was probably somewhere in this vicinity that the good Father Bernardin perished on his way from the Nepisiguit to the St. John, in 1621, as related by LeClercq. The first mention of it in print that I have found is in Wightman's report on barometric measurements, made in 1839, contained in a British boundary Blue-book of 1840. Governor Head was here in 1849, as Gordon tells us, but he left us no account of his travels. Governor Gordon came in 1863, and has left us in his "Wilderness Journeys" a most interesting account of his impressions, as well as the first printed description of the lake. He admired it as possessing "more beauty of scenery than any other locality I have seen in the province, except, perhaps, the Bay of Chaleurs," meaning, of course, the head of the Bay, above Dalhousie. He gave to Bald Mountain the name Sagamook—(mount of chiefs)—which it still bears. Later in the same year Professor L. W. Bailey visited the lake, and has given us our first scientific notes upon it, particularly its geology.† Since then Messrs. Hind, Ells, Chalmers, and Hay, have briefly visited it with results contained in well-known reports.‡ There are references to Nictor Lake in various reports, guide books, sporting books, etc., but I believe the above-mentioned include all real sources of information. Nearly every writer, from Gordon to the present, speaks of the beauty of the lake.

Place-Nomenclature. On the map (Fig. 6) are two sets of names, one in Roman letters, including those already more or less in use (for a list of which I am indebted to Mr. George Armstrong, of Perth Centre), and another set in italics which now appear for the first time. The latter I have myself given, for reasons and upon a principle fully set

* I was accompanied and aided by my brother, Mr. Arthur Ganong. The preceding summer I was with Mr. G. U. Hay, who has described our trip in this Bulletin (XVII. 153).

† In his "Report on the Mines and Minerals of New Brunswick," (1864), and also in his "Notes on the Geology and Botany of New Brunswick," (Can. Nat., 1864).

‡ Geological Reports: this Bulletin IV, 104.

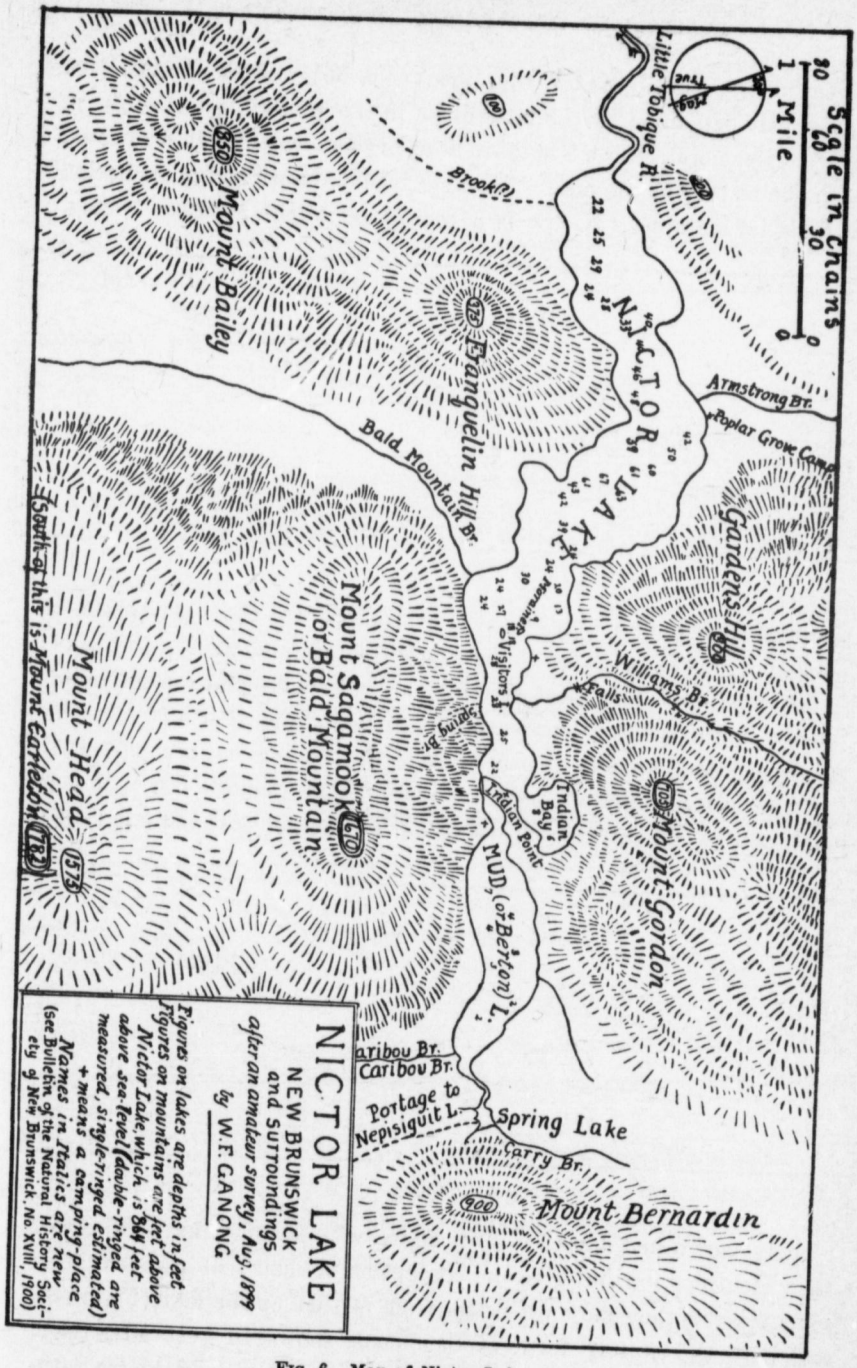


FIG. 6. Map of Nictor Lake.

forth in the next note of this series (No. 30). Most of them are sufficiently explained by the facts given in the preceding section, *i. e.*, they commemorate those who have been in some way closely connected with the history of the lake. Moraine Island describes its formation as a glacial moraine. Nictor is a corruption of the Maliseet Nictau,

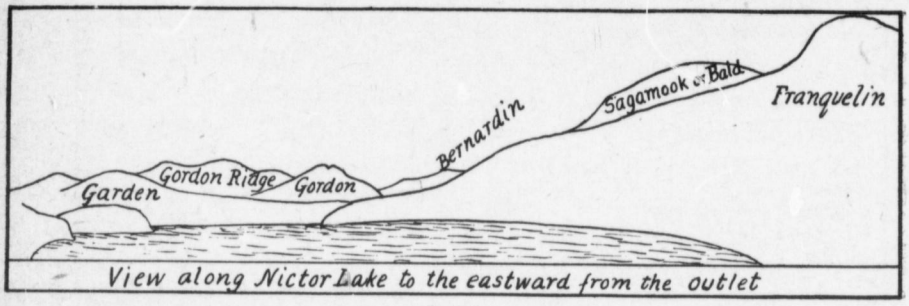


FIG. 7.

meaning Forks, and applied by the Indians to the main forks of Tobique. It was extended to the Little Tobique, and then to the Lake.

Description. The most striking and charming feature of Nictor consists in the splendid forested hills among which it winds. In the beauty of its hill scenery no other lake of the province can compare with it. The hills are highest towards the east (their heights are upon the map), and as one enters from the Little Tobique he sees the fine range

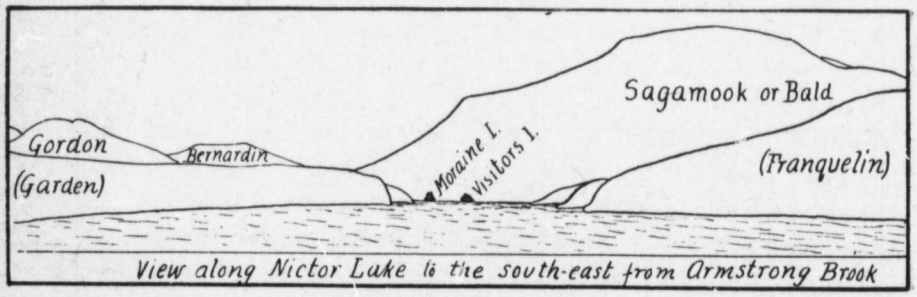


FIG. 8.

crudely shown in Figure 7. This figure will be sufficient to admit of their identification, but gives no conception of their real grandeur. In some respects they show yet better from farther up the lake (Figure 8), and here the stately form of Sagamook shows to best advantage. Best of all, however, are the views from the little island under Saga-

mook, from which all the prominent hills about the lake are visible. The view to the east is the finest (Figure 9), but to the west it is little inferior (Figure 10). Above all and over all, however, towers grand Sagamook. Rising steeply over sixteen hundred feet directly from the lake, higher than any other New Brunswick hill rises from the water, clothed with living forest, except for a few bold bosses near

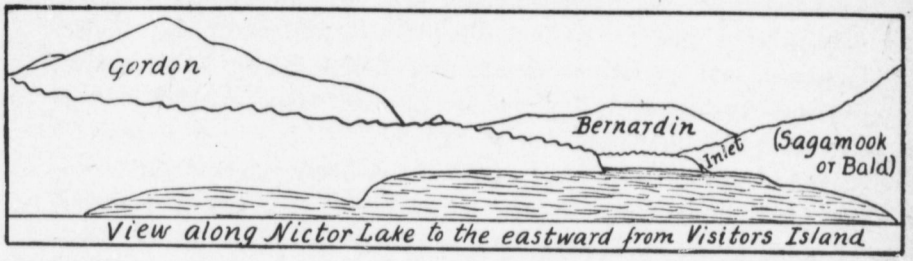


FIG. 9.

its summit, shrouded often in mists, it is easily the finest, even though not the highest, of New Brunswick hills. Happy is he who, from the ideal camping place upon the island, can watch day after day these beautiful hills in their varying lights and colors, and can know they are his own.

Next in charm to the hills is the virgin forest which clothes them. This is everywhere entirely unbroken, except for the few naked spots

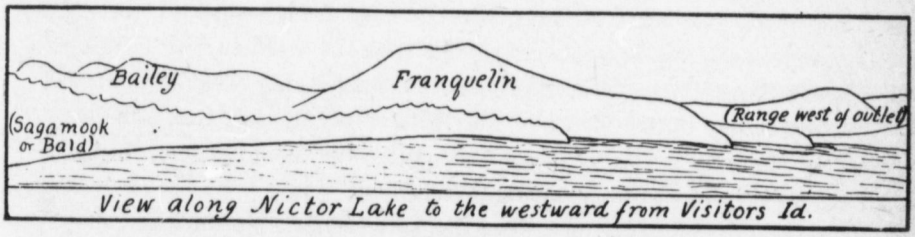


FIG. 10.

near the summit of Sagamook. There is no trace of fire, nor of the lumberman. Probably in no accessible part of the province is there a finer forest, or one more nearly primeval than this. It is of the mixed growth of our common provincial species, and it is a fine sight to see the splendid spruce in sombre green towering above the level of the brighter green hard woods. This forest owes its preservation to the expensiveness of driving lumber down the crooked Little

Tobique. But the shadow of the deadly pulp-mill already looms over it, and its glory will soon depart.

This forest is extremely rich in game, especially moose and deer. The lakes contain many trout and other fish, though in this respect they are inferior to the Nepisiguit lakes.

Physiography. The lake is 864 feet, more rather than less, above mean sea level. Its maximum depth is 67 feet, surprisingly little for a hill lake.* This depth diminishes to only 28 feet directly under Sagamook, and lessens eastward so that Mud or Berton Lake, separated from Nictor only by a morainic ridge and connected with it by a short brook falling from one to two feet, is but a few feet deep, though it is made thus shallow by deposits of organic mud similar to that found in so many of our "mud lakes."† The shores of Nictor are usually bold and rocky, but in places the shores are of loose morainic materials, and but rarely of gravel or sand. There are but two islands, one of them narrow and low, apparently a moraine, and the other of highly tilted slate rising abruptly from the bottom. The latter bears a few trees and bushes, and forms the most charming camping-ground that I know of in New Brunswick. Four large brooks flow into the lakes, of which two, Bald Mountain and Caribou, flow in broad deep valleys, which are doubtless the courses of ancient rivers. Williams' Brook is new, and has upon it, not far from the mouth, an irregular fall of some eight feet, whose murmur can be heard from afar on still days, and the mist from which in certain weathers hangs like smoke over the slope of Gordon. A striking place is Spring Lake, practically an immense spring with a summer temperature of but 41° or 42°. The lakes empty by the Little Tobique, a very winding stream of much, though rather monotonous, beauty, but perfectly ideal for the amateur canoeman.

Origin of the Lake. I believe the lake occupies an ancient valley of erosion choked by glacial drift. As I shall show in a later note, the entire upper valley of the Nepisiguit is very ancient, and it could not have emptied by its present course. It probably therefore ran into Nictor Lake by way of the portage valley now followed by Caribou Brook. The valley of the Little Tobique, though perhaps post-glacial

* The deepest known lake in New Brunswick is Clear Lake, Lepreau, 78 feet (this Bulletin, XIV, 48).

† This Bulletin, XVII, 126.

in spots, is certainly pre-glacial as a whole. By its extension back the lake was doubtless robbed from Mamozekel waters, into which it once probably flowed along the low valley now occupied by Bald Mountain Brook.

The geology, as traced in general by Bailey, Ells, and Chalmers, is shown upon the geological map. All the large hills about the lake and its entire eastern end are of Pre-cambrian felsites, but Silurian rocks appear at the western end. One very remarkable fact about the geology of the lake, first referred to by Bailey, is the presence of the little island of slate, Visitor's Island, completely surrounded by felsites. It may represent the remanant of a tongue of Silurian rocks extending along the bed of the lake to this point, which would give a great age to this valley. The island slopes down so steeply and abruptly on the north side as to suggest a fault running along the axis of the lake. Were it not for its relatively enormous size, 100 feet long by 50 wide, one would be tempted to view it as simply an enormous boulder. But this is but one of the very many attractive problems awaiting solution in this region.

Natural History. No study whatever has yet been made of the zoology of the region, and but little of the botany.

The Neighboring Highlands. To the north of the lake the mountain ranges appear irregular, and I have not tried to work out their particular arrangement. On the southern side, however, they are as follows: Sagamook is not an isolated mountain, but is the northernmost of three parallel ridges forming together a great island or plateau of felsite (see map, Fig. 6, and also the map accompanying the next note, Fig. 13). This plateau has Nictor Lake on the north, the deep valley of Caribou Brook and the portage on the east, Bald Mountain Brook valley on the west, and a valley between Nepisiguit Lakes and the Mamozekel on the south. Sagamook is separated from the next ridge, Mount Head, by a valley not over 300 feet deep, while a somewhat deeper valley lies between Head and Mount Carleton. The appearance of Head and Carleton from Sagamook is shown by Fig. 11. Mount Carleton is over 100 feet higher than Sagamook, and is easily recognized by its bold, bare, saw-like top. Still farther to the southward one can see the summit of Mount Winslow, not a part of this plateau (Fig. 12). On the westward of the valley of Bald Mountain Brook runs a fine range of hills south-west. It begins at Nictor Lake

with Franquelin; next is Bailey, and then follows a series of six or more crests, which are to be named for the geologists who have investigated the structure of the province, and which, therefore, may well be called the Geologists' Range. But on these matters future communications will be made to the Society.

The impression of this plateau which one gains by viewing it from either Nictor or Nepisiguit lakes is extremely misleading. Thus

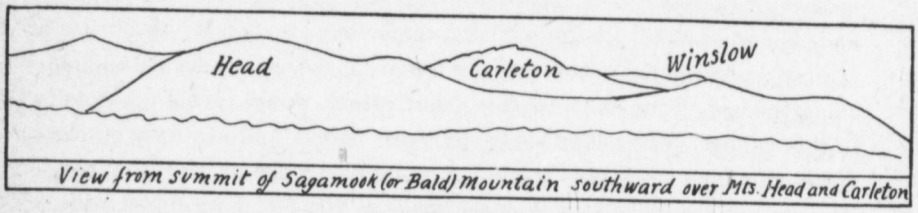


FIG. 11.

the summit of Mount Carleton is not visible at all from Nictor Lake nor from the Upper Nepisiguit Lake, though it is from the Lower Nepisiguit Lakes. Again, the summit of Sagamook is not visible from the Upper Nepisiguit Lake, but only from the lower lakes. It is only by visiting the summits of these mountains and comparing the different views thus obtained, that one can gain a correct knowledge of their relationships.

A great charm of these mountains is the view from their summits. That from Sagamook is particularly grand. From the naked bosses

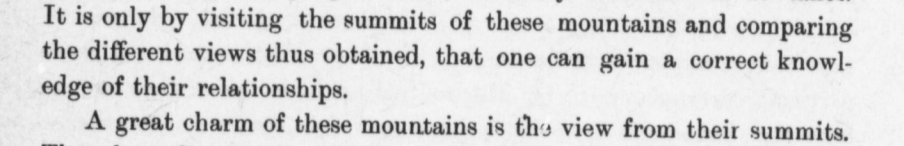


FIG. 12.

at the west end one can look away over the rolling Silurian plateau to the mountains of Quebec and Maine, while from the highest point of the mountain, a bare place near the eastern end of the ridge, one can see far off to the north and east, and the fine range of mountains through which runs the Nepisiguit, and the great mass from which rises Big Bald on the South Branch. But even these views are sur-

passed by those from the summit of Mount Carleton,* for here from one spot the eye may range without hindrance in every direction, and there cannot be a grander outlook over a more rugged country anywhere in this province. Everywhere lie the splendid hills with innumerable crests, as if the sea, with its rollers and breakers were suddenly stilled to stone. They stretch away vast, silent, patient, as unvexed by the little affairs of man as by the shadows of the summer clouds floating above them. They are nearly all forested and unburnt, a great contrast with most other parts of the province. As one stands upon the summit of one of these rarely-visited hills on a fair summer's day, and looks upon these unspoiled hills and forests, the very rugged foundations of his native land, he cannot but feel an exaltation which is one of the best joys of life.

Nictor Lake, therefore, lies to-day not only by nature the most charming place in the interior of New Brunswick, but as yet entirely unspoiled. But the doom of the summer hotel even now threatens its shores, and the pulp-mill its forests. But why should not the people of New Brunswick prevent its despoiling, and set aside the lake and its shores as a provincial park, to be kept wild and beautiful for their enjoyment forever? It can be sacrificed for a small present profit, or saved for a large one in the future. But there is another reason for the preservation of the lake region. In the very near future New Brunswick must turn her attention to systematic forestry, or else lose her chief source of wealth, and resort to direct taxation of her citizens. The first step towards such forestry must be the setting aside of certain areas to be managed on good principles, as a nucleus for forestry extension, and for instruction in forestry management. Nowhere in the province in an equally accessible place is there so fine a forest as here, or one which it would be easier to manage on correct principles. Various states of the United States are making reservations about the heads of their principal rivers for the purpose of preserving forest and game and water supply, as well as for wild parks. Let us be warned in time and set aside here a forest and game preserve and wild park for the future instruction and enjoyment of our people.

* Mount Carleton is most easily reached from Nictor by taking a compass line to it from the highest point of Sagamook.

30.—Proposals for a Nomenclature of unnamed New Brunswick Hills and Mountains.

(Read December 5th, 1899).

It is a fact that the great majority of New Brunswick hills and mountains, including some of the very finest, are to-day quite nameless. In the settled districts, it is true, they are mostly named, but most of New Brunswick is unsettled. This seems the more remarkable when it is recalled that practically all of our streams and lakes, even to small brooks and ponds, and in the wildest parts of the province, are named. But for this the reason is plain. Our watercourses have a relation to our interests through their use for lumbering, hunting and fishing; hence they must often be spoken of, and names for them arise. But our mountains only exceptionally affect our interests in these or other ways, hence are rarely spoken of, and names do not arise for them. Such is the condition at present, but it will not always be so. As the province becomes settled, as hunters and tourists visit it more, as a provincial literature arises, as forestry becomes systematized, as maps become more accurate and detailed, as scientific explorations become more extended and minute, a need for names for our mountains will be felt, and they will gradually come into use. Unless, however, some broad and consistent plan for the giving of such names be adopted, those which will arise will be often of the most trivial, inappropriate and inconvenient sort. One has only to instance the very numerous and confusing Bald Mountains.* Is it not possible to inaugurate some plan which will provide for our mountains a convenient, appropriate and pleasing nomenclature? Certainly such a matter is eminently one for consideration by this Society.

If now, we pass to details, three questions arise: first, what kind of names should be given; second, what shall determine the adoption of proposed names; third, how may they be introduced into general circulation? We may most conveniently consider these questions in reverse order.

How may names, deliberately given, be introduced into general circulation? Guides, lumbermen, and most others who are much in

*Attention was first called to incongruities and inconveniences in our place-nomenclature by Professor Bailey (Mines and Minerals of N. B., 1864, pp. 8, 9).

the woods, make no use of maps, but adopt names only as they hear them, or as they arise naturally from the fixation of descriptive phrases, the method by which nearly all place-names arise among uneducated people. Yet such people, as I have often observed, have great respect for maps, and for their "correct," *i. e.*, printed names; and undoubtedly they would adopt them when brought to their attention, for otherwise unnamed places, provided only they are pronounceable and familiar enough in form to be easily remembered. But surveyors, tourists, hunters, scientists, and the better class of guides, do use maps, and unhesitatingly adopt their names. The number of such visitors to our mountains is increasing, and if the new names are on the maps used by them, they will be adopted; the guides will then hear them and pass them to others, and so on, until in time they will become widespread and fixed. The great practical point, then, is to secure their insertion upon all new maps, not only upon geological and other scientific maps, but upon all those issued by the Provincial and Dominion governments. If the Society approves of this plan, and will use its influence to urge the adoption of these names in all official publications, setting the example in its own publications, it will go far to secure this desirable end.

We next consider what shall determine the names to be adopted. I would suggest that such names be adopted and approved by the Society as are given upon the same principles as are recognized among scientific men for the naming of new species of animals or plants; that is, the first name applied to a previously unnamed place shall be accepted when published with such a description and illustration as will enable any other person to recognize it. The illustration should be a drawing, or better a photograph, or a survey (not a sketch) map accurately locating the place.

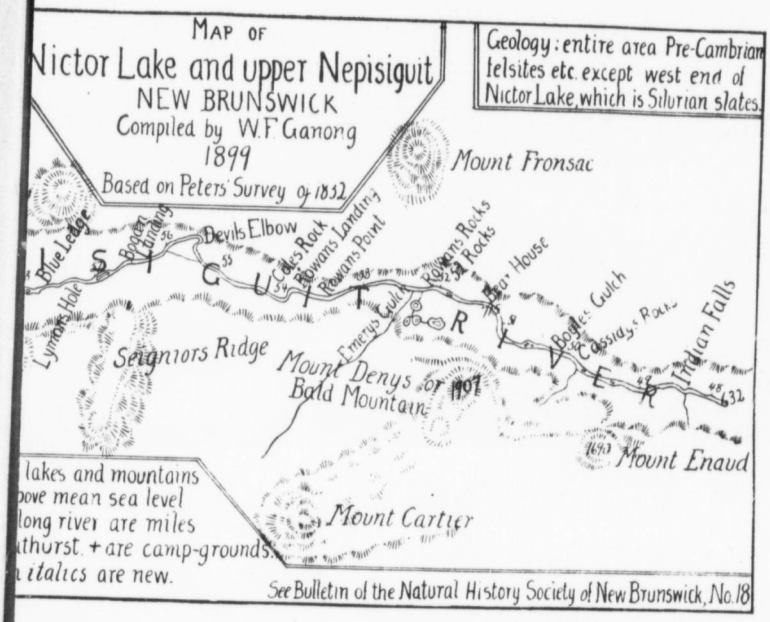
We ask, finally, what kind of names may best be given? Here we are much aided by taking account of the known qualities of the best place-names. The best names are, first, *melodious*, that is, they have a well-balanced succession of a few pleasing easily-pronounced sounds; second, they are dignified, that is, are free from incongruous associations, and have sounds consistent with the character of the place; third, they are individual or unique, that is, are applied to but a single place, and not met with elsewhere. Few names can realize all of these qualities, but they put before us an ideal to be striven for.

As to the actual words chosen, they may be drawn from any one of several classes. First, there are descriptive names; but these are good only when they describe some striking and easily-recognizable quality of the place, and are such as are not likely to be in use or to be adopted elsewhere. Our mountains, however, are not unlike enough to one another to make many such names available. Then there are Indian names, especially when these are familiarized into an easily pronounced form. Unfortunately, however, our Indians appear rarely to have had native names for mountains, and this, of course, for much the same reason that their white successors have none. Again, names may be drawn from those of persons or events prominent in the early history of the province. In these we have a great store of pleasing, easily-pronounced, already more or less familiar, words; and, as to their appropriateness, it is surely fitting that the names of those who have laid the foundations of the province should be lastingly commemorated in her eternal foundation hills. Most of our new names will probably be drawn from this source. Of course such names will be applied, as nearly as possible, to places associated with the person or event commemorated. It is a fact, too, that more honor would be done a person by naming for him a smaller mountain in an accessible and much visited place, than a larger one in a place inaccessible. There should be, too, some proportion between the importance of the place and the prominence of the person commemorated; the greater hills should be named only for those of provincial prominence, while the smaller may well be devoted to the names of those whose importance is only local.

With the convictions here expressed, and following the principles here recommended, I have ventured to apply names to the more prominent mountains about Nictor Lake and along the upper Nepisiguit. This region includes some of the highest, and perhaps scenically the finest, of New Brunswick mountains, and is withal fairly accessible.

About Nictor Lake is a particularly fine series of hills, described and figured in the preceding note (No. 29). The map accompanying that paper, as well as the one with this, show all new names in italics.

Mount Bernardin is named for the Recollet Missionary, who, about 1621, perished of cold and hunger somewhere in this vicinity while on his way from the mouth of the Nepisiguit to the St. John. *Franquelin* is for the great French cartographer, who was the first, in



d County

Moose Brook

Goose Pond

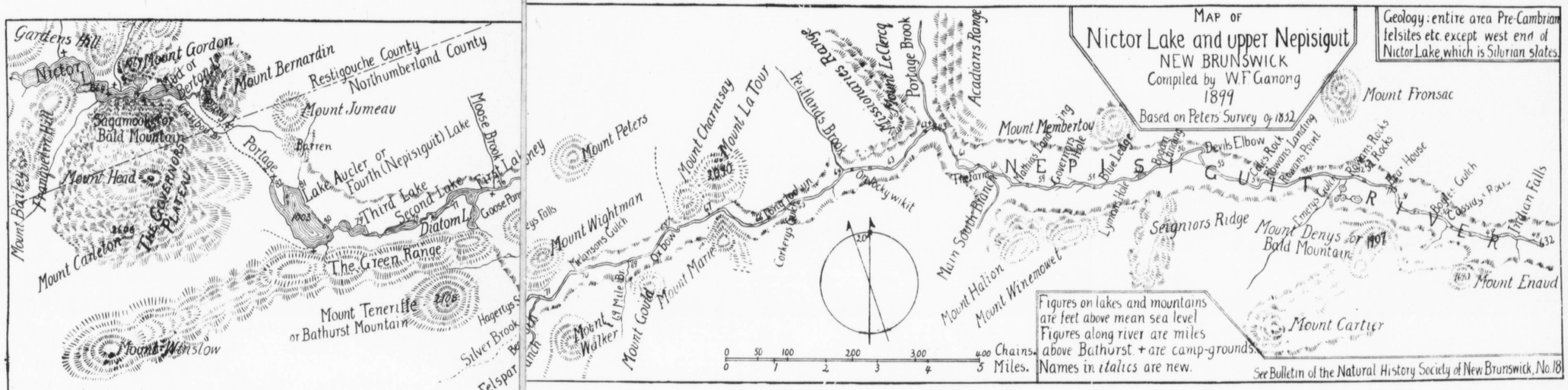
Hagerty's

Silver Brook

Felspar

)0 feet.

The height of S



MAP OF
Nictor Lake and upper Nepisiguit
NEW BRUNSWICK
Compiled by W.F. Ganong
1899
Based on Peters' Survey of 1832

Geology: entire area Pre-Cambrian felsites etc. except west end of Nictor Lake, which is Silurian slates.

See Bulletin of the Natural History Society of New Brunswick, No. 18

FIG. 13

The height of S

k is 2534 feet above the sea; Carleton is 2646 feet; Gordon is 1569 feet; LaTour is 2090 feet.

1686, to place Nictor Lake upon a map. *Garden* is for the surveyor who, in 1835, was the first to sketch a modern map of the lake, and to apply the name Nictor to it. *Berton* (lake, not mountain), is for the other surveyor who, in 1837, made the sketch map which has been the original of all published maps of the lake even to the present day. *Head* is for a governor of the province who was here in 1849 and named Mount Teneriffe. *Gordon* is for another governor, whose charming book, "Wilderness Journeys," published first in 1864, gives the first published description of the lake. It was he who named Mount Sagamook. *Bailey* is for the naturalist, Professor in the University of New Brunswick, who gave us, in 1864, the first scientific account of the geology and botany of this region. *Carleton*, applied to what is much the highest mountain in this part of the province, and possibly in the entire province, is named for Thomas Carleton, governor of New Brunswick from its foundation in 1784 until his death in 1817. Mounts Carleton, Head and Sagamook form a plateau, which, since its peaks are named for two governors, and by another, may well be called *The Governors' Plateau*. In Nictor Lake lies a little island named from its mode of formation, *Moraine Island*. South of Carleton lies another high and conspicuous mountain named *Winslow*, in honor of Edward Winslow, who was so closely associated with the foundation of the Province of New Brunswick, and who is as yet uncommemorated in any place-name.

As one stands upon the western end of Sagamook, he can see running off to the southwest a fine range of very prominent hills, with several rounded summits. This range begins with Mount Bailey and terminates near Bald Head, south of the Tobique. Since Bailey is one of the range, the other summits may well be named for the other geologists who have worked in this province, *Gesner*, *Robb*, *Hartt*, *Matthew*, *Dawson*, *Ells*, *Chalmers*, and the range may well be called the *Geologists' Range*. No maps or figures are here presented, for I hope soon to give it further study.

We pass next to Nepisiguit waters, of which a map is given herewith (Fig. 13), and we may well commemorate in its numerous grand hills those who have been prominent in the history of the river and the region of the North Shore about its mouth. We come first to a large lake. It first appears on the excellent map of 1685 by the Recollet missionary, Jumeau, as *L. aucler*, and the name is restored.

From no part of this lake can the summits of Sagamook or Carleton be seen, nor, of course, can the lake be seen from their summits, but they can be seen with great distinctness from near the summit of Teneriffe (Figs. 14, 15). In addition to those already mentioned, one sees a low rounded hill, which shows more distinctly from the lower end of the lake, named for *Jumeau*, the lake's first cartographer. To

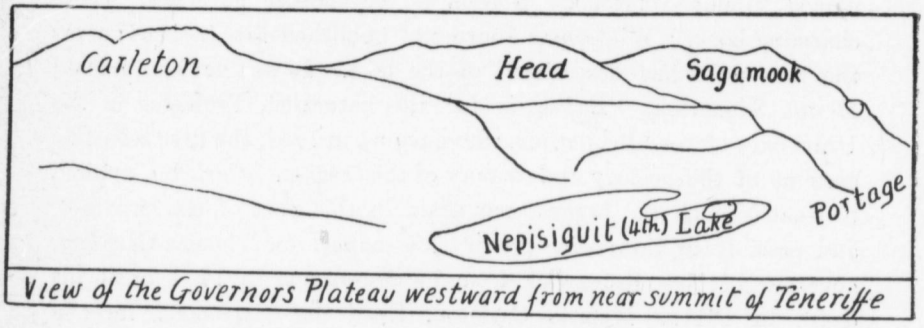


FIG. 14.

the northward stands up a splendid very high rounded dome, falling outside the limits of the map, but shown in Fig. 15, easily seen from Sagamook and from other directions, which is named *Mount Villebon* in honor of the most prominent of the French governors of what is now New Brunswick when it was a part of Acadia.

Below Aucler are three other shallow lakes, from the eastermost of which an arm, forming another lake, runs to the southward. This is

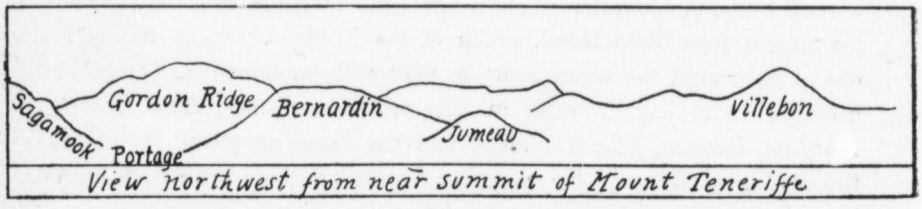


FIG. 15.

remarkable for its great deposit of diatomaceous earth, described in an earlier note (No. 17), whence it may be well called *Diatom Lake*. South of these lakes and parallel with them runs a splendid ridge, known appropriately to the lumbermen as the Green Range. It is, I think, continuous with Mount Winslow, but I am not sure of this.

South of it stands Mount Teneriffe, from which a fair view may be obtained to the westward (Figs. 14, 15), and a particularly grand one to the eastward (Fig. 16). From here two mountains falling outside the limits of the map show up with particular distinctness, the round dome of Big Bald on the south branch of Nepisiguit, and to the left of it a pointed mountain with three bare spots near its summit. The latter is named *DesBarres* for the man, afterwards governor of Cape Breton, who first thoroughly surveyed our coasts, and who mapped, in 1780, the interior of New Brunswick far better than any other cartographer until well into this century. This is, I think, the mountain shown on the geological map at the forks of the south branch of Nepisiguit (just west of the large N).

We begin now to descend the river. As in other rivers of the province the lumbermen have a nomenclature of their own for the

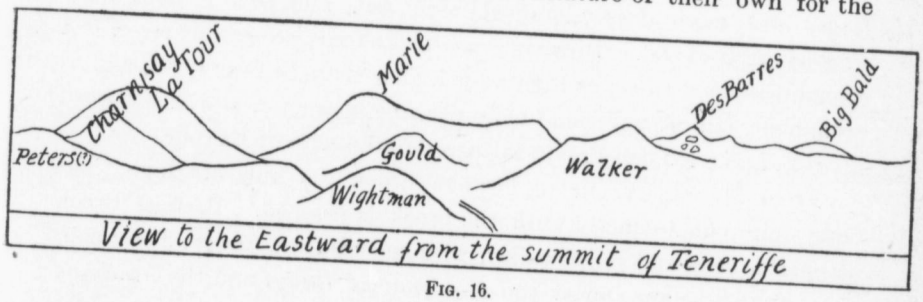


FIG. 16.

rapids, rocks, points, etc., along the river, and these names (for much help in compiling which I am indebted to Mr. P. J. Burns, M.P.P., of Bathurst,) are given on the map. As to the mountains, the first we meet is the symmetrical hill around which the river flows, which may well be named *Mount Cooney*, in honor of the author of the "History of Northern New Brunswick and Gaspé," (1832), in which is found the first, and, on the whole, an accurate description of the river. Northeast of this is a prominent symmetrical mountain, which is named *Mount Peters*, for the surveyor whose accurate map of the river, made in 1832, is the basis for all subsequent maps. From the forks of the Little South Branch three fine mountains may be seen at once, one of which was named Felspar Mount by Professor Bailey in 1863, and on the slope of which he describes a remarkable chasm. That to the east of it is named *Mount Walker* in honor of Commodore Walker, who was the first English settler at the mouth of the river,

where in 1768–1776 he had a large trading establishment described by Cooney. The rounded mountain just north of the river here is named *Mount Wightman*, for the surveyor of Fredericton who, in 1839, carried a line of barometric measurements through this region for the British government, as described in a Boundary Blue Book for 1840. Farther down on the south bank is a distinct, though not a high hill, which should be named *Mount Goold* (on the map, by mistake, Gould), for Arthur Goold, who at one time owned the site of Bathurst and attempted to make a settlement there. Lower still, on the north bank, towers up a splendid symmetrical rounded mountain, prominent in the landscape from both up and down river (see Figures 16, 18), showing from the west a marked red color; this is named *Mount LaTour* for the Sieur de LaTour, so well known in our provincial history. Just west of it is another of similar character, but not so large, and more deeply stained with red, and this is named for *Charnisay*, his rival. Directly south of LaTour, across the river, is a splendid wooded ridge, as high as or higher than LaTour itself, and as prominent, but of softer and more pleasing character, which is named *Mount Marie*, for our Provincial heroine, the wife of LaTour.

From Mount LaTour to Portage Brook the hills are high,* but none stand out distinctly until the brook is reached. Portage Brook occupies a deep and broad valley, with splendid hill ranges along both sides, and these are named the *Missionaries' Range* and the *Acadians' Range* to commemorate two peoples prominent in the history of the North Shore. One of the hills in the Missionaries Range, the prominent one as seen from below the brook, in the angle between brook and river, is named for *LeClercq*, who, in 1691, published a most valuable book containing much information about the lower part of the river. It will be well in the future to apply the names of other missionaries to other summits of this range, and likewise to apply the names of prominent Acadians to the summits in the Acadian range.

Just below the South Branch, on the south side, are two prominent rounded hills (Figure 17) which may be named *Mount Halion* and *Mount Winemowet* for two Micmac chiefs mentioned by Cooney.

* From the river alone one is apt to be misled as to the character of these hills along the river. They appear like long ridges, and one imagines deep valleys and other ridges behind them. In fact they are often but the edges of a great plateau, into which the river has cut a deep valley. It is only to more or less isolated mountains and ridges that names are applied in this paper.

Lower, on the north bank stands out a very prominent mountain (Fig. 17), which is named *Mount Membertou* in honor of the grand old Micmac sachem, friend of the French, and one of those who saw Cartier on the North Shore in 1534. Descending the river one presently sees a bare reddish summit appearing over a wooded ridge, the first glimpse of Fronsac (Fig. 17), and later there comes into view

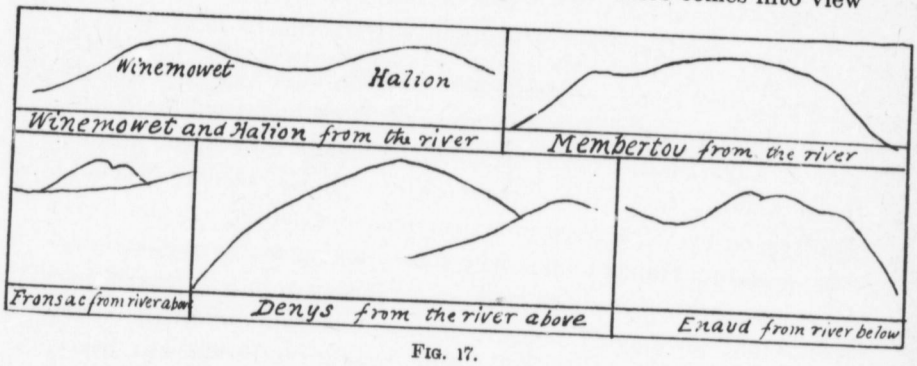


FIG. 17.

the symmetrical mountain locally called Bald Mountain (Fig. 17), but much better to be known as *Mount Denys* in honor of the first settler at the mouth of the river, and the author of one of the most important early works on Acadia, published in Paris in 1672. North of it lies *Mount Fronsac* (Fig. 18), somewhat higher than Denys itself, but otherwise less distinctive, named for the Sieur de Fronsac, Denys' son, who lived and had a fort at Miramichi. Southwest of Denys there

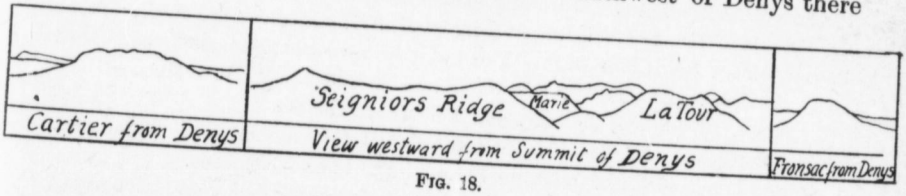


FIG. 18.

towers up a bare mountain visible from many points (Fig. 18), the highest and most conspicuous in this vicinity (sometimes, I believe, called Little Bald Mountain), which may well be named *Mount Cartier* in honor of the first explorer and map-maker of our North Shore. To the westward rises a high and prominent ridge, which is named the *Seigniors Ridge* for the French Seigniors who once possessed much of New Brunswick, and played some small part in her history. To the eastward is a lower mountain, which shows more prominently from

the river below (Fig 17), and this is named *Mount Enaud* (also spelled Enault) for one of the most prominent of the early settlers at the mouth of the river, mentioned by Cooney.

Below Indian Falls no more prominent mountains appear. The country becomes a flat plateau, sloping evenly and gradually eastward.

31.— On Heights determined with Aneroid in 1899.

(Read December 5th, 1899).

In the course of a canoe trip up the Tobique and down the Nepisiguit in August last, I made many measurements with a good aneroid. These were all taken contemporaneously with the readings made at Fredericton by Dr. Harrison for the meteorological service, and I wish to express my thanks to him both for adjusting my aneroid and also for a long series of readings used in computing results. I have since found that my aneroid tends to read a trifle low, especially on the greater heights; hence the following figures are to be taken as below, rather than above, the truth. Those marked with a star (*) have never before been measured. The heights are all above mean sea level at St. John. The position of all of the places, except the last in the list, may be seen upon the map accompanying Note 30.

Forks of Tobique (or Nictau). Mean of two measurements, 576 feet. Wightman gives (with an added correction explained earlier in Note 25) 575 feet for four miles below Nictau.

Surface of Nictor Lake. Mean of fourteen measurements, 837 feet. Chalmers made it 878, and Wightman (corrected) 877. Mean of the three, 864.

Sagamook (or Bald) Mountain. Mean of two measurements, 1633 feet above the lake. Chalmers gives 1659, and Wightman 1719. Mean of the three, 1670 above the lake, and 2534 above the sea.

*Mount Carleton. By direct measurement 112 feet higher than Sagamook, and hence 1782 above Nictor Lake, and 2646 above the sea.

*Mount Gordon, on Nictor Lake. 705 feet above Nictor Lake, and 1569 above the sea.

*Bank of Caribou Brook, half way across the Nictor-Nepisiguit Portage, 984 feet.

Surface of Nepisiguit Lake. Mean of five measurements, 1011 feet. Chalmers gives 996; mean of the two, 1003. Mr. Chalmers statement that this is the highest lake in New Brunswick, was of course made before the heights of the lakes on the south branch of Tobique, which are much higher, were measured. By direct measurement I made it 145 feet above Nictor Lake, *i. e.*, 864 + 145 = 1009.

*Mount Teneriffe. By direct measurement, 1105 feet above Nepisiguit Lake, and hence 2108 feet above the sea. Mr. Chalmers is in error in stating that this is about as high as Sagamook. Even as seen from Sagamook it is much lower.

*Mount LaTour. By direct measurement, 1150 feet above the river. As this falls 160 feet between the lake and Portage Brook, and the fall is considerably greater below than above it, the river is here probably 940 feet above the sea, and hence LaTour is 2090 feet above the sea.

*Mouth of Portage Brook, river level. Mean of five observations, 843 feet.

*River at camping place near the "bear house" at foot of Mount Cartier or Bald Mountain. Mean of four observations, 715 feet.

Mount Denys, or Bald Mountain, above Indian Falls. By direct measurement, above the river at the camping place, 1175 feet. In 1898 I made it 1170 feet; mean, 1172. This agrees well with the height of 1183 feet on the survey map of 1832 by Peters. Mean of these two, 1138, which, added to the river level, gives 1893 feet above the sea. Chalmers, following Ells, gives 1922; mean, 1907. There are higher mountains in the near neighborhood.

Mount Enaud, or Bald Face Mountain, is given on the Peters map as 998 feet high, that is, of course, above the river, and hence about 1690 feet above the sea.

*Lower end Indian Falls. Mean of three measurements, 632 feet.

*Mouth of Nine-mile Brook. Mean of two measurements, 429 feet.

APPENDIX.

THE FREDERICTON NATURAL HISTORY SOCIETY.

(Instituted February 2nd, 1895).

The Society continues to hold its meetings in the High School Building through the kindness of the School Board. The attendance has been generally good, and much interest shown in the discussion of the subjects dealt with in the papers read before the Society.

During the year addresses were given, or papers read, as follows:

1899.

Feb. 20. Insect Life, by Mr. Wm. McIntosh.
Mar. 20. Electricity, by H. H. Hagerman, M.A.
April 17. A Talk on Insects, by Mr. G. W. Bailey.
May 15. The Eye, by Dr. Bailey.
Oct. 16. Our Summer's Work, by Dr. Bailey and Mr. W. T. L. Reed.
Nov. 20. How the Brain Works, by Mr. John Brittain.

At the May meeting Mr. W. H. Moore presented the Society with a number of alcoholic specimens of Reptilia and Amphibia; Mr. Drury Allen donated a collection of birds' eggs, and Mr. H. H. Hagerman, a crayfish and a cat-fish.

The officers of the Society for the year ending in February, 1900, are:

L. W. Bailey, Ph.D.....*President.*
G. N. Babbitt, Esq.....*Vice-President.*
John Brittain.....*Secretary.*
B. C. Foster, M.A.....*Treasurer.*
H. H. Hagerman, M.A.....*Curator.*

JOHN BRITTAIN,
Secretary.

KINGS COUNTY NATURAL HISTORY SOCIETY.

(Organized at Sussex, Kings County, N. B., October 2nd, 1897).

The officers for the year ending October 2nd, 1899, are as follows:

R. P. Steeves, A.M. ..... *President.*
Miss L. Wetmore..... *Vice-President.*
W. N. Biggar..... *Secretary-Treasurer.*

During the year nine meetings were held, eight regular and one special. The following papers have been read before the Society:

1898.

Nov. 5. Snakes, by Miss Annie White.

1899.

Mar. 4. The Deer Family, by Miss Annie White.
Fur-bearing Animals, by W. A. Alward, A.B.

April 8. Insects Injurious to House Plants, by W. E. Goold.
Unity of Living Things, by Robert King, A.B.
Return of Birds, by Miss L. Wetmore.

May 5. Moths and their Preventatives, by Miss Edith Darling.
A Spring Ramble, by Miss L. Wetmore.
The Nuthatches, by Miss L. Wetmore.

The result of the work of collecting for the museum has been the addition of forty-four specimens to the scientific collections.

For the better keeping and exhibiting of the specimens, the Society has procured this year the following: one large cabinet for minerals, etc., one glass case for birds, and two cases for insects.

Eight new members were added to the roll during the year.

The thanks of the Society are due the Natural History Society of New Brunswick for Bulletins, etc., received., and also to Mr. G. U. Hay for assistance rendered.

W. N. BIGGAR,
Secretary.

THE NATURAL HISTORY AND ANTIQUARIAN SOCIETY OF PRINCE EDWARD ISLAND.

(Instituted March 28th, 1889; re-organized January 10th, 1899).

During 1899 eleven public meetings have been held, and on each occasion the attendance has been good.

The dates of the meetings and the subjects of the papers and lectures were as follows:

1899.

Jan. 10. Re-organization.

24. Business meeting, followed by an impromptu address upon "Some of our Fungi," by Mr. John MacSwain.

Feb. 7. Rust of Wheat, by John MacSwain.

21. Geological Reminiscences of Prince Edward Island, by Thos. May.

Mar. 7. Floriculture, by James Tait.

21. An Abnormal Vegetable Growth in the Human Throat, by L. W. Watson, M.A.

Apr. 4. Some Geological Evidences of the Nebular Hypothesis, by John Newson.

18. Some Effects of Solar Radiation upon Organic Life, by W. J. Bulman, B.S., etc.

May 2. Some Notes on Man Primeval, by Charles Palmer, Q.C.

16. The Colored Races of P. E. Island, by J. T. Mellish, M.A.

Nov. 27. *(a)* Notes on Fungi Collected by Miss Pippy, 1899, by John MacSwain

(b) Note on a Piece of Petrified Wood found in the heart of a living Tree, by J. M. Duncan.

(c) Explanation of an Abnormal Potato Growth (exhibited by Mr. W. Doull), Lawrence Watson.

Dec. 11. An Introduction to the Study of Mineralogy, by Rev. T. H. Hunt, M.A., B.D.

The annual "outing" was held on the 24th of June, when the Society and many guests, having visited on the way the Micmac encampment at Rocky Point, walked to the ruins of "Ringwood," where Hon. F. St. Croix Brecken delivered a short address upon the Life and Times of Col. Cumberland. The ruins of Fort La Joie were next visited, where Messrs. Brecken and Newson delivered very inter-

esting addresses upon the history of the place. The position of many historic sites was pointed out by Mr. Newson as the party, after luncheon at the President's summer residence, proceeded on its way to Holland Cove. Here the listeners enjoyed the reading by Mr. Brecken of a paper upon Captain Holland and his work, embodying much matter of rare historical value.

During the year a delegation from the Executive Committee interviewed the Provincial Government, praying for a grant of money (such as is annually given our sister societies in the other provinces), and the use of rooms for the Society and for museum accommodation. The delegation was most kindly received, and the accommodation asked for was promised as soon as any suitable rooms at the disposal of the government should become available.

Application was made to the Geological Survey for a collection of mineralogical specimens which has been promised so soon as our Society shall have a suitable place in which to store and exhibit the grant.

We have received the publications of a few sister societies, and it is much to be desired that we may soon be in financial position to publish such bulletins as will enable us to secure a number of similar "exchanges," the educational value of which cannot be over-estimated.

In conclusion, it is gratifying to recognize on every hand, many evidences that the Society enjoys the confidence, interest and good-will of the community at large, that it is conceded that material advance has been made in the educational work of the Society, and that the prospects of rapid growth and constantly-increasing usefulness are of the very brightest character.

LAWRENCE W. WATSON,
Secretary-Treasurer.

Charlottetown, P. E. I.

THE ST. JOHN OBSERVATORY.

In addition to the annual meteorological abstract, a brief description of the instruments and work of the St. John Observatory may be of interest.

The Observatory is the chief station in New Brunswick under the Canadian Meteorological Service of the Department of Marine and Fisheries.

Observations of pressure, temperature, hygrometric conditions of the air, amount and character of precipitation, clouds, velocity and direction of the wind and general conditions of the weather are made at intervals of four hours, commencing at 3.44 A.M. local time. In addition to the meteorological work, astronomical observations are made for determination of time.

The Director's office, instrument and clock room is situated in the north wing of the Customs building, the thermometer shed and rain gauge on the ground adjoining the observer's residence, the anemometer and wind vane are mounted on the time ball tower.

The standard barometer by H. J. Green, New York, is constructed on Fortin's principle, the level of the mercury in the cistern being adjusted previous to each reading; secondary to this is a smaller barometer of the same construction, and a Richard's barograph (self-recording barometer). The thermometers are all by Negretti & Zambra of London, have been tested at the Kew Observatory in London, and are exposed in the Canadian pattern shed and screen which faces north, the bulbs of the principal thermometers being four feet above the soil. The highest and lowest temperatures are registered by mercurial maximum and spirit minimum self-registering thermometers which are read and re-set at the midnight observation, the temperature of the air at time of observation from the ordinary mercurial thermometer, and the hygrometric observations from a pair of thermometers, one of which has its bulb covered by a thin muslin wrapping, kept moistened by water or covered by a thin coating of ice during freezing weather.

The anemometer is of the Robinson pattern, and with the wind vane records electrically the direction and velocity of the wind upon the register. The register has three essential parts,—the cylinder, the clock and the electro magnets. A specially ruled sheet is placed upon the cylinder and revolved by means of clock work; the direction of the wind is printed upon the sheet every five minutes, and a mark is made at right angles to the direction of the revolution of the cylinder for each mile of wind, and the number of marks within a given space shows the rate per hour at which the wind is blowing. The sheet placed on the cylinder holds the record for twenty-four hours.

The rain gauge has a circular receiving surface equal to ten square inches. No snow gauge is used, but it is assumed that ten inches of snow equals one inch of rain.

The astronomical equipment is intended specially for the determination of correct time. The transit room is situated on the western side of the building, and the transit telescope is mounted on a substantial brick pier, capped with stone. It is of modern construction by Troughton & Simms, London, has an object glass of two and a half inches diameter, two setting circles attached to the tube, micrometer eye pieces and electric illumination. Observations of stars on the meridian are made with this instrument for the correction of clock errors and rates.

The standard sidereal clock by Victor Kullberg, London, was received at the Observatory in September, 1899. It has a zinc and steel compensated pendulum, similar to the standard sidereal clock of the Royal Observatory, Greenwich, a central steel rod being surrounded to about the middle of its length by a tube of zinc, and then incased by an outer tube of steel. The latter carries the lead bob, which is cylindrical in shape (weighing forty pounds) and suspended at the middle of its height, thus eliminating the temperature changes in the bob itself. This clock is of the best construction, and is fitted with break circuit attachment for operating chronograph. The movement and pendulum are mounted on a solid iron bracket, which is firmly bolted to heavy masonry; the iron base and bracket also carries the case of solid teak. To prevent sudden changes of temperature from affecting the clock, it is enclosed in a closet which is thickly padded with felt.

The transmitting clock, which was formerly used as a standard sidereal, was made by Emanuel, of London. It has lately been fitted with electric contacts for automatically transmitting time by the electric telegraph. It has a mercurial compensated pendulum, and is enclosed in a similar closet to the one described for the sidereal standard. There is also another mean time clock, with mercurial pendulum and a box chronometer, in the observatory.

The time ball on the northern tower of the Customs building is dropped by an electric key on the table which contains the electric telegraph instruments.

D. L. HUTCHINSON,
Director.

METEOROLOGICAL ABSTRACT FOR 1899.

OBSERVATIONS RECORDED AT ST. JOHN OBSERVATORY, LATITUDE, 45° 17′ N.; LONGITUDE, 66° 4′ W.

D. L. HUTCHINSON, *Director.*

	BAROMETER.			TEMPERATURE.			Cloudiness: 0 = clear; 10 = wholly clouded.	Precipitation: Rain and melted snow.	WIND DIRECTION AND VELOCITY.																		Thunder Storms.
									N.		N. E.		E.		S. E.		S.		S. W.		W.		N. W.				
	Mean.	Highest.	Lowest.	Mean.	Maximum.	Minimum.			Hours.	Miles.	Hours.	Miles.	Hours.	Miles.	Hours.	Miles.	Hours.	Miles.	Hours.	Miles.	Hours.	Miles.	Hours.	Miles.	Hours.	Miles.	Hours Calm.	Total Miles.	
January	30.30	30.75	29.03	19.9	46	−12.7	5	4.35	28	312	91	1096	17	194	44	843	21	358	128	1954	55	814	339	5724	21	11,295	0
February	29.88	30.51	29.13	18.7	43.7	−7	6	3.14	24	199	103	1376	29	299	24	331	13	78	55	771	76	1170	329	5852	19	10,079	0
March	29.95	30.62	28.76	27.2	45.5	2.8	7	5.48	41	361	194	1924	25	196	79	1247	36	356	124	2313	29	484	187	3314	29	10,195	1
April	30.01	30.33	29.48	39.01	61.7	22.5	6	0.94	67	880	132	1408	28	313	61	514	122	801	78	1041	28	224	154	2015	50	7,196	0
May	30.03	30.31	29.61	48.3	79.2	30.5	6	3.51	29	423	213	2652	22	139	63	337	160	1124	96	1007	6	74	84	1177	71	6,933	0
June	29.97	30.36	29.66	54.5	80.2	44 8	7	2.65	42	346	103	1035	16	84	67	352	187	1363	129	1561	14	127	114	1435	48	6,303	4
July	29.95	30.30	29.60	59.1	78.5	46.2	7	7.47	20	103	24	159	12	88	144	949	218	1280	135	1468	35	306	68	786	88	5,139	4
August	30.02	30.40	29.74	62.5	79	47.7	6	2.17	20	137	66	449	33	309	84	546	163	900	120	1080	9	53	147	1546	102	5,020	1
September	30.06	30.49	29.57	55.4	70.2	34	4	3.05	24	157	60	484	43	344	122	961	101	740	187	2219	20	223	148	2254	15	7,382	1
October	30.20	30.54	29.65	47.7	70	29	6	2.49	78	641	97	852	22	126	44	382	61	347	149	2026	18	154	246	2778	29	7.306	0
November	30.02	30 56	29.42	34.7	59.7	16.2	6	3.37	107	1192	91	988	1	1	31	464	14	229	108	1151	74	491	277	3648	17	8,164	0
December	30.04	30.83	29.31	27.7	51.8	−2.5	6	5.45	113	1083	110	1052	46	416	48	1133	21	290	127	2389	55	811	216	3130	8	10,304	0

Barometer readings have been reduced to sea level and 32° Fahrenheit. The minus sign when used indicates temperatures below Zero. The maximum temperature, 80.2, was registered on the 9th of June; the minimum, − 12.7, on the 2nd January. Precipitation for year was 44.07 inches.