Technical and Bibliographic Notes / Notes techniques et bibliographiques

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

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

- [ ] Coloured covers/ Couverture de couleur
- [ ] Covers damaged/ Couverture endommagée
- [ ] Covers restored and/or laminated/ Couverture restaurée et/ou pelliculée
- [ ] Cover title missing/ Le titre de couverture manque
- [ ] Coloured maps/ Cartes géographiques en couleur
- [ ] Coloured ink (i.e. other than blue or black)/ Encre de couleur (i.e. autre que bleue ou noire)
- [ ] Coloured plates and/or illustrations/ Planches et/ou illustrations en couleur
- [x] Bound with other material/ Relié avec d'autres documents
- [x] Tight binding may cause shadows or distortion along interior margin/ La reliure serrée peut causer de l'ombre ou de la distorsion le long de la marge intérieure
- [ ] Blank leaves added during restoration may appear within the text. Whenever possible, these have been omitted from filming/ Il se peut que certaines pages blanches ajoutées lors d'une restauration apparaissent dans le texte, mais, lorsque cela était possible, ces pages n'ont pas été filmées.

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

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

- [ ] Title page of issue/ Page de titre de la livraison
- [ ] Caption of issue/ Titre de départ de la livraison
- [ ] Masthead/ Générique (périodiques) de la livraison

- [ ] Additional comments:/ Commentaires supplémentaires:

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

10X	12X	14X	16X	18X	20X	22X	24X	26X	28X	30X	32X
						/					

THE

CANADIAN RECORD

OF SCIENCE.

VOL. IV. JULY, 1891. NO. 7.

On a New Horizon in the St. John Group.

By G. F. Matthew, M.A., F.R.S.C.

Read at Meeting of the Natural History Society of New Brunswick, 5th October, 1891.

Among fossils which are considered to be of special importance in determining the age of Cambrian strata, none are thought to be of greater value than that curious net-like organism called *Dictyonema flabelliforme*.

Most of the continental geologists regard the beds which contain this fossil as the highest which should come under the name of Cambrian, as distinguished from Ordovician or Lower Silurian, because at these beds there is an important palæontological break which we now know to be only local for the Atlantic region, but which seems in Europe to be of unusual importance.[1]

In Great Britain, however, another set of beds, the Tremadoc slates are included in the Cambrian rocks. This group contains many Cambrian types, occurs in the original Cambrian area, and for these reasons is attached to the Cambrian system. The next system begins with the Arenig group in which the true graptolites come in in strength and variety.

[1] Prof. G Lindström asserts that in Sweden not a single species passes this limit.

Dictyonema flabelliforme had been sought for in the black shales of Division 3 (Bretonian) unsuccessfully until this year. Films, probably due to this fossil had been met with, but they were too much distorted and obscured by slaty cleavage to be with safe[illegible] referred to it. Now, however, the presence of this fossil is undoubted, and serves to add another to the known palæontological horizons of the St. John group.

Mr. G. Stead, whom the writer had sent to search for the Tremadoc fauna on Navy Island, in St. John harbour, found Dictyonema in the ledges at the west end of the island. Subsequent examinations resulted in the discovery of fine examples of the fossil, and showed that it occurs at intervals through a considerable thickness of beds. Judging from the position at which Dictyonema was found, it is probable that the Tremadoc fauna is not on the island, but to the north of it in the channel of the river St. John.

The history of this Dictyonema is interesting, as showing through how many successive phases of increasing accuracy the knowledge of an extinct organism may pass. The original describer of the species evidently thought it related to the sea-fans as he called it a Gorgonia. The rising, branching and spreading hydrosome, with its sub-parallel, occasionally forking branches, would seem to favour this reference of the species. The branches too, are covered with minute pores, or what appear to be such, and thus in another respect the species resembles the sea-fans.

But Eichwald could not have discovered that he was dealing with a hollow cup or bell, and not a fan-like expanded organism, or he would scarcely have applied the specific name by which he designated the fossil.

Still further from a correct understanding of the nature of this fossil, were Goeppert and Unger, who thought it to be a plant of some kind. These men were palæobotanists, and so less prepared to look for analogies to the fossil in the animal kingdom.

It is now generally admitted that the fossil described by the late J. W. Salter as *Dictyonema sociale* is identical with

D. flabelliforme. Mr. Salter fully understood the cup-like form of the species which he described and its relation to the graptolites, and his name well expresses the multitudes of these delicate organisms which are exposed in breaking open layers of the Dictyonema shale.

For a long time the idea prevailed that this organism was rooted in the mud and grew on the sea bottom. One author speaks of the lower part of the hydrosome as a kind of cage buried in the mud, which supported the cup in an upright position, but it does not seem at all clear that Dictyonema was in any way thus attached. The sicula or initial point is altogether too small and slight to give support to the structure growing from it, and the living cells begin immediately above the sicula, and therefore, it is improbable that the lower part of the hydrosome was buried in the mud. Dictyonema seems rather to have been a free organism, floating in the ocean, and perhaps capable of moving by means of ciliæ or fleshy appendages which have not been preserved.

Dictyonema began life as a Bryograptus, if we may judge by the appearance of the hydrosome, which did not develop connecting threads on the primary branches, and usually not until the growth of the secondary branches was completed. Then gradually and more numerously as the hydrosome grew, the cross threads appeared.

It is in keeping with this that Dictyonema was not the first form of the Graptolite family that appeared. Beside a few poorly preserved forms of the Lower Cambrian rocks, there were in Sweden and Acadia two genera of graptolites which either preceded it or appeared with it; these are Trichograptus or Clonograptus, and Bryograptus.

G. Linnarsson discovered a graptolite in West Gotland, which he referred to Dichograptus. It is a small, slender form with distant cells, which, by H. A. Nicholson, has been referred to Trichograptus, and by O. Hermann to Clonograptus. The species was found with the trilobite *Sphærophthalmus alatus*, and therefore, should be older than the Dictyonema schists.

Charles Lapworth in many places in his "Geological distribution of the Rhabdopora," recognized Bryograptus as older than the Dictyonema shale,[1] but Dr. W. C. Brögger disputes this, and says that in Scandinavia that genus appeared above the Dictyonema beds. He cites three species which appeared very soon after Dictyonema, and one of these is referred by Hermann to Trichograptus.

Our observations in the St. John basin favour Lapworth's views, as we find a Bryograptus mingled with the earliest examples of Dictyonema, and below the proper Dictyonema beds.

Dictyonema flabelliforme ranges through a greater thickness of beds in Acadia than it does in Sweden or Norway, and perhaps for this reason, has a greater variety of Brachiopods and Trilobites associated with it than are found in these countries, or indeed any where else. Included in the beds where Dictyonema is found, there are trilobites belonging to Angelin's genus Leptoplastus and to Agnostus. *Parabolina* cf *heres* Brögg, and *Protopetura* cf *acanthura*, Ang., also occur, and as the fossil is found about fifty feet lower down than the bed where these trilobites occur, it may even reach the zone of *Parabolina spinulosa*, Wahl. But the Dictyonema of these lower layers is a bushy form like var. *confertum* of Sweden.

Only one trilobite is mentioned as occurring in Sweden in the Dictyonema beds. This is Angelin's species *Acerocorne ecorne*, a species resembling *Peltura scarabeoides*, but possessing a pygidium devoid of spines. J. C. Moberg has thrown doubt on the occurrence of even this one trilobite in the Dictyonema beds. He mentions that it is said to have been found at Sandby in Scania where *Protopeltura acanthura* occurs, and it is thus possibly with fossils somewhat older than the true Dictyonema beds. Further, it may be added that Linnarsson says the Dictyonema beds in Scania contain (beside their characteristic fossil) a species of Dichograptus in great numbers, and that in that province a "transition

[1] Die. Silurischen Etagen 2 und 3, p. 37.

might occur between the Olenus schists and the Dictyonema schists." The conditions in Scania appear to correspond with those in Acadia, as the trilobites of the "Upper Olenus Beds," (Div. 3*a*. and *b*. of the St. John Group), are mingled with Dictyonema. But on the other hand, the upper or typical Dictyonema beds (Div. 3*c*.) at St. John, have so far yielded no trilobite

Dictyonema also has associated with it at St. John, several species of Brachiopods,—an Obolus somewhat like *O. Apollonis*, Eichw, also an Obolella, a Linnarssonia like *L. misera*, Bill; and a Lingula or Linguella.

Dictyonema lived long enough in the St. John basin to develop considerable differences in the appearance and structure of the hydrosome. We recognize two varieties which are probably the same with those mentioned by Dr. Brögger as existing in Scandinavia, and we also observe that the variety most common in Acadia differs from the type in having more numerous, because more closely set hydrothecæ. The variety *Norvegicum* characterised by heavy cross-bars has changed from the type in the direction of *D. quadrangularis* Hall, of the Levis shales, and the special Acadian variety in the direction of Sir J. W. Dawson's species *D. delicatulum* of the same shales. The former variety is known to occur in the St. John basin at the Arenig horizon (Div. 3*d*.), but the latter though known at Quebec, has not been found here.

Including the Dictyonema beds we now have in the third or Bretonian division of the St. John group the following well characterized horizons:—

a. Zone of *Parabolina spinulosa* (formerly described as Zone of *Leptoplastus stenotoides*).

b. Zone of *Peltura scarabeoides*, contains also *Dictyonema flabelliforme*.

c. Zone of *Dictyonema flabelliforme*, typical development of the species.

?. Several hundred feet, fauna unknown.

d. Zone of *Dichograptus Logani* and *Tetragraptus*, 4-*branchiatus*, &c.

On Some Granites from British Columbia and the Adjacent Parts of Alaska and the Yukon District.

By Frank D. Adams, *Lecturer in Geology, McGill University.*

Some three years ago, when on the staff of the Geological Survey of Canada, the writer was requested by Dr. G. M. Dawson, to examine a series of rock specimens collected by that gentleman and his assistants, Messrs. McConnell and Ogilvy, during their explorations in the Yukon Districts and Northern British Columbia in 1887. The results of this examination were published as an appendix to Dr. Dawson's Report on the Yukon District.[1]

The rocks examined were, for the most part granites, but included also, diabase porphyrites, diabase tuffs and other rocks, which, however, were normal in character, and possessed of no features which here deserve especial mention or further description.

Among the granites, however, there were three which were rather remarkable and seemed to be worthy of a more extended study than it was at that time possible to make. I have accordingly, through the kindness of Dr. Dawson, re-examined the hand specimens, and with the aid of additional thin sections have made a more detailed study of the rocks in question.

Granite from Wrangell Island, Alaska.—The first of these rocks is a rather fine grained grey granite from Wrangell Island, Alaska. In Dr. Dawson's Report it is referred to as follows: "The rocks along the west shore of Wrangell Island, in the vicinity of the town and harbor, are chiefly black flaggy argillites, remarkably uniform and regular in their bedding and with a westward dip. They are considerably indurated and contain small staurolite crystals in some layers, while on the surface of others crystals

[1] Appendix V. Notes on the Lithological Character of some rocks collected in the Yukon District and adjacent Northern parts of British Columbia, by Frank D. Adams. Annual Report of the Geological Survey of Canada 1887.

of mica have been developed. Similar rocks are found on other parts of the coast, both in the north and south, and from a lithological point of view, they much resemble the Triassic argillites of the Queen Charlotte Islands, though no fossils are found at this place. The ridge behind the town of Wrangell is chiefly composed of rather fine grained grey granite, which is probably intrusive and may have been the cause of the incipient crystallization observed in the argillites. The north part of the island is formed of a similar granite, probably a continuation of the same mass." Dr. Dawson informs me that the granites all through this district seem to be more recent than the slates and that he regards the mass in question as almost certainly of eruptive origin.

The hand specimen when examined seems to show a very indistinct tendency towards parallelism of mica individuals, and when thin sections are examined there is evidence in the somewhat uneven extinction of the quartz grains as well as in the twisting of the biotite, that the rock has been submitted to pressure. It is composed essentially of quartz, orthoclase, plagioclase and biotite, with epidote, allanite, garnet, sphene, zircon and apatite, as accessory constituents. The essential constituents show nothing especially deserving of mention. The feldspars are generally fresh and frequently show a beautiful zonal structure due to growth-rings. Occasionally a distinct border with well marked granophyre structure is seen about a portion of a feldspar individual. The garnet, of which a few grains are present in most of the sections, is light brown in colour. The interest of the rock centres in the epidote with its associated allanite.

The epidote is present in considerable amount and is generally associated with the biotite. It is colourless and has rather a high index of refraction, occurring in prisms elongated, parallel to the *b* axis with a perfect cleavage parallel to the length. Examined in convergent light between crossed nicols it is seen to be biaxial, the plane of the optic axes in all cases being at right angles to the

length of the prism. In some instances the double refraction is sufficiently strong to give rise to the greenish-yellow, yellow and pink colours usually seen in thin sections of this mineral, but in others, and almost invariably in very thin sections the mineral shows the deep blue interference colours characteristic of Zoisite. It was thought at first that both minerals were present, but a more careful study of the slides showed that the blue colour was given by thinner parts of individuals which elsewhere polarize in yellow tints, the blue colour appearing as border around the little bays or cavities in the crystals to be described further on, and where, therefore, the epidote was thinner than elsewhere. Since, however, normal epidote has a sufficiently strong double refraction to give brilliant yellow interference colours even in the thinnest sections ordinarily attainable, it is probable that this is a variety poor in iron, and thus approaching Zoisite in composition, these two minerals being dimorphic, their formula being identical, except that in epidote a portion of the alumina is generally replaced by ferric oxide. The absence of the usual pleochroism in the mineral points to the same conclusion.

Associated with some but by no means with all of these crystals of epidote are little individuals of allanite. These are sometimes very small and of a more or less irregular shape, but frequently have a good crystalline form consisting of a prism elongated in the direction of the *b* axis and generally having what are probably pyramidal terminations at one extremity. The plane of the optic axis is at right angles to the longer axis of these crystals. It has a high index of refraction, possesses a distinct zonal structure and is pleochroic, the colours being as follows:—

$\mathfrak{a}$—Light yellowish brown.
$\mathfrak{b}$—Purplish brown.
$\mathfrak{c}$—Pale yellowish brown.

The light passing through the crystals parallel to $\mathfrak{a}$ is of nearly the same colour as that passing through parallel to $\mathfrak{c}$. The colour is not so intense as is usual in allanite, al-

though this may be due in part to the fact that these crystals are very small.

In two or three cases twin crystals of allanite were found. the twinning line probably being $\infty P\bar{\infty}$, in one case extinctions of 23° and 27° respectively on either side of the twinning line were observed, but none of the crystals are cut quite parallel to the clinopinacoid. The epidote, when associated with these allanites, has crystallized around them, sometimes enveloping them completely, but at other times only partially, forming what is generally a very irregular border. The allanite and epidote are probably intergrown in parallel position, but no section was found so cut that this could be actually proved. The mode of occurrence of these two minerals is seen in the accompanying cut (Fig. 1) in the upper left hand division, the epidote being represented in outline, while the allanite is black. This association of epidote and allanite has already been described from a number of localities.[1]

The epidote is remarkable, not only as occurring in very considerable amount in the granite, but also from its mode of occurrence. It is evident at the first glance that it does not result from the decomposition of the plagioclase or other constituents of the rock, as is frequently the case in much decomposed igneous rocks, since it occurs in large well defined crystals, these however seldom have a perfect form but possess a very peculiar eaten or corroded appearance, being traversed by little irregular canals and arms of another colourless mineral with much lower index of refraction. These arms are in many cases, too small to enable their character to be determined, but on careful examina-

[1] Becker, Ewald.—"Ueber das Mineralvorkommen im Granit von Striegau, insbesondere über den Orthorlas und dunkelgrünen Epidote."—Breslau.

Hobbs, W. H.—"Ueber die Verwachsung von Allanite (Orthit) und Epidote in Gesteinen."—Tschermak's Min. and Pet. Mitt., 1889, i., also Johns Hopkins University Circular, April, 1888.

Lacroix, A.—"Contributions à l'etude des Gneiss à Pyroxene et des roches à Wernerite." Bull. Soc. Min., France, April, 1889.

Tornebohm, A. E.—"Mikroskopiska Bergartstudier XII.,Epidot gneiss," Geol. For. i., Stock Forh. No. 75, 1882.

tion it is found that they are for the most part quartz, in fact arms of quartz can in many places be seen running into the epidote crystals from adjacent quartz grains, the arm and the external portion of the grain belonging to the same individual. In other places, however, these little arms were found to consist of plagioclase and to be continuous with the plagioclase associated with the epidote in the same manner as in the case of the quartz described above, probably some of them may also be orthoclase. Three of these epidote crystals are represented in outline in Fig. 1, (Nos. i, ii, iii). They were drawn with the aid of a camera lucida from epidote crystals occurring in the sections of the Wrangell Island granite. In the second one (No. ii), however, it was found to be impossible to show all the inclusions and little arms, only the largest and best defined being represented, while a number of smaller ones are omitted.

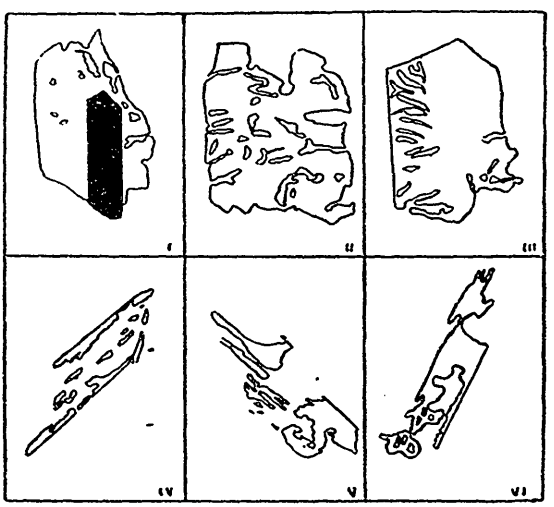

FIGURE 1.

i.—Epidote, enclosing Allanite in Granite from Wrangell Island.

ii, iii.—Epidote in Granite from Wrangell Island.

iv, v, vi.—Single individuals of Muscovite in Granite from Pelly River.

The mode of occurrence is exactly the same as that described by Dr. Geo. H. Williams in the case of the epidote occurring in the Mica Diorite from Stony Point on the Hudson River (*American Journal of Science*, June, 1888). The nearest analogy to it observed in other rocks, is the structure of the garnets in many garnetiferous gneisses. In the garnetiferous gneisses of the Laurentian System which I have had an opportunity of examining in thin sections, the garnets, although sometimes forming compact individuals, in other specimens have a structure closely resembling, and often apparently identical with that above described. This structure in gneisses and in the granite under consideration, does not seem to be due to the eating away or partial solution of crystals which originally had a perfect form, as in the quartz phenocrysts of quartz porphyries, where fragments of what were evidently once quartz crystals which have been eaten apart, can often be found lying near each other having lost their common orientation, nor are the bays which run into the epidote always or generally large and well defined like the arms of the groundmass in the quartz phenocrysts in question, but on the contrary, they are generally long, slender curving arms and little irregular canals, and are frequently found closed at the outer end, forming cavities which then apparently become filled up, leaving finally one or more minute inclusions or little points of the quartz or feldspar completely isolated in the epidote individual. In other grains these have apparently also disappeared, and a crystal free from all inclusions is the result. The epidote, like the garnets in the gneiss, presents the appearance rather of having grown into the surrounding minerals by first sending out little arm like extensions of its substance which subsequently meet one another, in this way including some of the foreign mineral which may or may not finally disappear. The few grains of garnet which as above mentioned, occur in sections of the Wrangell Island granite have this same structure.

Where an allanite crystal is enclosed in the epidote this

irregularity in structure does not extend to the allanite. The latter has the appearance of a primary mineral, around which the epidote would naturally tend to crystalize, if any were developed in the rock, the two minerals being isomorphous.

As it was necessary to carry as little weight as possible over the long stretches of country traversed by the Yukon expedition, only single hand specimens of each rock were collected, and the description given above is that of the single specimen of this Wrangell granite collected by the party. The only other specimen which I could obtain from Fort Wrangell was one kindly given to me by Mr. R. G. McConnell of the Geological Survey of Canada, which was collected by him from the slopes of the hill behind Fort Wrangell some years previously, and which proves to be a fine grained Muscovite Granite or Aplite. It occurs associated with the argillites, probably in the form of a dyke. The occurrence of this rock in the vicinity would also point to a probable eruptive origin for the granite above described. The rock is a typical Aplite being composed of quartz, orthoclase, plagioclase, and a large amount of muscovite. The muscovite is quite normal in its mode of occurrence, and shows no signs of the fretted or indented outline possessed by muscovite in the Pelly River granite to be described further on. It occasionally holds little bunches of black rutile needles, sometimes geniculated twins, and associated with these in the muscovite, a few stout little crystals were observed having a very high index of refraction and well defined crystalline form—acute double pyramids truncated by basal planes. These are probably anatase. A few grains of topaz are also present.

Granite from Pelly River, Yukon District.—The second rock, unlike that just described, was collected in the interior of the Yukon District, being found on the upper Pelly River near to its confluence with the Lewes River. The specimen is marked "61," the exact point from which it was taken being indicated on Dr. G. M. Dawson's "Map of the Yukon District and British Columbia," Sheet 3.

In his report, Dr. Dawson refers to this granite as follows: (p. 132).

"Nine miles above the confluence, by the course of the river, a great mass of impure serpentine comes out on the bank, and six miles and a half above the same place, grey granite of the usual character is again met with and appears to constitute the hills to the east of the river for the remaining few miles of its course." It is a grey muscovite biotite granite of miduum grain. There is a barely perceptible parallelism visible in the arrangement of the constituents, so that it might possibly be termed a granitic gneiss. It consists of the following minerals, quartz, orthoclase, microcline, plagioclase, muscovite, biotite, epidote, garnet, calcite, sphene and pyrite. The quartz and orthoclase constitute a large proportion of the rock, while the plagioclase, micas and other constituents are less abundant. The quartz and feldspar are sometimes broken and show uneven extinction, in fact the rock seems to have been considerably crushed, but I can see no evidence of anything like complete re-crystallization. The biotite is not very abundant and is sometimes partly altered to chlorite. The garnet, which like the sphene and pyrite is present in small amount, occurs in irregular shaped isotropic grains which are much cracked. The epidote, muscovite, and calcite, however, are of especial interest.

The epidote is the normal variety with one good cleavege at right angles to the plane of the optic axes and generally possesses a faint pleochroism, colourless and greenish yellow. It occurs occasionally in fairly perfect crystals, but is frequently found in the same curiously imperfect forms which it assumes in Wrangell Island rock. The little arms and bays which run into these epidote individuals are sometimes quartz. In very many cases, however, they are feldspar (plagioclase) as indicated by the biaxial figure and polyoynthetic twinning, the included portions being continuous and having the same optical orientation as the feldspar surrounding the epidote, being in fact, a portion of the same individual. The muscovite is rather more

plentiful than the biotite, being present in rather large amount. It has the same curiously irregular outlines as the epidote, being sometimes in very slender forms and delicate skeleton crystals and at other times in tolerably stout individuals. The little indentations which frequently form a very delicate and complicated lace work about the edge of the crystals are occupied by whatever mineral the mica happens to be embedded in, sometimes quartz, but at other times orthoclase or plagioclase, and in the great majority of cases when the little arms are so cut that they can be accurately studied, the mineral occupying them is seen to have the same extinction and to be continuous with that surrounding the mica, forming in fact, as in the case of the epidote, part of one and the same individual. Sometimes a number of little muscovite crystals situated near each other will be found to have the same orientation, although in the plane of the section there is no connection between them, in fact in one grain of feldspar, probably plagioclase, two well defined sets of small slender muscovite individuals were seen crossing one another at an angle of 55°, the members of each set extinguishing simultaneously, while a third set formed of fewer individuals also similarly oriented was arranged in a third direction cutting across these. In Fig. 1, (Nos. iv, v, vi), three occurrences of this muscovite are represented, the separated parts in each case having a common orientation.

The muscovite showing this peculiar structure is frequently found immediately in contact with biotite which shows no signs of it, nor is the muscovite a bleached biotite, for no transition stages are ever observed, though both are seen in contact along a sharp line in several cases. The biotite, however, is as above mentioned, sometimes altered to chlorite. The calcite occurs in large individuals, sometimes alone and sometimes associated in groups of two or three. They are generally irregular in shape and show the usual twinning. Like the muscovite and epidote it is frequently developed as skeleton crystals, and has been found enclosed in muscovite, in plagioclase, and in un-

twinned feldspar, presumably orthoclase. It has also been found partly surrounded by quartz, but never completely embedded in that mineral. All three minerals, muscovite, epidote, and calcite, frequently occur associated and intergrown, all having apparently a similar origin, the calcite, like the other two, apparently growing into the other constituents of the rock.

Figure 2 shows the mode of occurrence of these minerals in this Pelly River granite and their relation to the other constituents of the rock. All the little inclusions and arms in the central portion of the large muscovite crystal have precisely the same orientation as the large plagioclase individual which here bounds the muscovite on one side, having formed apparently at one time portions of the same individual.

FIGURE 2.

Section of the Granite from Pelly River × 42 diameters.

M—Muscovite. B—Biotite.
E—Epidote. P—Plagioclase.
C—Calcite.

Muscovite occurring in skeleton crystals in plagioclase in

precisely the manner described above was also observed in thin sections of a granite collected by Mr. J. B. Tyrrell of the Canadian Geological Survey at Rock Point, Lake St. Martin, Manitoba. Mr. Tyrrell states that it is, without doubt, an eruptive granite. It occurs penetrating a dark green hornblende schist through which arms of the granite run in all directions while the schist contains imperfectly developed staurolitic minerals, the result of contact metamorphism. In other similar rocks from the Lake Winnipeg district, epidote occurring in these peculiar forms was observed.

Granite from Coast Ranges, British Columbia.—The third rock is from the Coast Ranges of British Columbia, where it forms large exposures on the Stikine River not very far from its mouth. It is of medium grain, grey and porphyrtic with numerous small plagioclase crystals. It is composed of quartz, plagioclase, orthoclase, biotite and hornblende, and should be classed either as a quartz diorite or a biotite hornblende granite, according to the relative amounts of plagioclase and orthoclase present in the rock, amounts which can only be determined by a separation of the constituents by means of heavy solutions or by chemical analysis. The rock is interesting from the occurrence in it of allanite in rather large brown pleochroic crystals with well marked zonal structure which must be rather abundant, as they were found in three of the six thin sections of this rock which were prepared.

Conclusions.—The origin of the epidote and muscovite, as well as of the calcite above described, is a question of considerable interest. We may suppose these minerals to have been produced in one of three ways. They might be:—

1. Original minerals which were crystallized from a granitic magna and subsequently corroded, eaten away and partially reabsorbed as in the case of the quartz phenocrysts in quartz porphyries, or the biotite and hornblende in many volcanic rocks.

2. Minerals which have been developed during a complete re-crystallization of the original rock, owing to pressure or

some other metamorphic agency, but which did not complete their growth.

3. Minerals which have grown in the rock after its solidification, but without re-crystallization of the other constituents.

The first hypothesis does not seem to be tenable in the present case, for not only is epidote a mineral which occurs but very rarely in granites, except as a decomposition product, but a careful examination under the microscope would seem to show that, as above mentioned, the apparent corrosion of the crystals, whether epidote, muscovite or calcite, is quite different in character from that produced by the corrosion and partial resolution of a caustic magma. If the muscovite were so corroded, the biotite should also have been attacked with the removal of the muscovite molecule at least.

Further, if a crystal of muscovite were eaten away until the merest skeleton alone remained, or until the crystal had actually been separated into several pieces, it would be impossible for the entire skeleton and even the several disconnected portions to preserve exactly the same orientation had there been the slightest motion in the molten magma, and we cannot but suppose that there would be a certain amount of motion when such extensive resolution was taking place.

Moreover, as above mentioned, there is reason to believe from their similarity in mode of occurrence and close association, that the epidote, muscovite and calcite, have had a similar origin, but we would hardly expect calcite as an original mineral in so acid a rock, much less crystallized in large individuals in actual contact with quartz.

Neither does there seem to be reason to believe, after a careful study of the thin sections of the rock, that anything like an entire crystallization of the granite has taken place as supposed in the second hypothesis. Were it not for the epidote, muscovite and calcite, the rocks would be considered normal granites probably somewhat crushed. Their character is that of eruptive rocks, not of crystalline schists.

The third hypothesis, namely that the minerals in question have been developed in the rock after its solidification, perhaps by dynamic action, and indicate a first stage of metamorphism but without complete re-crystallization, is not nearly so startling as it might seem at the first glance. We have examples of such a development in a number of cases, and it may be that the growth of minerals in this way is a much more common factor in development of crystalline schists than is generally supposed. It is what takes place in almost every case of pseudomorphism by alteration.

"All the rocks situated at considerable depths in the earth's crust must be subject to great pressure resulting from the weight of the superincumbent masses. Under these pressures, liquids and gases may be made to penetrate between the molecules of the solid crystals. The evidence that such permeation of solid crystals by liquids and gases has taken place is overwhelming. In the words of Van der Waals, 'All bodies can mix with one another when the pressure exceeds a certain value.'"[1] That by the action of such solutions secondary minerals may be developed is a very reasonable supposition, and that they have been so developed in the rocks at present under consideration seems to be the explanation which best accords with facts observed.

As a good example of the growth of one mineral in and through another after the solidification of the rock of which it is a component part, the development of wollastonite in the plagioclase, of a plagioclase-pyroxene rock from Brittany described by Dr. Whitman Cross may be cited.[2]

Another example is the alteration of quartz into steatite described by Dr. Weinschenk.[3] In this case the steatite was found to grow in the crystals of quartz which were traversed by very fine capillary cracks, thus forming a net work

[1] Chemical changes in rocks under Mechanical Stresses" by Prof. J. W. Judd, Journal of Chemical Society. May, 1890. (p. 410).

[2] "Studien über bretonische Gesteine Tschermach's Min. u. Pet. Mittheil, 1880, iii.. 369."

[3] "Ueber die Umwandlung des Quarzes in Speckstein." Zeit. für Kryst, 1888. (p. 365).

enclosing angular bits of quartz which were finally completely altered to soapstone. It was found, moreover, that the process could be repeated artificially. By boiling finely powdered rock crystal in a solution of carbonite of potass and sulphate of magnesia, the quartz grains were found to become corroded and converted along their outer portions into a scaly aggregate, rich in magnesia, undecomposed by aqua regia, and having the optical properties of talc.

The development of andalusite and staurolite in contact zones might in many cases also serve as an excellent example of this mode of growth, since in many cases such slates have not undergone complete re-crystallization.

Lastly, there are the double zones of pyroxene and hornblende, which have been described as surrounding the olivine where it would come in contact with the plagioclase in so many gabbros from various parts of the world. If these "rims" are really the result of dynamic action as has frequently been asserted, they afford one of the best instances of the growth of one mineral in another in a solid rock, for here we have the hornblende in many cases occurring in the most delicate acicular crystals, distinctly growing out into the large unfractured plagioclase crystals on all sides. In the norite from Lake St. John,[1] however, where these zones are especially well developed and which is the occurrence that I have been able to study most carefully, there is practically no evidence of great dynamic action, and the zones seem to be due to the caustic action of the molten magma before the solidification of the rock. There is, however, one difference between occurrences described in this paper and those described by Cross and Weinschenk, namely, that in these Yukon rocks the minerals in question penetrate and apparently grow into, not one mineral but several minerals.

This third hypothesis seems, therefore, to be the one which best accounts for the very peculiar mode of occur-

[1] "On the presence of zones of certain Silicates about the Olivin occurring in Anorthosite rocks from the River Saguenay." American Naturalist, Nov., 1885.

rence of these minerals in the rocks described in this paper. It is hoped that similar occurrences may present themselves in more accessible localities so that a more thorough study of them may be made, since, if it could be shown that secondary minerals are commonly developed in this way much light would be thrown on the nature of the complicated processes at work during the metamorphosis of rocks.

Philip Henry Gosse.

By Carrie M. Derick, B.A.

One of the earlier explorers in the rich field of Canadian natural history, and a man who did much towards the popularization of scientific knowledge, the late Philip Henry Gosse, has been excellently portrayed in a recent biography by his son, the London poet, who not only brought to his task rare literary ability, but had at his command a great mass of biographical material collected by his father. From his "Life"[1] the materials for the following sketch have been obtained.

In their married life, Thomas and Hannah Gosse presented a curious picture of incongruity. He was a wandering miniature-painter, shy and unambitious, not an inspired artist but a good draughtsman with a keen appreciation of the beautiful. His wife was strikingly handsome, an uneducated, passionate woman, whose strong practical nature made her the ideal mainstay of the family under the most trying circumstances.

Their second son, Philip, was born in Worcester in 1810. But his parents soon removed to Poole, where his childhood was passed. He obtained the rudiments of an education in an ordinary day-school, but the truly educative influence of these early days was constant association with his aunt, Mrs. Bell, who was a woman remarkable for her devotion to

[1] The life of Philip Henry Gosse, by his son Edmund Gosse, London, Keegan, Paul, Trench, Trubner & Co., 1890.

science, and filled with a passionate love of nature, with which she succeeded in so imbuing her nephew that scientific research remained for him the one unfailing charm of his existence.

Mrs. Gosse, though herself uneducated, appreciated the talents early displayed by her son, and made strenuous efforts to advance his education, sending him for a short time to the Blandford School, where he received the only classical training he ever enjoyed.

The extreme poverty of his parents forced them, in 1814, to place him in a large mercantile house in the Newfoundland trade. His duties were not heavy and he found much time for miscellaneous reading. The magic of romantic poetry took him captive. His chief amusement, however, was zoology, and from every source he added to his information in this department, searching for specimens, copying plates, reading descriptions. When he was sixteen, a travelling menagerie aroused in him one of the strongest passions of his life, a love of tropical lepidoptera. The collection contained one of the grand silver-blue butterflies of South America, and "this created an extraordinary longing in the boy's heart to go out and capture such imperial creatures for himself." The gratification of this desire was long delayed but in 1827, an appointment in a counting-house in Carbonear, Newfoundland, enabled him to begin his studies of the insect-life of the New World.

The next five years were spent in work uncongenial but not arduous. A visit of six weeks to his old home was his only holiday, but his opportunities for pursuing his studies were many. The period is very important, marking as it does, his transition from boyhood to manhood, and the development not only of his scientific tastes but of that peculiar religious fervor which characterized him throughout his life.

His studies were made without the aid of books or proper apparatus, so that he was largely thrown upon his own resources. Turning to nature, the great fountainhead, he so assimilated her teachings, that he was afterwards the better

able to profit by the records of the researches of others.

His business duties were uninteresting, the comparatively minute and inconspicuous character of the insects of Newfoundland failed to satisfy him, and his discontent was further increased by the social gloom that darkened the life of the colony. Little, therefore, was needed to make him sever his connection with Carbonear. Many circumstances combined to turn his thoughts towards Canada. It had the fascination of the unknown, the romance of the "forest primeval," its riches were described in glowing terms by emigration agents, its insect life was glorified in a popular work which fell into his hands. He felt destined for a successful farmer, skill being of secondary consideration in a land so wonderfully rich. Confident of success, he wrote to his brother asking him to join him in an Arcadian life, saying: "We would have all things in common; we could entomologize together in the noble forest, and, in the peaceful and happy pursuits of agriculture, forget the toils and anxieties of commerce. Not that our lives will be idle, for we shall have to work with our own hands, but there will be the pleasing and stirring consciousness that our labor is for ourselves, and not for an unkind, ungrateful master. The land where I go is exceedingly fertile and productive, and, with little more than half the toil necessary on an English farm it will yield not only the necessaries, but even the luxuries of life." At first, he intended to go to the shores of Lake Huron, but acquaintances in Quebec dissuaded him, and he made an excursion to Compton where he finally decided to buy a partially cleared farm; doubtless induced by the profusion of butterflies. Long afterwards, he wrote in regard to his settlement at Compton, "I felt and acted as if butterfly-catching had been the one great business of life."

Ploughing and sowing, teaching in the district schools, failing in all his attempts, he nevertheless managed to retain his rosy dreams for many months. Rejoicing in the beautiful scenery, revelling in the novel riches of the animal life, he forgot his troubles and enthusiastically

studied not only the insects, but all the natural objects, keeping copious notes which he afterwards embodied in the "Canadian Naturalist," his first published book. "The first encouragement from without which came to him in his career," says his biographer, "the earliest welcome from the academic world, arrived in the spring of 1836, in the modest shape of a corresponding membership of the Literary and Historical Society of Quebec. This was quickly followed by a similar compliment from the Natural History Society of Montreal. Those elections indeed conferred in themselves no great honour, for these institutions in those early colonial days, were then in their boyhood and too inexperienced to be critical in their selection. It was none the less a great gratification to the young man. He contributed papers to the *Transactions* of either societies, sending to Montreal a *Lepidoptera Comptoniensa*, and to Quebec an essay on *The Temperature of Newfoundland* and *Notes on the Comparative Forwardness of Spring in Newfoundland and Canada.* He also sent to the new museum at Montreal a collection of the lepidoptera of Compton." But poverty, fatigue, ill health and a sense of failure at last overwhelmed him. He yielded to his misfortunes and sold his farm, blaming the country for the sad ending of his bright hopes.

One turns with relief to the record of his scientific life. The "Canadian Naturalist," was intended by him to be a kind of "Naturalist's Calendar," setting forth the praise of God and showing the delights he felt in study. Unfortunately, it is presented in the form of a dialogue between a father and a son, which is sometimes tiresome, always rambling, but which notwithstanding its crudity, shows the germs of those qualities which afterwards made Gosse a popular and useful writer:—"picturesque enthusiasm, scrupulous attention to truth in detail, a quick eye and responsive brain, and a happy gift in direct description." It was one of the earliest books to call students from the laboratory and museum to the woods and streams and bid them "observe the living heart of nature." Appearing at a time when little was known of the natural wonders and re-

sources of Canada, it was a valuable addition to the scientific knowledge of the land, and, doubtless, inspired some of its sons to undertake a more systematic study of the natural history of their native country.

Looking with longing eyes towards the semi-tropical life of the Southern States, in 1838 Philip Gosse left Canada, the only trophy of his struggles there being a large cabinet of insects. The next year he spent in Alabama, teaching a small school for the sons of planters. In his leisure, he continued his favorite pursuits in the midst of delightful natural surroundings. In a letter of July of that year, he says:—"An eye accustomed only to the small and generally inconspicuous butterflies of our own country, can hardly picture to itself the gaiety of the air here, where it swarms with large and brilliant hued swallow-tails and other patrician tribes, some of which, in the extent and volume of their wings, may be compared to large bats. These occur, too, not by straggling, solitary individuals, in glancing over a blossomed field, you may see hundreds, including I think, more than a dozen species, besides other butterflies, moths and flies.

A rather amusing incident is related as having occurred about this time. "In Alabama the squirrel question was one of great importance in local politics. These delightfully amusing animals are unfortunately wasters of the first order; they are in the cornfield morning, noon and eve, from the time that the grain is growing in the sheath to the moment when what remains of it is housed in the barn. While Philip Gosse was at Mount Pleasant, a fellow from the north sent round an advertisement that he would lecture in a neighbouring village, and that the subject of his discourse would be to reveal an infallible preventive from the thefts of the squirrels. The announcement attracted great curiosity, and the planters assembled from all sides. A deputation started from Mount Pleasant itself, and Philip Gosse, thinking to hear what would be of interest to a naturalist, was of the party. A considerable entrance fee was charged but very willingly paid. At last the room was full, the

doors closed, and the orator appeared on the platform. He began by describing the depredations of the squirrels, the difficulty of coping with them, and various other circumstances with which his audience was familiar. He was a plausible fellow and seemed to have mastered his subject. At last he approached the real kernel of the question." "You wish," he said, "to hear my infallible preventive, the absolute success of which I am able to guarantee. Gentlemen, I have observed that the squirrels invariably begin their attacks *on the outside row* of corn in the field. *Omit the outside row*, and they won't know where to begin!" The money was in his pocket; he turned and vanished by the platform door; his horse was tied to the post, he leaped into the saddle and was seen no more in that credulous settlement. The act was one of extreme courage as well as impudence in that land of ready lynching, but my father was wont to say that after the first murmur of dissatisfaction and words of anger, the disappointed audience dissolved into the most good-humoured laughter at themselves."

Notwithstanding this delightful field for study and the kindly, rough-and-ready hospitality of the planters, after the first few months Gosse was utterly miserable. As an Englishman, his prejudices clashed with those of his companions, and though no humanitarian, he was sickened by the horrors of slavery, which even to him, seemed indispensable in Alabama. In January, 1839, he, therefore, abruptly took his departure, seeking after a twelve years' exile, his life-work in his childhood's home. He was reduced to extreme poverty, and knew not where to turn, when his cousin, Prof. Bell, recommended the manuscript of the "Canadian Naturalist" so highly to Mr. Van Voorst, the publisher, that he offered one hundred guineas for the work. This offer was accepted with joy, and never again in his career as an author was Philip Gosse reduced to such straits. The next few years were full of intellectual effort, but little of his work during this period was published. Two books, however, "An Introduction to Zoology," and the "Ocean," written for the Society for Pro-

moting Christian Knowledge, opened his eyes to the fact that he was destined to be a popular author. "The Ocean" showed a great advance in literary style, and was fully illustrated by the author himself who, without imaginative power, was a correct and minute reproducer of animals and plants.

Towards the close of 1844, a pleasant break occurred in the monotony of his life. He was sent upon an exploring expedition to Jamaica, a land at that time almost unknown to naturalists. The two following years were spent in a careful, thorough investigation of the ornithology of that island. During his stay he made many important contributions to the science of zoology, proving two hundred species of birds to be indigenous to the country, and discovering twenty-four new species of mammalia, reptiles and fishes. His "Naturalist's Sojourn in Jamaica" is probably the most delightful of his books. Full of lovely descriptions of the picturesque scenery of the island, it also shows his life there to have been crowded with scientific incident and valuable experiences. A more technical record of his work is found in "The Birds of Jamaica," written shortly after his return to London; but, though well received by those best qualified to judge of its merits, the book was a financial failure.

His religious life was always intense and of that stern character which brooks no compromise with the world. About this time, therefore, becoming dissatisfied with Methodism which he considered to have fallen from its former high estate of unworldliness, he connected himself with the "Plymouth Brethren." At these meetings, he frequently met Miss Emily Bowes, whom he married in 1848. She was a woman of mature mind and sober tastes; of great tact and wisdom, and during the nine years of her married life she did much towards developing the gentler side of her husband's character, rendering him less shy and reserved, more sympathetic and genial. While sharing his religious views, she exercised an influence over him opposed to his naturally stern and fanatical temperament.

The first year of their married life must have been one

of self-repression difficult to her social, cheerful nature, for Philip Gosse's "ideal of life was to exist in an even temperature of domestic solitude, absorbed in intellectual work, buried in silence." However, as time passed on, the two grew nearer together and daily became more harmonious in feelings and tastes.

In 1849, their son Edmund was born. But an event of far greater interest to Gosse marked the year for in June, "he made his first independent examination of a rotifer under the microscope, and the date may be worth noting, as that of the opening of one of the most important of all the branches of his labours. The extreme ardour with which he took up subjects sometimes wore itself out rather rapidly. He grew tired of birds, afterwards he grew tired of his once well-beloved sea-anemones. But in the rotifers, the exquisite little wheel animalcules, whose history he did so much to elucidate, in these he never lost his zest, and they danced under his microscope when he put his faded eye to the tube for the last time."

For the last five years Gosse had been leading a life of severe work, almost without social interests and unbroken by holidays. Its monotony proved injurious to his health, and he consequently left London in 1852 and for a time established himself at St. Marychurch, South Devon. He remained there long enough to develop the idea of the marine aquarium, and to carry on the researches described in "A Naturalist's Rambles on the Devonshire Coast." After a few months however the climate proved enervating, and he removed to Ilfracombe, where he threw himself with ardour into the work of exploration and made several discoveries recorded in "The Devonshire Coast."

The chatty style of his books seems to have suggested the idea that he might prove a popular lecturer, and though he had never attempted such a thing, in 1853 he consented to make a few remarks about sponges which he was studying at the time. He illustrated his lecture with large drawings in chalk upon the blackboard, and the success of the novel experiment was such that he continued lecturing for several years.

In 1854, Gosse gave to the world "The Aquarium," a delightful record of eight months hard work on the Dorsetshire Coast, where he had been collecting material for the aquaria of Regent's Park. The volume was reviewed by Charles Kingsley who subsequently expanded the review into that charming little book "Glaucus," the pages of which are full of the praises of Gosse, his recently acquired friend. Gosse further extended his acquaintance with the English coast by a visit in 1854 to Tenby in Pembrokeshire. "Its honeycombed rocks and weedy basins" made his work there uniformly brilliant and successful, and a graphic account of his experience is given in "Tenby," a book which displays more than any other his "air of taking us upon his knees like a grandpapa."

He was elected a "Fellow of the Royal Society" in 1856, and his treatise on the "Manducatory Organs in the Class Rotifera," published in the Society's Transactions, brought him into further notice in scientific circles.

But the joy of success was soon dimmed by a great sorrow. Emily Gosse, while helping her husband, attending to household duties, and occupied with the writing of popular Gospel Tracts, had been slowly failing, and in February 1856 she died. The loss of this noble woman and true wife marked a crisis in her husband's career. Every year her influence had become more apparent, and had added to the brightness of their life; but now Gosse became more reserved than ever, and withdrawing to Sandhurst near St. Marychurch, he made there his solitary home.

Given up to morbid musings and in a state of mental exhaustion, he turned his thoughts towards evolution, a subject to which previously he had paid but little attention. In 1855 he had been presented to Charles Darwin, and had, at once, yielded to the fascination of his simple, cordial nature. For some years he continued in correspondence with him, helping him by investigations and memoranda which tended to strengthen those evolutionary ideas, destined to stand opposed to his dearest beliefs. Gosse was not a philosophical thinker, but a minute observer and accurate

describer of facts, and for sometime he did not concern himself with the theories developed from the details he furnished. At last, however, his conscience forced him to enter a protest against the hypothesis of evolution. "The current interpretation of the Bible lay upon his judgment with a weight he could not throw off. Therefore, leaving his own field of research, he entered the list with scientific philosophers to his own discomfiture and the regret of his friends."

"Omphalos" was an attempt to reconcile the six-day theory of creation with the facts of geology. His theory was this: "Life is a circle, no one stage of which more than another affords a natural commencing point. Every living object points irresistibly to the existence of a previous living object of the same kind. Creation, therefore, must mean the sudden bursting into the circle, and its phenomena produced full-grown by the arbitrary will of God, would certainly present the stigmata of a pre-existent existence." By many examples he strives to show that this has been the case with living forms and concludes that the various formations of the earth's crust with their fossils, are not records of past ages teeming with strange life, but mere marks upon the surface of a world, full-grown from its birth, representing links in the cycle of its development which had no existence except in the thought of the Creator.

His argument is ingenious, but the book was an utter failure from the first, not even receiving the approval of the orthodox party. Kingsley's criticism voiced their feelings. In a characteristic letter to Gosse, he said: "I do fear your book has given the 'Vestiges of Creation' theory the best shove forward it has ever had."

The work, nevertheless, served a good purpose in removing the author's depression. He returned with enthusiasm to his proper sphere of observation and gave to the world in 1860, "A History of the British Sea-anemones and Corals." As if for recreation, he then turned to the poetic side of nature, and his "Romance of Natural History" has, perhaps, more purely literary merit than any of his other

writings, and still possesses a charm for readers long accustomed to popular works on science.

A kind of inertia had begun to creep over Gosse. One by one, he had dropped his old acquaintances, and daily retired more within himself. In 1860 however he married again, and Miss Brighton, who became his second wife, proved the good genius of his home.

Orchids and coloured stars now became the objects of his devotion. In 1875 he wrote: "In enthusiasm, in the zest with which I enter into pursuits, in the interest which I feel in them, even in the delights of mere animal existence, and the sense of the beautiful around me, I feel almost a youth still."

His latter years were passed in the enjoyment of the new hobbies and of the old ones revived. Butterflies and rotifers again occupied his attention; and at the close of his career, he had the great pleasure of sharing in the compilation of Dr. Hudson's well-known work on "The Rotifera." But the end of his labours was fast approaching. One night, while searching for double stars, he took a severe cold which resulted in his death on August 23rd, 1888.

His works live after him and in them is found the fullest expression of his mind and character. His reserved and unsympathetic nature made it difficult for him to reveal himself to those about him. His friendships, therefore, were ephemeral. Even Charles Kingsley tired of constant efforts to come into closer touch with one entrenched behind an impenetrable wall of reserve. His peculiar religious views increased his isolation, but all who knew him respected him for his rigid adherence to his sacred beliefs, for his pure heart, and his reverential faith.

Of him, as a careful student of the details of science, too much can hardly be said. "His extreme care in diagnosis, the clearness of his eye, the marvellous exactitude of his memory, his recognition of what was salient in the characteristics of each species, his unsurpassed skill in defining those characteristics by word and by pencil, his

great activity and pertinacity, all these combined to make Philip Gosse a technical observer of unusually high rank."

Notes on the Flora of St. Helen's Island, Montreal. [1]

By D. P. Penhallow.

In the latter part of June of the present year, a visit was paid to St. Helen's Island, not so much in the expectation of discovering any striking features in the flora of that delightful park, as for a quiet afternoon's enjoyment. It was, therefore, a matter of considerable surprise to find not only a rather rich flora for so small an area, but several species not found elsewhere or but rarely, growing in considerable abundance. Mr. Henry Mott has recently drawn my attention to a little book on St. Helen's Island, by A. Achintre and Dr. J. A. Crevier, [2] in which an account of the plants is given. The list comprises ninety species for the entire season, a number probably much below what would actually be found by careful examination. So far as we are aware this is the only list published up to date. It is much to be hoped that the short list now given may be extended and made complete in the near future. It comprises some plants not noted in the list above referred to.

It may be noted that the peculiar situation of the Island, surrounded as it is by a large body of water, undoubtedly tends to more equable conditions than obtain on the main land, and hence favor the establishment there of species which might not be found elsewhere in the neighborhood of Montreal. The former occupation of the Island as a military post by the British troops, would also serve in large measure to account for the presence of several species which do not flourish elsewhere.

As we follow the main walk leading from the landing to the band stand, and about two thirds way across the Island,

[1] Contribution from the Botanical Club of Canada.

[2] L'Isle Ste. Helene, passé, présent et avenir, par MM. A. Achintre et J. A. Crevier, M.D., Montreal, des ateliers du journal *Le National*, 1876.

several species of the nettle tree (*Celtis occidentalis*, L.) will be observed. From this point to the band stand and as far beyond as the entrance to the fort, numerous specimens will be found. The only other locality near Montreal, where this species occurs, is at St. Anne's. On the road from the station to Dr. Girdwood's, and about half way to the latter place, a number of fine-trees may be seen on each side of the highway. Again, about two miles beyond, near Mr. Forget's, there are several more trees.

The three thorned acacia (*Gleditschia triacanthos*, L.), is found within the fort, near the old officers' quarters. The trees are fine specimens and stand in a row where planted for ornamental purposes. While this species is commonly cultivated in Southern Ontario, it is but rarely found in Quebec, the only other locality known to me being Cote St. Antoine.

The other trees found are chiefly those common to the vicinity of Montreal. They embrace the common beech (*Fagus ferruginea*, Ait.), white oak (*Quercus alba*, L.), an occasional specimen of the white hickory (*Corya alba*, Nutt.), one specimen of black walnut (*Juglans nigra*, L.) This tree is never found in Quebec in the wild state, and but few instances of its occurrence in cultivation here are known to me. At the Botanic Garden, at the top of Cote des Neiges hill, are one large tree and two small ones, all apparently thrifty.

White birch (*Betula populifolia*, Ait.), sugar maple (*Acer saccharinum*, Wang.), and silver maple (*Acer dasycarpum*, Ehrh.), the latter planted along the road for shade purposes, are abundant, as also are the American basswood (*Tilia americana*, L.), white elm (*Ulmus americana*, L.), and butternut (*Juglans cinerea*, L.) Slippery or red elm (*Ulmus fulva*, Michx.), and English elm (*Ulmus campestris*), are met with occasionally.

Of the smaller trees and shrubs, the hawthorns, so abundant everywhere about Montreal, are represented by *Cratægus coccinea* and *Cratægus tomentosa*. The round leaved cornel (*Cornus circinata*, L'Her.), common elder (*Sambucus racemosa*, L.), choke cherry (*Prunus Virginiana*, L.), sumac

(*Rhus typhina*, L.), are all common. The common lilac (*Syringa vulgaris*) and buckthorn (*Rhamnus cathartica*, L.), are found near the old officers' quarters, where they were evidently planted for ornamental purposes. The common mountain maple (*Acer spicatum*, Lam.), is quite common through the woods.

The other plants found present no other features of interest beyond their representation there, as shown in the following enumeration:—

Acer dasycarpum, Ehrh.
" *saccharinum*, Wang.
" *spicatum*, Lam.
Achillæa millifolium, L.
Ampelopsis quinquifolia, Michx.
Anemone virginiana, L.
Aquilegia canadensis, L., very common.
Archangelica gmelini, D C., abundant.
Artemisia vulgaris, L., very common.
Arctium lappa, L.
Asclepias cornuti, Decaisne, very common.
Aspidium filix-mas, Swartz.
Betula populifolia, Ait.
Carya alba, Nutt.
Celtis occidentalis, L.
Cnicus arvensis, Hoffm.
Cratægus coccinea, L.
" *tomentosa*, L.
Cratægus oxycantha, L. Introduced here for ornament. One of the few places about Montreal where it has become established.
Cornus circinata, L'Her.
Cynoglossum officinale, L.
Erigeron philadelphicus, L.
Fagus ferruginea, Ait.
Geranium maculatum, L.
Gleditschia triacanthos, L.
Impatiens fulva, Nutt.
Inula helenium, L., very common.
Juglans cinerea, L., occasional.
" *nigra*, L., rare.
Lithospermum officinale, L., rather common.
Menispermum canadense, L.
Onoclea sensibilis, L.

Pastinaca sativa, L.
Plantago major, L.
Potentilla anserina, L., very common.
" *norvegica*, L.
Prunus virginiana, L.
Quercus alba, L.
Ranunculus acris, L.
Rhamnus cathartica, L. Introduced, but apparently spread from the original location.
Rhus typhina, L.
Rosa blanda, Ait.
Rubus odoratus, L.
Rumex crispus, L.
Sambucus racemosa, L.
Sanguinaria canadensis, L.
Scrophularia nodosa, L., very abundant within the fort's limits.
Solidago canadensis, L.
Syringa vulgaris,
Taraxacum dens-leonis, Desf.
Tilia americana, L.
Trifolium repens, L.
Typha latifolia, L.
Ulmus americana, L.
" *campestris ?*
" *fulva*, Michx.
Urtica gracilis, Ait.
Verbascum thapsus, L.
Vicia sativa, L.

Annual Presidential Address.

By Prof. Bernard J. Harrington.

I suppose that most of us have at some time stood at the stern of an Ocean steamship and gazed back at the great expanse of water left behind, and the long line marking the vessel's course. Perhaps, too, we have gone forward and looked out upon the stretch of waters ahead, wondering as to the future calm or storm, or endeavouring to peer through rising mists and see the light on some distant headland. So we, as a Society may—and I think with advantage—from time to time, look backwards and then forwards, endeavouring to learn from the past lessons that may help us in the

future. I am not one of those who delight in calling attention to past failures, or who rejoice in gloomy forebodings as to the future. Nor would I, on the other hand, paint in golden hues what would be more accurately depicted by neutral tint. Hopefulness is an essential element of success in such a Society as ours, but croaking is not the parent of hopefulness, and exaggeration invariably begets disappointment.

The Natural History Society of Montreal is now 64 years old, and considering the difficulties with which it has to contend, the mere fact of its continued existence is something to be proud of. Like most organizations of the kind it has had its ups and downs; but on the whole its course has been one of progress. Beginning in 1827 with 26 members it now numbers, apart from corresponding members, 222. Then its property was entirely prospective, while today it is entirely free from debt, owns a building which originally cost nearly $11,000 apart from the land, and is now worth a much larger sum. It has brought together large and valuable collections representing different departments of natural history, ethnology and archæology, and a library containing over 3,000 volumes, many of them of very great value to the scientific man. I refer more particularly to the bound series of scientific journals and the transactions of many learned societies.

But while our Society was founded in 1827, its true life dates from 1857, when it adopted the "Canadian Naturalist and Geologist" as its organ of publication. It will be remembered that this journal was begun in 1856 by the late Mr. Elkanah Billings, at that time a barrister at Ottawa. The first volume was published by him, but on being called to Montreal to occupy the important position of Palæontologist to the Geological Survey, the continuance of the "Naturalist" was assumed by our Society. In 1884, owing to circumstances which it is unnecessary to detail here, the title of the journal was changed to that of the "Canadian Record of Science," under which name it has been most ably edited by Prof. Penhallow. Altogether we have pub-

lished 21 volumes with an aggregate of nearly 10,000 pages. Scientifically, the value of these pages is very great, and, but for our Society, a large proportion of the information which they contain would have been lost to Canada and the world. To-day, anyone working at Canadian science must make frequent reference to them, and the more he studies them the more he will be impressed with their value. This, at least, is my experience. Their usefulness, however, would be greatly enhanced by a general and properly classified index, and I may perhaps, be allowed to suggest to the incoming editorial committee the advisability of preparing and publishing one.

Our original constitution states that "the chief object of the Society shall be the investigation of the Natural History of Canada." According to the original By-laws, too, we find provision made for a Committee of Publication, to whom "all essays read before the Society shall be referred, to the end that they may select those which may appear of sufficient value to cause them to be published."

Great importance was obviously attached to the publication of papers giving the results of original work, and this, it seems to me, is really our most important function, being the most lasting in its results and serving to connect us with the scientific world outside.

There is, however, another portion of our work to which I attach very great value. I refer to our free popular lectures—the "Somerville Course." Having been Chairman of the Lecture Committee for the past eight years, I have come to feel a deep interest in this department of the Society's work, and it is not without much regret that I now—as I must—resign it to other hands.

Previous to the bequest of Mr. Somerville, we find that popular lectures under the auspices of the Society had been attempted, though not always with success. The first course was during the winter of 1832-33. In 1835, a popular course on Botany was undertaken by Dr. Hall, but had to be given up for want of an audience. In 1837, the Rev. James Somerville, Minister of St.

Gabriel Street Church died, leaving a sum of £1,000 currency to maintain an annual course of lectures in connection with the Society. Exactly how this money was utilised at first I am not aware, but we all know that eventually it was put into our building, the Society, however, making itself responsible for the provision of an annual course of free lectures. I do not say that this appropriation of the money was unwise, but I have long felt it to be the duty of this Society to raise an equal, or if possible, a very much larger sum, the interest of which could be made available in connection with the lectures. Had the Society means at its disposal, the usefulness of the lecture work could be greatly extended. It would, for example, be possible to secure from time to time, services of distinguished lecturers from the neighbouring republic, and to hire a larger hall than ours for special occasions. During the past few years we have been able to induce scientific men to come from other cities of the Dominion to address us, but have been unable to offer them anything but their travelling expenses in return. Nor is it right that gentlemen from our midst should be called upon so often, not only to lecture without remuneration, but to pay the cost—often considerable—of the materials used to illustrate their lectures.

It is to be regretted that our own hall is not larger; for on lecture evenings it is often overcrowded, and for the past five years we have been afraid to advertise our courses fully, knowing that it would be impossible to accommodate larger audiences.

The interest shown by the public in our lectures convinces me that they are one of the needs of our growing city, and I sincerely hope that before long it may be possible to greatly expand the work. During the past five years we have done what we could to improve and systematise the courses, and in this we trust we have not wholly failed.

Apart from our Somerville lectures, it would perhaps be worth while to try short courses on special subjects by one lecturer. Such courses have recently been tried in the

Manchester Museum, and have, we are told, been fairly attended. A course of evening demonstrations by the keeper in the museum there has also been attempted, but has been given up as it did not meet with satisfactory encouragement.

We are sometimes told that our Society does little for the public; but such a statement can only arise from ignorance. Much more I admit might be done, but if we measure what has been accomplished by the support which we have received from the apathetic public of this city, then I say there is little ground for complaint on the part of the public. Let any fair-minded person study our Records with care, and I believe he will admit that they contain a history of self-sacrificing endeavour to benefit the community and advance the cause of science. If we have failed to accomplish very grand results, it must be borne in mind that all along we have had to struggle for bare existence, that our work has, for the most part, been done by men harassed with the cares of business life or worried with the ever increasing duties of modern educational or professional work.

I have referred to the value of our journal, to the importance of our lectures and museum as means of public education, but let me remind you that the inception of the Geological Survey of Canada was largely due to the energetic action of this Society in 1841; that the city owes the visits of the American Association for the advancement of science in 1857 and 1882, and of the British Association in 1884 to this Society. The Royal Society of Canada, too, holds its meeting here next week owing to an invitation from our body, and there is every reason to believe that good results will flow from this gathering. Speaking as one of the Fellows, I may say that, while I believe that Ottawa should be the permanent headquarters of the Royal Society and the place where most of its meetings should be held, an occasional gathering elsewhere will be beneficial both to entertained and entertainer. It was never, however, intended that the Royal Society should be peripatetic like

the British and American Associations, of which it is not the Canadian analogue. The French Academy and the National Academy at Washington, are rather the models after which our Royal Society was formed.

The monthly meetings of the Natural History Society are its strictly scientific evenings, the Somerville Lectures its popular evenings. At the former the papers are of a technical character, and therefore, the meetings are apt to be small, though really not smaller than in the case of similar societies elsewhere, and now much larger than they have been at times in the past. If we look back at the Records of 1844 and 1845, we read of meetings with an attendance of six, five, or even four members. In 1848, again, after the Society had been in existence for more than 20 years, we find the council regretting that at several of the ordinary meetings business could not be proceeded with for want of a quorum.

Now the question sometimes arises, "Would it not be better to make the monthly meetings less technical—more popular?" Personally I do not think so. What we want, it seems to me, is not fewer meetings for the discussion of purely scientific questions, but more occasions for the popular presentation of science. On such occasions, I am sure that our friends of the Microscopical and Entomological Societies would be willing and happy to give us their kindly aid. Here let me say, that I regard the affiliation of the latter society with ours as a step in the right direction. In a community like this, what is needed is concentration of energy rather than multiplicity of organizations. In connection with the subject of meetings and members, I would suggest that an effort be made to get more lady associates and to have more of them at our meetings. From remarks which I have recently heard, it does not seem to be generally known that ladies may become associate members, and that the annual fee is only $1. Additions should also be made to the number of our corresponding and honorary members, and unless we wish to be accused of holding intercourse with the spirit world the

roll of the former should be revised; for there remain upon it names of many who have long gone hence.

The recent donation to the Museum by the Rev. Dr. Campbell of a collection of British plants, and the necessity of providing a proper place for its preservation, brings prominently before our notice the fact that this Society—a Natural History Society—has no herbarium. That it once had a nucleus of a herbarium we know; and it is a disgrace that it should have been allowed to go to destruction; for special interest attached to it on account of those who contributed to its formation. I am told that it once included the Macrae collection containing 2,000 specimens, the Holmes collection of 750 specimens, 300 specimens from the neighbourhood of Edinburgh collected by the late Dr. Hall, a collection of Canadian plants made and presented to the Society by Lady Dalhousie, &c., &c.

It is not for me to enter into details with regard to the recent improvements in the museum, but I am sure that the Society is under great obligation, not only to the Honorary Curator, Mr. Brown, but to all the gentlemen who have so ably assisted him in the work of re-arrangement. In the museum too, as well as in all matters pertaining to the interests of the Society, the services of Mr. Griffin the superintendent, have been invaluable, and I hope that before long the Society may be able to make his position a much better one than it is at present.

The need of means for improving the museum and adding to our collections is, I know, deeply felt by the Honorary Curator; for while some branches of Natural History are well represented, others require great additions to bring them up to date. Take our mineral collection for example, I suppose that it is little better now than it was forty or fifty years ago.

In our library great improvements have been made by Mr. Chambers; but here again money is required. The additions consist almost entirely of miscellaneous journals and pamphlets received in exchange for the Record of Science, and while these are of great value, the library

would be rendered far more attractive if we could now and then place on our shelves, or better still, upon our table, some of the more recent books on different branches of natural history. I am sure this would be a great boon, more particularly to our younger members.

But it is easy to expatiate upon the needs of such a Society as this. Every advancing institution has ever increasing needs, and you may be sure that a society without needs is in a state of stagnation. Some of the improvements which I have suggested I had hoped to see carried out during my own tenure of office; but a year soon rolls by, and what I anxiously hoped to do I must leave to others to perform. I have so many claims upon my time and strength that I now wish to retire to the ranks of this Society, and in doing so, let me thank you heartily for the honour that you did me in making me your President, and for all the kind indulgence that you have shown me during the past year. Though unwilling longer to hold any office in the Society, I trust that indirectly I may be able to advance its interests in different ways.

In conclusion, gentlemen, let me remind you of the great satisfaction which everyone may derive from a study of nature, who, as Wordsworth puts it,

> "Never did betray the heart that loved her."

Sometimes down at the sea-side I fall in with people who tell me that the time hangs heavily on their hands—there is nothing to do—nothing to see; and yet every wave that breaks upon the beach at their feet is filled with surpassing forms of beauty, whose study would make the hours all too short.

One man some years ago asked me how I could endure the monotony of such a place as Little Metis. "I like," said he, "to go where I can see horse races every day and fire works every night." Is there pity too deep for such a man?

"The soft blue sky did never melt into his heart."

The busiest among us are those most in need of change

of thought and scene, and nowhere can more complete change be found than in the fairyland of nature. The man who perpetually harps upon one string will no doubt become familiar with its vibrations, but he will never be a musician, and he who, year in and year out, keeps his nose on the same grindstone, is not likely to become a man of much breadth of view.

I do not think that anyone's business will suffer seriously because he devotes an occasional hour to the study of nature, and if occasional "sermons in stones" can make him "see good in everything," he ought not to grudge the loss of a few dollars.

Proceedings of the Society.

The annual meeting of the Society was held on Monday the 21st. of May, Dr. B. J. Harrington in the Chair.

The following reports were read and adopted :—

Report of the Council.

Gentlemen :—The Council beg to submit their Report for 1890–91. Decided progress has been made by the Society during the session just closed, and great interest manifested in all its proceedings. Eleven meetings of Council have been held, and seven monthly meetings of the Society, at which valuable and instructive papers were read. Fourteen ordinary members, and two associates, have been elected during the year. The Museum has been re-arranged, and a considerable amount of money spent upon it; the Hon. Curator's report will contain all the details. The Library also has come in for a large share of attention and expenditure, and will be reported on. The building of the Society is in good order, and the hall has again been rented to the Congregation worshipping there. At the invitation of our Society, which has done much for the advancement of science and education in Montreal, the Royal Society of Canada will hold its next meeting in this city on the

twenty-seventh of May. This will be the first time the Royal Society has held its meetings outside of Ottawa, and a large number of men of science are expected from all parts of Canada and the United States. It would have been a source of pleasure and profit if some of the savants of England and France who were invited, could have met with the Royal Society on this occasion, but, we regret to say, the time between the invitations and the meeting was too short to permit of their making suitable arrangements to be present. The several committees which have been appointed to receive the Royal Society and the Governor General, who is to be present on this occasion, will, we are sure do everything in their power to make the meeting one of the most successful ever held by the Society, and we hope it may lead them to select other cities in the Dominion for future meetings.

The Somerville Lectures were unusually interesting this year, and the attendance large. They were six in number, and delivered in the following order:—

Thursday, March 12th—"A Popular talk about Birds." By J. M. Lemoine, Esq., F.R.S.C., Quebec.

Thursday, March 19th—"Ants—A Home Study." By Very Rev. Dean Carmichael, M.A., D.C.L.

Thursday, March 26th—"The Squid and its Relations." By Sir J. Wm. Dawson, C.M.G., F.R.S.

Thursday, April 2nd—"Coral Animals." By F. D. Adams, M.A.Sc.

Thursday, April 9th—"Domestic Pets." By Professor D. McEachran, D.V.S.

Thursday, April 16th—"Domestic Fowls." By Dr. T. Wesley Mills.

(Then follows an account of the Society's Field Day at Lachute, a report on which will be found on page 199 *et seq.* of this volume.)

The thanks of the Society have been tendered to the distinguished gentlemen who gave their valuable time for the advancement of its interests. The next Field Day will be held at Calumet on Saturday May the 30th, leaving Windsor St. depot at 9.10 a.m. by special train. It is expected

that a number of the members of the Royal Society will join the excursion. The whole respectfully submitted.

JOHN S. SHEARER,
Chairman

CURATOR'S REPORT.

To the President and Members of the Natural History Society,

GENTLEMEN:—I have the honor to report that the work of re-arranging the Museum which was commenced nearly two years ago, may now be said to have been completed—so far as space and accommodation would allow—in accordance with the plan outlined in my last Annual Report.

During the year, three large cases have been added to the main floor of the museum and occupy the centre space, and in these the mammals have been appropriately arranged, labelled, and classified by Mr. Horace T. Martin. This arrangement has allowed more space to be devoted to the birds which were previously too crowded to be seen advantageously.

A most complete classification of the Ornithological Collection has been made by Mr. Caulfield. The Canadian specimens have been kept separate, and the various families and groups so arranged as to be of the greatest scientific value to the student in quest of knowledge in this field.

The classification of the Entomological Collection has been completed by Mr. Winn, and an examination of this cabinet will show, that not only has the work been done with scientific accuracy, but also with so much neatness and taste as to reflect no small degree of credit on the efforts of this young worker.

The fossils have been arranged in the floor cases to the left of the main entrance, while the sponges and corals will be found immediately following. The Conchological collection has likewise been arranged to the right of the main entrance.

The rocks and minerals now occupy a prominent place in the gallery. Duplicate specimens have been removed and

new ones introduced. Upwards of 2,000 neat white boxes have been made wherein to arrange the specimens. To Mr. E. H. Hamilton we are indebted for the very complete re-arrangement of this important department.

The Ferrier collection of Egyptian antiquities has been completely overhauled, the cases cleaned and relined and their contents carefully re-arranged.

The Indian relics, Esquimaux implements and Mexican antiquities, together with various other specimens of an historic nature have also been re-arranged and placed in new, or renovated cases and are now to be found at the south end of the gallery, where a complete re-arrangement of the cases having been made, and due regard to light having been paid, they are now seen to better advantage than ever before. This part of the work as well as that connected with the fossils and shells has been conducted by Messrs. John S. Shearer, E. T. Chambers and myself. To these two gentlemen along with the others whose names I have already mentioned am I specially indebted for the willingness and heartiness with which they have responded to the numerous demands made upon their time, and for their valuable assistance in aiding me to carry out these important changes. In this connection it is also my pleasing duty to refer to the assistance rendered by the Superintendent, Mr. Griffin, not only to me personally, but also to those who have been associated with me in this work, and to say that Mr. Griffin by hard work and earnest endeavour, has shown an interest in the affairs of the museum, far beyond what might be termed the ordinary line of duty.

During the alterations it was found necessary to close the museum for several months, and no accurate record of visitors was kept.

The work remaining to be done consists chiefly in labeling and placing a few new specimens.

The following specimens have been added to the museum during the year:—

DONATIONS.

Musk-Rat, *Fiber Zebethicus.*

Antlers of Virginian Deer.
American Merganser, *Merganser Americanus.*
American Bittern.
Bobolink, *Dolichonyx Oryzioorous.*
American Pipits, (pair.)
Olive Backed Thrush.
Varied Woodpecker.
" " (young.)
Cedar Waxwing, (male.)
" " (female.)
Semipalmated Plover.
Buff Breasted Sandpiper.
Rose Breasted Grosbeak, (young.)
Cape May Warbler, *Dendroica Tigrina.*
Virginian Horned Owl.
Surf Duck.
American Goshawk, *Accipiter Antricopillus*, (female.)
Golden Wyandotte.
Lake Trout.
Three Cases Exotic Insects.
Caterpillar Fungus, *Sphaeria Robertsii*, from New Zealand.
Fossils from the Trenton formation.
Concretions from the Connecticut Clay.
Apatite, Renfrew, Ont.
" Templeton, Que.
Titanite, Renfrew, Ont.
Phlogopite, Templeton, Que.
Dawsonite, Montreal.
Copper Ore and Boulder from the Conglomerite vein of the Calumet and Hecla Mine, Michigan (Lake Superior.)
Nickel Ore and Nickel Matte from the Blizard Mine, Sudbury, Ont.
Specular Iron from the Republic Mine, Michigan.
Magnetic Specular Ore (Iron) from the Champion Mine, Michigan.
Japanese Tray.

By Exchange.

Buffalo Horns.

Respectfully submitted,

J. STEVENSON BROWN,
Hon. Curator.

REPORT OF THE LIBRARIAN.

GENTLEMEN:—In addition to our usual exchanges the following books have been added to your Library during the past year:—

The Mineral Resources of Ontario.
Report of the Royal Society of Canada, vol. 7.
Reports of the U. S. National Museum, 1886-87.
Proceedings of the U. S. National Museum, vol. 12.
Smithsonian Report, 1887.
Reports of the U. S. Geological Survey, 1886-87, pts. 1 and 2.
Monographs of the U. S. Geological Survey, vol. XV, pts. 1 and 2.
" " " " vol. XVI.
Fishery Industries of the United States.
Mineral Resources of the United States.
Occasional Papers of the Californian Academy of Science
Missouri Botanical Garden.
Bulletins of the N. Y. State Museum.
Proceedings of the Manchester Philosophical Society.

The following were presented by the authors:—

Birds of Greenland, by Andrews, T. Hagerup.
Physiographical Geology of the Rocky Mountain Region in Canada, by Dr. G. Dawson.
Sculptured Anthropoid Ape heads, by J. Terry.
Useful and Ornamental Stones of Ancient Egypt, by Sir W. Dawson.
Pleistocene Flora of Canada, by Sir W. Dawson and Prof. Penhallow.
Geology of Quebec and its Environs, by H. M. Ami.

The whole of the contents of the cases have been examined, the loose parts put up into volumes as far as they are complete, and 171 volumes have been bound and put on the shelves. The books have been classified in the cases as far as possible, and good progress is being made with the catalogue.

The exchanges have been duly acknowledged by the hon. librarian, and the following have been added to the list:—Bulletins of Scientific Laboratory, Denison's University; West American Scientist and Zoe, published at San Francisco; Bulletins Laboratory of Natural History State

University, Iowa; Proceedings of Academy of Sciences, Rochester; Journal of Comparative Neurology; Oregon Naturalist; Mining and Scientific Review.

Although so many volumes have been bound, there are still a large number of valuable exchanges in the German, Italian and French languages which should be bound up. There are also several volumes in paper boards which certainly deserve better covers. So many volumes of exchanges are completed in the course of the year that the Committee would suggest an annual appropriation from the funds of the Society for binding.

The attention of your Committee has been drawn to the fact, that although your library contains most valuable treatises on the different departments of Natural History and interesting records of the progress of Science in all parts of the world, it is still somewhat deficient in modern works of reference, such as are continually asked for, particularly works on Entomology, Palæontology, Ornithology, Mineralogy and Botany. The Committee would therefore respectfully suggest that such works as Dana's "Mineralogy," Nicholson's Palæontology, new edition of Gray's works on Botany, Carpenter on the Microscope, etc., be added.

Your Committee consider that as a new catalogue is being made, it offers a good opportunity to members and friends of the Society, to have included in it any number of works they may be inclined to present to the Library.

Respectfully submitted on behalf of Library Committee.

E. T. CHAMBERS.

REPORT OF THE EDITING COMMITTEE.

The past year has witnessed very gratifying progress in the work of the Editing Committee. The plan of producing biographical sketches of Canadian men of science has been continued, and will be extended in the future. The editors have felt that the increasing importance of the *Record* as a medium of scientific thought, and the possibility of securing

papers of superior merit justified a greater effort in providing increased illustrations. Their work in this direction has met with gratifying encouragement from the Society, which has placed a small sum at their disposal. The amount thus provided has again been supplemented by a donation of fifty dollars from Mr. P. S. Ross.

The exchanges have largely increased during the year, while requests for the *Record* either by purchase or exchange have been constant and of increasing frequency, showing that the position of our publication abroad is annually becoming better.

The editors would venture to remind the Society that the position now held by the *Record* has been obtained only by great effort and in the face of unusual difficulties. This publication constitutes, practically, the work of the Society and every effort should be made not only to continue it uninterruptedly, but to increase in every possible way the reputation it has now gained.

As it is my intention to now resign the position I have held as chairman of this committee from the foundation of the *Record*, I would express my indebtedness to my associates for the valuable assistance given me in this work.

Respectfully submitted,

D. P. PENHALLOW,
Chairman.

The Treasurer then presented the following statement:—

Natural History Society of Montreal—In Account with James Gardner, Treas.

RECEIPTS.		DISBURSEMENTS.	
To Balance from last year	$ 101 53	By Salary Superintendent and commissions	$ 493 35
" Rents	1,112 50	" Sundry expenses	206 83
" Members' annual subscriptions	697 00	" Light	206 14
" Walter Drake, Esq., life membership	50 00	" Fuel	160 22
" Samuel Finley " "	50 00	" Insurance	60 00
" Jonathan Hodgson " "	50 00	" Taxes	24 00
" P. S. Ross, Esq., special donation towards illustrating Record of Science	25 00	" Soil temperatures	7 50
" Government grant	400 00	" Somerville lectures	35 44
" Field day surplus	33 18	" Record of Science	509 04
" Interest	6 40	" Museum ordinary expenditure	30 00
" Entrance fees museum	8 48	" " extra ordinary "	579 85
" Balance due treasurer	40 99	" Improvements on building	156 88
		" Library	105 83
	$2,575 08		$2,575 08
		May 21, 1891—By balance due Treasurer	$ 40 99

Examined and found correct.

R. W. McLACHLAN,

J. W. STIRLING, M.B.

Montreal, May 21, 1891.

The rules being suspended, the following were elected ordinary members:—George Hague, G. Kinloch, John Macfarlane and John C. Hodgson. Mrs. Horace T. Martin was elected an associate member.

The following officers were then elected for the ensuing year:—

Honorary President—Sir J. Wm. Dawson.

President—Dr. B. J. Harrington.

Vice-Presidents—Hon. E. Murphy, J. H. R. Molson, Jno. S. Shearer, Sir Donald Smith, Very Rev. Dean Carmichael, Rev. Dr. Campbell, Geo. Sumner, Rev. J. W. Smyth and J. H. Joseph.

Recording Secretary—Frank D. Adams.

Corresponding Secretary—Dr. J. W. Stirling.

Curator—J. S. Brown.

Treasurer—James Gardner.

Members of Council—J. S. Shearer, *Chairman;* J. A. U. Beaudry, Major Latour, R. W. McLachlan, Dr. Ruttan, S. Finley, P. S. Ross, H. R. Ives, Dr. Wesley Mills and Edgar Judge.

Editing and Exchange Committee—Dr. T. Wesley Mills, G. F. Matthews, J. F. Whiteaves, F. D. Adams and Rev. Dr. Campbell.

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

Lecture Committee—Dr. T. Wesley Mills, Rev. Dr. Campbell and P. S. Ross.

House Committee—John S. Shearer, J. Stevenson Brown and Edgar Judge.

Membership Committee—S. Finley, P. S. Ross, Dr. J. W. Stirling, Geo. Sumner, J. A. U. Beaudry, R. W. McLachlan, E. H. Hamilton, J. H. Winn, E. Judge and Rev. J. W. Smyth.

The Annual Field Day.

The annual field day of the Natural History Society took place this year on the 30th of May, a date somewhat earlier than usual. This day was chosen in order that the members of the Royal Society of Canada, which had met in the city in the early part of the week and had ended its sittings the evening before, might be invited to share in the pleasures and advantages of the occasion. It was a happy thought which led to the proposal to ask the Royal Society to be the guests of the Natural History Society, even though the time was a trifle early for seeing the country in the full glory of its verdure, or for capturing so many specimens of insect life, or witnessing so large a floral bloom as usual. Such members of the Royal Society as honoured the Natural History Society with their presence on the occasion expressed themselves as delighted with the excursion, feeling that it was a pleasant variety in the duties which had engaged their attention during the week, to turn from the dry details of scientific symbols, mathematical processes and musty manuscripts, to look at a page of the grand open volume of nature. It was to them a happy rounding off of the series of events by which the reception committee of Montreal citizens had sought to make the first visit of the Royal Society of Canada to the commercial metropolis of the Dominion an agreeable one. And it added immensely to the pleasure and profit of the members of the Natural History Society and their ordinary patrons to have with them on their annual outing so many distinguished *savants*, who could help them to interpret better than usual the phenomena of nature.

Letters of apology from the President of the Royal Society, Very Reverend Principal Grant, D.D., and others were read, regretting their inability, owing to previous engagements and the necessity they were under to leave the city, to accept the invitation of the Natural History Society. But there were a good many of the invited guests present, among others Monseigneur Tanguay, Prof. Prescott, of the

American Association for the Advancement of Science; Prof. Bailey, of Fredericton; Prof. Macoun, of the Geological Survey; Prof. McKay, of Halifax; Professors Penhallow, Johnston, Murray and Dr. Wesley Mills, of McGill College, Mr. Geo. Murray, of the High School; Revs. Dr. Patterson and Withrow, Thos. McIlwraith, Esq., of Hamilton, one of the great ornithologists of the continent; Jas. H. Coyne, Esq., of the Elgin County Pioneers; H. Ami, Esq., of the Geological Survey, and Messrs. W. D. Lighthall and A. E. Lyman, representing affiliated societies.

Among the members of the Natural History Society accompanying the excursion were Messrs. J. S. Shearer, Vice-President; Senator Murphy, Vice-President; J. S. Brown, President of the Microscopical Society; Professor Cox and Mr. Adams, of McGill College; Capt. Adams, Dr McConnell, R. W. McLachlan, S. Finley, H. T. Martin, H. McLaren, F. B. Caulfield, J. B. Goode, Edgar Judge, Hon. J. K. Ward, T. H. Carter, J. Harper, Rev. Dr. Smyth and Rev. Dr. Campbell, Vice-President. The citizens generally were represented by Aldermen Rolland, Martineau, Shorey and Griffin, Rev. Principal Barbour, Messrs. Geo. Lighthall, E. H. Hamilton, Dr. E. H. Clarke, Eugene Beaudry and others, and a very large number of ladies, who have always proved the most enthusiastic patrons of our annual field day. The excursionists filled five cars to their utmost capacity.

The place selected for this year's visit was Calumet, a station on the main line of the Canadian Pacific Railway midway between Montreal and Ottawa. At this point the southernmost ridge of the Laurentians almost touches the north bank of the Ottawa river, and a lovelier spot, or one likelier to yield a day's profitable search to the naturalist could not have been chosen. The weather proved most propitious and great was the delight of all the excursionists as the train bowled past numerous orchards white with fragrant blossoms and grassy meads dotted with the golden radiancy of the dandelion, and pastures enlivened with the brightest of buttercups. Calumet was reached at 11 a.m. and as the guests defiled from the train laden with baskets,

nets, vasculums, bottles, and the other appliances provided for the day's enjoyment or work they were met and welcomed by Mr. Brown, Mayor of the Parish, Rev. R. Hamilton, of Grenville, and other friends, who gave advice and directions as to the way in which each could best secure the end he or she had in view in coming to Calumet. The naturalists divided into three parties: The *Geologists*, under the direction of Mr. Adams and Mr. Tyrrell: the *Entomologists*, under the guidance of Messrs. Caulfield and Wynn, and the *Botanists*, superintended by Professors Macoun and McKay, accompanied by Rev. Dr. Campbell, with Rev. R. Hamilton who resides in the district as *cicerone*. A large party went off with Hon. J. K. Ward to his lumbering establishment near by, where they were entertained to a real shanty dinner. Carriages were in waiting for such as wished to drive to Grenville or Point du Chene, past the mouth of the River Rouge, and not a few took advantage of the opportunity of having a drive over the country roads. Lovers of scenery and those bent on securing sketches for their portfolios, fresh from nature, hovered around the picturesque little river, ascending to the foot of the cascade, which makes a leap of about 80 feet, but a short distance up, or climbing to the top of the hills near by, the sunny, well-wooded slopes of which tempted the more vigorous pedestrians to try their muscle, and which, when they succeeded in scaling them, afforded a prospect that was a full reward for the labour of the ascent. The broken face of the ground in the neighbourhood gave promise of much variety, especially in the vegetable and mineral products of the district, and the day's investigations made good this promise. The banks of the Rouge are well known haunts of the botanist, where his practised eye discerns a greatly mixed *Flora*, many species being found there far away from their native *habitat*, carried down from the north by the force of the current, but the fierceness with which the sun's rays beat down upon perspiring pedestrians effectually barred the progress of all but a few ardent collectors. Consequently that interesting point was not reached by the main

body of the botanical party. Yet enough was seen and noted to show that the county of Argenteuil is a very paradise for the botanist. The collections submitted in competition for the society's prize embraced not a few specimens that are comparatively rare. The excursionists reassembled at the station at 5 p.m., when prizes for the collections of the day in the several departments were adjudged, as follows:

GEOLOGICAL—*Named specimens*, Mr. F. S. Jackson, 9; *unnamed*, Mr. G. Saxe, 16.

BOTANICAL—*Named species* (1), Dr. Edward H. Blackader, 87; (2), Miss Addie Van Horne, 62; *unnamed*, Master Percy Penhallow, 52.

ENTOMOLOGICAL—*Named specimens*, Mr. J. F. Hausen, 40; *unnamed*, Mr. W. H. Adams, 145.

Before boarding the train on the return journey a vote of thanks to the Mayor, Mr. Brown, was moved and seconded, in short speeches, by Rev. Dr. Smyth and Ald. Rolland. This done the train started at 5 p.m. and reached the Windsor station at 7.30 p.m. Everything was done to promote the success of the excursion by the authorities of the C. P. Railway, whose chief engineer, Mr. Peterson, accompanied the train and formally superintended the arrangements. Light refreshments were also served by the Railway Company to the Natural History Society and its guests. Altogether the day will be marked as a red letter one in the society's annals.

THE BOTANICAL CLUB OF CANADA.

At the last meeting of the Royal Society of Canada, held at Montreal, an important measure was introduced into Section IV, looking to the promotion of botanical study and research throughout Canada. Dr. George Lawson of Hali-

fax, presented a short paper outlining the present position of botanical studies here, and pointing out the necessity of some concerted action on the part of botanists similar to that undertaken by the United States botanists in connection with the American Association, whereby greater interest in the study might be promoted, and more tangible results produced in the study of local floras. The suggestions were very heartily supported by the botanical members of the section, who forthwith organized themselves into a club under the patronage of the Royal Society, to be known as the Botanical Club of Canada.

The organization is of the most simple character, the idea being to offer the least impediment to membership by making the duties and regulations as light as possible, it being held that each member acting as a free agent, would be capable of doing the best work. The officers for the present year are:—

PRESIDENT:

PROF. GEO. LAWSON, PH. D., LL. D., F. R. S. C., Halifax, N. S.

SECRETARY-TREASURER:

A. H. MACKAY, B.A., B.Sc., F.R.S.C, Halifax, N. S.

SECRETARIES FOR THE PROVINCES:

ONTARIO: PROF. JOHN MACOUN, M.A., F.L.S., F.R.S.C., Ottawa.
QUEBEC: PROF. D. P. PENHALLOW, B.Sc., F.R.S.C., Montreal.
NEW BRUNSWICK: GEO. U. HAY, PH. B., St. John.
NOVA SCOTIA: E. J. LAY, ESQ., Amherst.
PRINCE EDWARD ISLAND: FRANCIS BAIN, ESQ., North River.
NEWFOUNDLAND: REV. A. C. WAGHORNE, New Harbour.
MANITOBA: —— BURMAN, ESQ., Winnipeg.
ALBERTA: W. H. GALBRAITH, ESQ., Lethbridge.
BRITISH COLUMBIA: DR. NEWCOMB, Victoria.

Membership is secured by the annual payment of twenty-five cents, or five years' membership for one dollar, or life membership for five dollars.

Through the various local secretaries acting under the direction of the provincial secretaries, it is hoped to stimulate a spirit of study and research among scholars in the various schools, give aid to more experienced collectors and eventually to distribute accurate data concerning the vegetation of Canada through the publications of local floras.

The RECORD OF SCIENCE has been selected by the Club as the recognized medium through which all publications will appear.

NOTICES OF BOOKS AND PAPERS.

THE GEOLOGY OF THE STATE OF MARYLAND.

There are probably few areas of the same size in which are represented so many geological formations and which also shows such a diversity in surface configuration as does the State of Maryland. The geology of the northern portion of the state and especially that portion about Baltimore has been carefully studied and accurate geological maps are nearly ready for publication. The southern portion of the state has, however, attracted less attention, although one of the finest geological sections through the tertiary to be found anywhere is that exposed along the Chesapeake, Potomac and Patuxent rivers. The strata are also very highly fossiliferous as rivaling in this respect the classic tertiary deposits of the Paris basin and we are happy to be able to state that a large collection of these fossils has recently been obtained for the Peter Redpath Museum of the McGill University. For our knowledge of the geology of this region we are principally indebted to Mr. N. H. Darton, of the United States Geological Survey, whose paper in the last volume of the Transactions of the American Geological Society (vol. ii), entitled "The Mesozoic and Cenozoic Formations of Eastern Virginia and Maryland" gives us the most complete account that has yet appeared of the geology of the "Costal Plain" in these states.

A further contribution to the Geology and Paleontology of this region is that published in a recent circular of the John Hopkins University (June, 1891) in which Dr. W. B. Clarke gives a resumé of the results obtained by the expedition recently fitted out under the joint auspices of the Johns Hopkins University, the Maryland Agricultural College and the United States Geological Survey to

examine and report on the geology, agriculture and archæology of the southern portion of the state. Dr. Clark gives a geological section across the state from the highlands of the Piedmont Plateau to the Atlantic coast, the various deposits being classified as follows;—

Cenozoic.	Recent.
	Pleistocene.
	Neocene.
	Eocene.
Mesozoic.	Cretaceous.
	Potomac.

The marked influence of the underlying formations on the soils of the country, described in this paper, is of especial interest as well as great practical importance. Referring to this Prof. Whitney, of the State Agricultural College, writes as follows. "The soils of each formation are so very characteristic and so uniform throughout that there will be little trouble in establishing the following soil types and showing the difference in the physical condition and properties in their relation to plant growth: 1, Neocene, forming the wheat and tobacco lands; 2, Eocene, the fruit and truck lands; 3, Columbia (Pleistocene), the fertile river terraces; 4, Appomatox (Pliocene?), the pine barrens; 5, Cretaceous. Mr. W. H. Holmes gives a brief description of the Kitchen-middens or great shell heaps marking the sites of ancient Indian villages or resorts at many points and some of which rank both as to mass and horizontal extent with some of the minor sub-divisions of the geological formations. A single one of these situated at the mouth of Pope's Creek is about half a mile long and 100 yards wide, the shells in many places being heaped up to a depth of ten feet. This great shell heap, overlies the miocene beds of this locality, not only in the valley of the creek, but on the slopes and summits of the hills on either side and contains in addition to the shells a great many Indian remains. About 200,000 cubic feet of these shells have been burnt into lime for fertilizing purpose. This amount, however, constituting but a very insignificant proportion of the whole.

The "oyster question" evidently attracted as much attention in Maryland in those early times as it does at present.

FRANK D. ADAMS.

Notices of Books and Papers.

Catalogue of the Fossil Cephalapoda of the British Museum, Part I, Nautiloidea. London, December, 1888. By Arthur H. Foord, F. G. S.

I.

This very handsome and important contribution to the history and classification of one of the most prolific groups of palæozoic fossils which reached us some time ago, would deserve a more lengthy notice than can be given here. Its author, well known to most of the Canadian geologists, as late assistant Palæontologist to the Geological Survey of Canada, and formerly a member of our Society, has been zealously engaged in the work which is now before us, and made it an indispensable treatise for reference. "Mr. Foord has diligently worked at the literature of the subject," says Dr. Woodward, keeper of the British Museum, "and has spared neither time nor labour in clearing up the many difficult points connected with the priority of names and in the verifying of generic and specific determinations," in all of which he has been eminently successful.

The following species from Canadian localities are described or referred to in the text, and are therefore of especial interest:—

LIST OF SPECIES FROM CANADA AND ARCTIC AMERICA.

SPECIES.	FORMATION.	LOCALITY.
ORTHOCERATIDÆ.		
Orthoceras decrescens,.....Billings.	Black River.....	St. Joseph Island, Lake Huron, Ont.
" *arcuoliratum*,..... Hall.	" "	Allumette Island, Ottawa River.
" *multicameratum*.....Emmons.	" "	Grenville, Montreal.
" *lamellosum*.....Hall.	Hudson River	Western Ontario.
" *laqueatum ?*.....Hall.	Trenton.....	Montmorenci Falls.
" *? sp. ?*	Silurian.	Griffith's Island, Arctic America.
" *arctioum*.....Foord.	"	Offley Island, Arctic America.
" *Griffithi ?* .....Houghton.	.....	
" *annulatum*.....Sowerby.	.....	
" *var. Americanum*.. .....Foord.	Niagara.....	Canada.
" *Darwini*.....Billings.	Niagara Formation....	Offley Island, Arctic America.

LIST OF SPECIES FROM CANADA AND ARCTIC AMERICA (*continued*).

SPECIES.	FORMATION.	LOCALITY.
ENDOCERATIDÆ.		
Endoceras Rottermundi..... Barrande	Black River.....	Lake Huron, Ont.
" *proteiforme*.....Hall.	Trenton.....	Montreal, Que.
" *? Ommaneyi*.....Salter.	Silurian.....	Cornwallis Island, Arctic America.
" (*? Orthoceras*) *explorator*, Billings.		
" *sp*	Calciferous.....	Mingan Islands, Que.
Piloceras Canadense..... Billings.	"	" " "
ACTINOCERATIDÆ.		
Actinoceras Bigsbyi.....Brown.	Black River.	Igloolik Island, Arctic America.
" *Belvitense*..... Whitfield.	" "	Thenalm Is., Lake Huron.
" *remotiseptum* ..... Hall, sp.	Trenton.....	Canada, probably.
" *Richardsoni*. .....Stokes.	Galena Limestone.....	Lake Winnipeg.
" *Backi*. ..... Stokes.	Niagara Group.....	Cape Louis Napoleon, Smith's Is., Dobbin Bay, Arctic America, etc.
" *sp*	" "	" "
" *Whitei*..... ..Stone, sp.	" "	Drummond Is., L. Huron.
" *vertebratum* ....Hall, sp.	" "	" " "
" *spheroidale* .....Stone, sp.	" "	" " "
" *inops ?*..... Dawson.	Carboniferous limestone	Brookfield, N.S.
Discosurus conoideus ....Hall.	Niagara Group	Drummond Is., L. Huron.
" *remotus*..... ....Foord.	" "	" " "
" *gracilis*.. ....Foord.	Niagara Group...	" " "
Huronia Bigsbyi..... .....Stokes.	" "	" " "
" *vertebralis*. .... Stokes.	" "	" " "
" *minuens* .....Barrande	" "	" " "
" *persiphonata*..... .. Billings, sp.	" "	" " "
" *obliqua* ..... Stokes.	" "	" " "
" *turbinata* .... Stokes.	" "	" " "
" *istincta*..... .. Barrande.	" "	" " "
GONIPLEOMATIDÆ.		
Septameroceras inflatum.....Billings, sp.		
ASCOCERATIDÆ.		
Poterioceras constrictum..... .....Hall, sp.	Trenton & Hudson Riv.	Montmorenci and Nottawasaga, Ont.
CYRTOCERATIDÆ.		
Cyrtoceras (*Meloceras*) *falx* .....Billings.	Black River	Allumette Is. Riv. Ottawa.
(GENUS OF DOUBTFUL AFFINITIES.)		
Jovellania Murrayi. .....Billings, sp.	Trenton	St. Joseph's Island.

II.

IBID:—Part II, 1891, Containing the remainder of the NAUTILOIDEA. The second part of this admirable work which Mr. Foord has undertaken and carried out so successfully, is an indispensable book of reference for all working palæontologists, well illustrated and with supplement. It contains 407 pages.

The following four species recorded from Canadian collections, and at present in the British Museum, (Nat. History Department) are of special interest to us, viz;—

TROCHOCERATIDÆ.

1. *Trochoceras boreale,* Foord, from the Silurian Rocks of Wellington Channel, in British Arctic America, collected by Capt. Inglefield, p. 23
2. *T Halli,* Foord, ("Lituites undatus" of Hall, Chapman, Billings and others).

   From the "Black River" rocks of Lorette, near Quebec, Canada, of which two views of a good specimen with description of this new species are given. pp. 41-44.

NAUTILIDÆ.

Trocholites planorbiformis, Conrad.

This form is recorded from the Trenton limestone of Montmorenci and Lorette, Que., which were presented to the British Museum authorities by Dr. Bigsby. Mr. Foord gives interesting notes on the early and nepionic stages of growth of the Canadian example of T. planorbiformis after which he appends a list of references to the British fossils, which have been referred by different authors to Trocholites planorbiformis, pp. 48-49.

SUPPLEMENT.

ACTINOCERATIDÆ.

Huronia, Portlocki Stokes:—From the Niagara Group of Drummond Island, Lake Huron, where Stokes obtained the specimen from which he described and figured the species in "Trans. Geol. Soc., London; Ser. ii, vol. V, pt. iii, p. 710, pl. IX, figs. 5, 1840.

HENRY M. AMI.