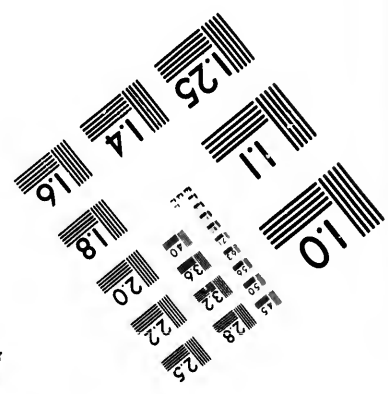
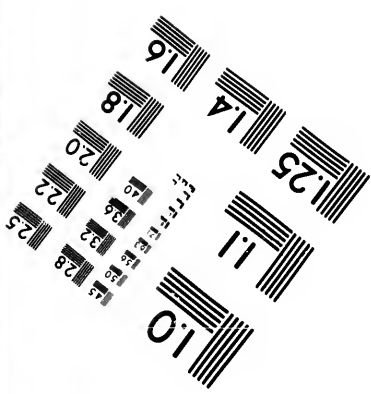
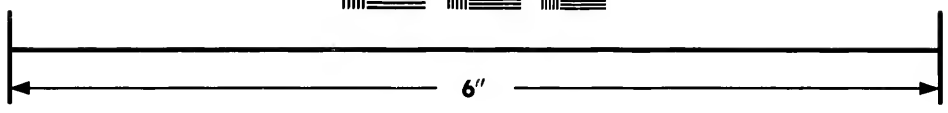
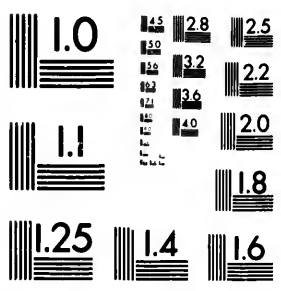


IMAGE EVALUATION TEST TARGET (MT-3)



Photographic
Sciences
Corporation

23 WEST MAIN STREET
WEBSTER, N.Y. 14580
(716) 872-4503

**CIHM/ICMH
Microfiche
Series.**

**CIHM/ICMH
Collection de
microfiches.**



Canadian Institute for Historical Microreproductions / Institut canadien de microreproductions historiques

© 1987

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
- Bound with other material/
Relié avec d'autres documents
- 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.
- Additional comments:/
Commentaires supplémentaires:

- Coloured pages/
Pages de couleur
- Pages damaged/
Pages endommagées
- Pages restored and/or laminated/
Pages restaurées et/ou pelliculées
- Pages discoloured, stained or foxed/
Pages décolorées, tachetées ou piquées
- Pages detached/
Pages détachées
- Showthrough/
Transparence
- Quality of print varies/
Qualité inégale de l'impression
- Includes supplementary material/
Comprend du matériel supplémentaire
- Only edition available/
Seule édition disponible
- Pages wholly or partially obscured by errata
slips, tissues, etc., have been refilmed to
ensure the best possible image/
Les pages totalement ou partiellement
obscurcies par un feuillet d'errata, une pelure,
etc., ont été filmées à nouveau de façon à
obtenir la meilleure image possible.

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

10X	14X	18X	22X	26X	30X
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12X	16X	20X	24X	28X	32X

The copy filmed here has been reproduced thanks to the generosity of:

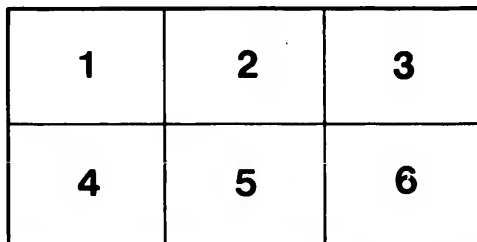
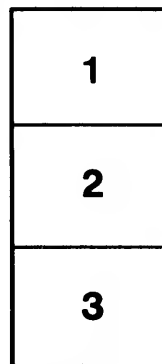
Harold Campbell Vaughan Memorial Library
Acadia University

The images appearing here are the best quality possible considering the condition and legibility of the original copy and in keeping with the filming contract specifications.

Original copies in printed paper covers are filmed beginning with the front cover and ending on the last page with a printed or illustrated impression, or the back cover when appropriate. All other original copies are filmed beginning on the first page with a printed or illustrated impression, and ending on the last page with a printed or illustrated impression.

The last recorded frame on each microfiche shall contain the symbol \rightarrow (meaning "CONTINUED"), or the symbol ∇ (meaning "END"), whichever applies.

Maps, plates, charts, etc., may be filmed at different reduction ratios. Those too large to be entirely included in one exposure are filmed beginning in the upper left hand corner, left to right and top to bottom, as many frames as required. The following diagrams illustrate the method:



L'exemplaire filmé fut reproduit grâce à la générosité de:

Harold Campbell Vaughan Memorial Library
Acadia University

Les images suivantes ont été reproduites avec le plus grand soin, compte tenu de la condition et de la netteté de l'exemplaire filmé, et en conformité avec les conditions du contrat de filmage.

Les exemplaires originaux dont la couverture en papier est imprimée sont filmés en commençant par le premier plat et en terminant soit par la dernière page qui comporte une empreinte d'impression ou d'illustration, soit par le second plat, selon le cas. Tous les autres exemplaires originaux sont filmés en commençant par la première page qui comporte une empreinte d'impression ou d'illustration et en terminant par la dernière page qui comporte une telle empreinte.

Un des symboles suivants apparaît sur la dernière image de chaque microfiche, selon le cas: le symbole \rightarrow signifie "A SUIVRE", le symbole ∇ signifie "FIN".

Les cartes, planches, tableaux, etc., peuvent être filmés à des taux de réduction différents. Lorsque le document est trop grand pour être reproduit en un seul cliché, il est filmé à partir de l'angle supérieur gauche, de gauche à droite, et de haut en bas, en prenant le nombre d'images nécessaire. Les diagrammes suivants illustrent la méthode.

ails
du
difier
une
page

rata
o

elure,
à

32X

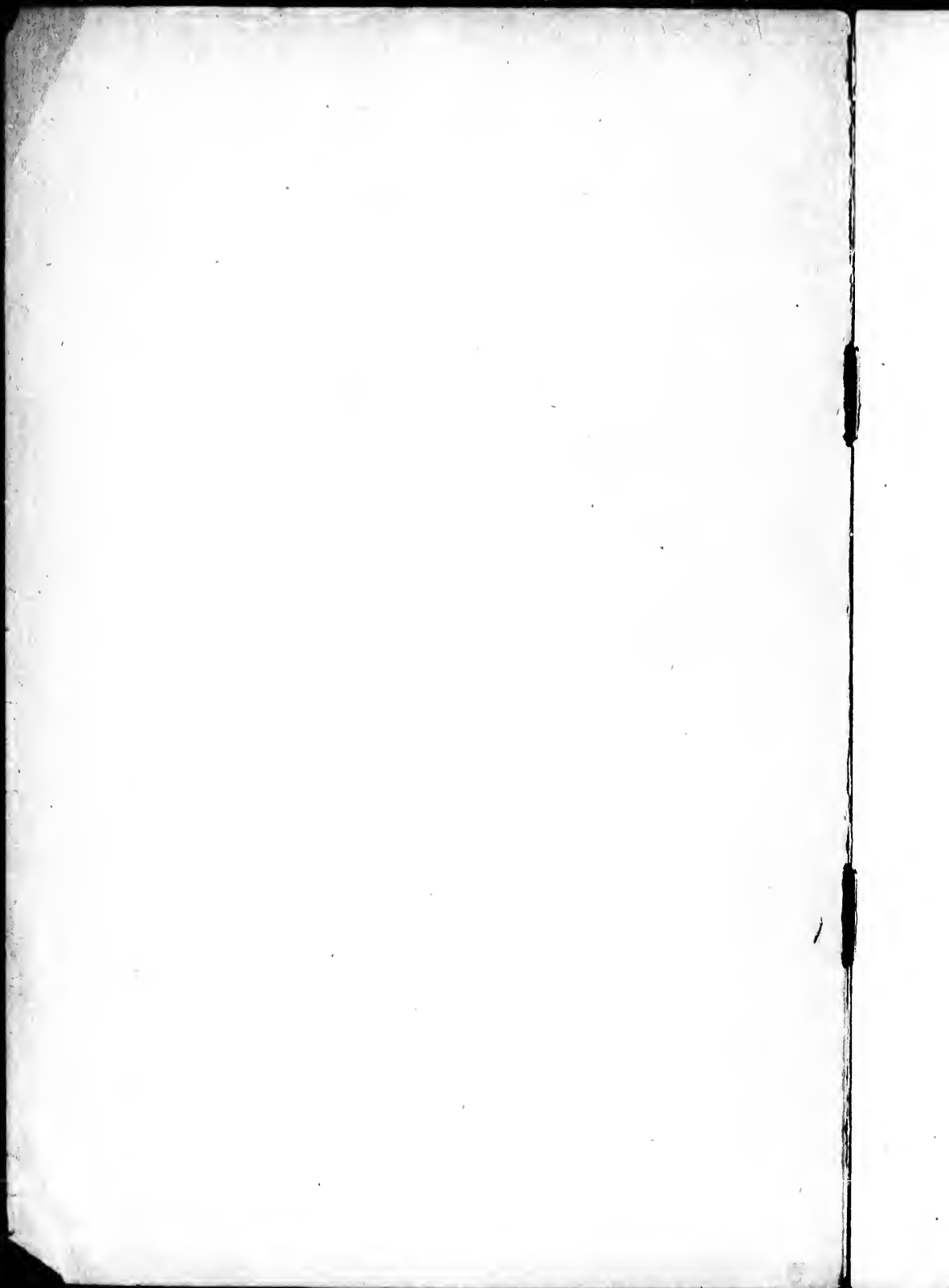
Reprinted from THE OTTAWA NATURALIST, Vol. XIV, No. 7,
pp. 121—127, October, 1900. Ottawa, Canada.

**Notes Bearing on the Devono-Carboniferous Problem in
Nova Scotia and New Brunswick. (Based on Dr.
David White's recent Report: "The Stratigraphic
succession of the Fossil Floras of the Pottsville
Formation in the Southern Anthracite Coal Field,
Pennsylvania.")**

BY

H. M. AMI, of the Geological Survey of Canada.

A
557.1
Am 5



Ex. THE OTTAWA NATURALIST, Vol. XIV, No. 7, pp. 121-127,
October, 1900, Ottawa, Canada.

NOTES BEARING ON THE DEVONO-CARBONIFEROUS
PROBLEM IN NOVA SCOTIA AND NEW BRUNSWICK.
(BASED ON DR. DAVID WHITE'S RECENT REPORT :
"THE STRATIGRAPHIC SUCCESSION OF THE FOSSIL
FLORAS OF THE POTTSVILLE FORMATION IN THE
SOUTHERN ANTHRACITE COAL FIELD, PENNSYL-
VANIA.")

By H. M. AMI, of the Geological Survey of Canada.

From recent studies pursued with great care and diligence, extending over a period of many years in the Floral zones of the Pottsville formation in Pennsylvania and the Eastern States, Dr. David White, the eminent palæobotanist of the United States Geological Survey, has given to the world a most elaborate and comprehensive report in Part II. of the "20th Annual Report of the United States Geological Survey—General Geology and Palæontology"—in which the results there given have considerable bearing upon and are closely in line with the results obtained in Canada during the last few years by the writer.

In May 1898, I had the good fortune of visiting the Southern Anthracite coal-field of Pennsylvania, in company with Dr. David White, and of examining several of the sections in the Carboniferous System of that state, with a view of obtaining evidence that would tend to throw light upon the Devono-Carboniferous problem in Nova Scotia and New Brunswick. Near the town of Pottsville, at Mauch Chunk, Tremont, Brookside, and many other localities, typical sections were observed, and a number of

characteristic fossils obtained. The succession of strata in the Pottsville district gave the following series of formations in descending order :

CARBONIFEROUS	}	Coal Measures.
		Pottsville.
		Mauch Chunk.
		Pocono.
DEVONIAN	}	Catskill.
		Chemung.

The above constitutes an unbroken though somewhat tilted series which, if followed down, would be found to be continuous with the Silurian system without any apparent unconformity or break, and presenting a series of estuarine and terrigenous deposits of the Carboniferous system, from the Coal Measures proper down to the Pocono, (the probable equivalent of the Horton formation of Nova Scotia according to Sir William Dawson, Dr. White and other authorities), followed by the terrigenous and estuarine Catskill series, and in close contact with, but preceding in point of time the marine sediments of the Chemung and earlier Devonian strata, with their brachiopod and crinoidal faunas.

The Pottsville formation underlies the productive Coal Measures* of Pennsylvania just as the so-called "Millstone grit" of Nova Scotia underlies the productive Coal Measures of that province. Workable seams of coal occur in the Lykens series (of Pottsville age) as well, yet not so extensively, as in the Coal Measures of Pennsylvania. In Canada, the Millstone Grit (or Westville formation of the Pictou coal field) is found to be for the most part barren of productive coal seams. A detailed study of the fossil floras which accompany and characterise the productive Coal Measures of both the Upper and Lower Coal Measures of Pennsylvania and elsewhere by Dr. White, has enabled him to locate definitely the horizon of the various seams met with, and I have no doubt that similar detailed palæobotanical studies in Canada would also yield important and definite results.

* The term "Coal Measures" is not by any means a good formational name, it is one conveying economic and petrographical relations, and should not be used in nomenclature and geological chronography.

In the present volume and report by Dr. White, among the "Pottsville" plants described and recorded by him are noticed quite an array of species characteristic of that formation, which were however originally described from the "fern ledges" of New Brunswick, for the most part, referred to the "Middle Devonian." This reference was very probably based more on apparent metamorphic and petrographic grounds than for any other reason. The importance of this finding of Dr. David White's cannot be too strongly emphasized, and in calling attention to the forms in common between the Pottsville formation and the Lancaster formation, at this juncture, the writer presents it as an additional argument in favour of the Carboniferous age of the New Brunswick deposits known as the "Mispick Group," "Cordaite shales," "Fern ledges," the "Little River Group" the "Dadoxylon sandstone" and the "Bloomsbury conglomerate." The strata constituting these "fern ledges" containing a large and abundant flora and fauna has been recently designated by the writer as the Lancaster formation.

The following species described by Dr. David White from the Pottsville formation of Pennsylvania also occur as identical or allied species in New Brunswick, whilst a number of them have also been recorded from Nova Scotia.

1. *Trigonocarpon Dawsonianum*, D. White.

On page 910 Dr. White describes this new species and writes: "it agrees so completely with the fragments figured by Dawson from the 'fern ledges' at St. John as 'fruit or bracts of uncertain nature,' that I have ventured to include a portion of the latter material as well as the same species." Dr. White further adds: "The figures given in the 'Devonian Flora' will serve to illustrate the Pottsville material which I name in honour of the late distinguished Palæontologist of America."

2. *Cardiocarpon obliquum*, Dawson.*

3. *Cardiocarpon cornutum*, Dawson.*

4. *Cardiocarpon Girtyi*, D. White. (Allied to *Cardiocarpon Baileyi*, Dawson.)*

* The species marked with an asterisk (*) were described by Sir William Dawson in Q. J. G. S., Vol. XVIII, 1862, pp. 296-330, London, Eng.

5. *Cordaites angustifolius*, Dawson (possibly young leaves of *C. Robbii*, Dawson).*
6. *Cordaites Robbii*, Dawson.*
7. *Annularia latifolia*, (Dawson)* Kidston.
8. *Annularia acicularis*, (Dawson)* Sp. (Under this species I note that Dr. White employs the term "Lancaster formation" suggested for the strata described as "Middle Devonian" from the "fern ledges" of Lancaster, New Brunswick.)
9. *Asterophyllites parvulus*, Dawson.*
10. *Neuropteris Pocahontas*, var. *inequalis*, n. var. Allied to *Cardiopteris Eriuna*, Dawson,* and *Odontopteris squamosa*, Dawson, (pre-occupied) which, by the bye, has been called *O. Dawsoniina* by S. A. Miller. Dr. White adds that it deserves a special comparison with the *Neuropteris Pocahontas* group of Pottsville forms.
11. *Megalopteris plumosa*, D. White, n. sp. This species closely resembles *M. Dawsoni*, Hartt, from the so-called Middle Devonian of New Brunswick.
12. *Alethopteris discrepans*, Dawson.* This species, originally described from the "fern ledges" of New Brunswick occurs in the Pottsville formation at the New Lincoln Mine. Of specimens from this locality, Dr. White says : they "appear to agree in all respects with specimens from the 'fern ledges' at St. John." "The occurrence of this species," he adds, "together with *Sphenopteris Harttii*, *S. pilosa* and *Pecopteris serrulata*, Hartt, in the Upper Lykens division of the Pottsville formation points strongly to the close relationship between the flora of the latter and that of the supposed Middle Devonian beds at St. John, a relationship so close as to convince me that no appreciable difference in age exists between the plant beds at the two localities." (p. 886.)
13. *Pecopteris serrulata*, Hartt.
14. *Sphenopteris pilosa*, Dawson.*
15. *Sphenopteris Harttii*, Dawson.*

Besides the above fifteen Canadian so-called Devonian species recorded by Dr. White from the Pottsville formation in Pennsylvania in his description of the species from the southern Anthracite coal field, he also records additional evidence, which, in the writer's judgment, points clearly to the view advocated in referring the Lancaster formation of New Brunswick with its abundant characteristic flora and fauna, including insects, crustacea, etc., to the Carboniferous and not to the Devonian System.

16. *Annularia laxa*, Dawson, sp. (*Asterophyllites laxus*, Dawson*), referred to in a subsequent paragraph, adds another species to the list of forms common to the Pennsylvania Carboniferous and the New Brunswick strata.

In his summary of conclusions regarding the floral zones of the Pottsville formation, Dr. White devotes paragraph 14 to the following statement, which will be of special interest to the students of systematic geology, not only of America, including the United States and British North America, but also of Europe. He thus writes :

"The flora of the Pottsville formation is so far identical, in both its genera and specific composition, with that from the supposed Middle Devonian beds of St. John, New Brunswick, as to leave no room for a great difference in the age of the latter. In fact, the plants from the 'fern ledges' include a flora essentially equivalent to that of the Sewanee zone, which appears to be represented by a portion of the section at St. John."

Such a statement, coming from so eminently qualified a worker in and student of Palæozoic floras, taken into consideration with the report of Mr. R. Kidston, of Stirling, Scotland, on fossil plants, from strata belonging to the Riversdale formation of Nova Scotia (the recognised equivalent of the Lancaster formation of New Brunswick or "fern ledges") compels me to re-affirm the statement made in the "Summary Report of the Director of the Geological Survey Department for the year 1897" (p. 135), that these formations "hold plants and animals which in their broad general character resemble those of the Eastern American Carboniferous."

This statement was intended to convey the idea that the Riversdale and Union formations had a Carboniferous facies and

were, in addition, the equivalents of those holding the fossil plants from Lancaster in New Brunswick, "held to be of Devonian age," thus implying that whatever one series was, the other must be also, and hence the Lancaster "fern ledges" must also have a Carboniferous facies though coloured Devonian.

Later, in the "Summary Report of the Director of the Geological Survey Department for 1898" (p. 181), I made the following statement: "Regarding the general results of this Devonian-Carboniferous problem from a palæontological standpoint, it would appear, in reviewing the value and amount of the evidence afforded by fossils obtained during the past three seasons, that, in so far as the faunas are concerned, they clearly indicate a 'Carboniferous facies.'"

Subsequently, in the "Summary Report of the Director of the Geological Survey Department for the year 1899" (pp. 201-203), the writer gives the result of an examination made by Mr. R. Kidston, F.G.S., of the material collected from the so-called "Devonian" strata of Nova Scotia; and as regards the rocks of the Horton formation, he says: they "appear to be undoubtedly Lower Carboniferous."... "there is no evidence at all to support the opinion that they are of Devonian age".... "all the evidence derived from the study of these fossils points very strongly against this view." Of the Riversdale series of plants, Mr. Kidston gives them "a pronounced Upper Carboniferous facies, and markedly possess the characteristics of a coal measure flora. Judged from a European comparison, no other conclusion can be arrived at."

Such evidences, relative to the Devonian-Carboniferous problem and the various results given, all seem to indicate that both in Nova Scotia and New Brunswick we find a series of fossil plants which in one province had been assigned to the Carboniferous and in the other to the Devonian, but whose characters and affinities as adduced and understood respectively necessarily place them both in the Carboniferous system.

For brief notes upon the succession of the strata in the Carboniferous of certain portions of Nova Scotia with special reference to the Union and Riversdale formations the reader is referred to the writer's paper on that subject in the Transactions of the Nova Scotian Institute of Science, Vol. 10, 1900, pp. 162-

178, and in the various summary reports of work carried on by the writer during the seasons of 1896-7-8-9, issued by the Geol. Survey.

The writer desires to emphasise the fact that he has done his utmost to search for evidence in support of the Devonian age of the strata in question. He has failed to find any except in the case of the strata constituting the *Knoydart formation*—a term used to designate the red shales, sandstones, marls and impure calcareous beds such as are developed in McArras Brook, Knoydart Brook, etc., and coloured Upper Devonian on the map prepared by the Geological Survey Department—in which remains of *Pteraspis*, *Cephalaspis*, *Pterygotus* and *Onchus*—examined by Dr. Henry Woodward and Mr. Arthur Smith Woodward, of London, England, and pronounced by them (as palæontological evidence warrants) as belonging to the base of the Old Red Sandstone type of the Devonian, and very similar in faunal as well as lithological character to strata of Devonian age in Herefordshire, England, and in Spitzbergen, as has been pointed out to the writer by these gentlemen.

Ottawa, 3rd Sept., 1900.

