

-vania coal-field. In the present paper I propose to group together the facts observed in Nova Scotia, New Brunswick and Lower Canada, with the view of facilitating comparison ~~to~~, and with the in the countries above referred to, and with the later coal measures, in which similar conditions were so much more widely extended.

I shall first present in a tabular form the order of succession observed at several places in descending order.

In former papers I have ~~termed~~ divided the latter inferior system of Nova Scotia into the Upper & lower coal measures, and the lower Carboniferous series including under the latter the deposits referred to in this paper; but for the sake of greater clearness I have called the lower coal measures of former papers the middle or great coal measures and the lowest beds containing plants the lower coal measures.

The Committee have the honor to acknowledge the receipt of your letter of the 10th inst. in relation to the proposed amendment to the Constitution of the State of New York. The Committee have the honor to inform you that the same has been referred to the proper authorities for their consideration. The Committee have the honor to inform you that the same has been referred to the proper authorities for their consideration. The Committee have the honor to inform you that the same has been referred to the proper authorities for their consideration.

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ON THE LOWER
CARBONIFEROUS
COAL MEASURES
AS DEVELOPED
IN BRITISH AMERICA

—
DATE "1858"
WRITTEN ON
BACK

Revue des questions scientifiques

(Gen. Bk. 7d.)

Société Scientifique

11, rue des Récollets

Year begins Jan.

Vols. per annum

Louvain

Subscribed to on 7 Mar. 24

See { Letter Bk.

" through direct

{ Order Bk. 16173

Price f. 44 -

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Postage

Net cost per annum

1
On the Lower Carboniferous Coal
Measures as developed in British
America.

Please
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full styles leaf
of the

Reports of the ~~character~~^{and its associated freshwater fauna} in dictating the
existence of the coal flora, at the beginning
of the Carboniferous period, have been
referred to various parts both of
the old and new world, and
have modified the views formerly en-
tertained of the ~~general sequence~~
subdivisions of the carboniferous system, in
Nova Scotia and New Brunswick
^{fresh deposits} they are developed but ~~great~~^a clear-
ness and fullness of detail, ~~and~~
may therefore be of service in throwing
much light on the nature of the
terrestrial conditions of the coal period,
^{and the relations of these lower coal measures to the true coal measures.}
~~if carefully studied and compared~~
~~with the true coal measures as~~
~~fully exposed in the coal sections of~~
~~these countries.~~ I propose in the
present paper to offer a contribution
toward this end, by collecting in
one view the information existing
on these ^{rocks in British America} ~~subject~~, with the addition
of facts recently collected by myself
and in the past summer, and
the results of a comparison of the
specimens in my collection with
those of the ^{upper} coal measures

[illegible]

2
Deposits of this character, indicating the
existence of the land flora at the be-
ginning of the carboniferous period are
by no means confined to Nova Scotia
but have been recognised in Britain
in Ireland and in the United States. They
are however developed in Nova
Scotia and New Brunswick with
special unwhit* cleavage and
fulness of detail, and I believe
that an examination of the ^{character} ~~character~~
of these beds and ^{freshwater} ~~freshwater~~ life
of this early carboniferous period is
illustrated in these countries will be
a welcome to those who may be en-
gaged in ^{the study of} ~~study~~ similar deposits
~~the country~~

part of the
coniferous ^{system} ~~system~~ as seen in the localities where it
is most fully exposed.

The occurrence of beds containing coal plants in connection with the Lower Carboniferous marine deposits of Nova Scotia, was observed by Sir W. E. Logan in 1841, though at that time the true place of the beds was not understood, owing to the prevalent belief that the limestones afterwards ascertained to be Lower Carboniferous, were of ~~Permian~~ ^{Permian} date. Sir C. Lyell examined these beds in 1842, as they occur at Horton Bluff, and the author subsequently more fully examined their relations to the marine limestones and traced them in various other parts of Nova Scotia, and at the Albert Mine in New Brunswick. *

This Series may, in general terms, be characterized as consisting of Shales and Sandstones destitute of marine remains and containing fossil plants, fish-
-es, and Entomostraca, locally underlying the great ma-
-rine limestones and gypsums of the ^{Permian} ~~Carboniferous~~ series, and ^{Permian} ~~Carboniferous~~ in some respects ^{different} ~~different~~ by mineral character and fossil remains. I have said locally ^{underlying} ~~underlying~~ by the marine limestones, because I believe that in some places they are strictly contemporaneous with these, forming estuary la-
-gunes ^{or} and swamp deposits at their margins. While in some instances these ^{exceptional} spots have been sunk beneath the sea and then covered by marine ^{beds} ~~deposits~~, in other places, they have retained their semi-terrestrial character, up to the coal measure period.

* Journal of Geol. Soc.

Vol. 1

p. 39.

S. P. 335.

p. 34.

To avoid repetition of details
 previously given I have ~~thrown~~
 into a tabular form. The
 structure of this part of
 the curriculum system as ~~was~~
~~presented in some of~~ it appears in
 some of the last exposures. I have
 in this table slightly reshaped the
 names ~~proposed~~ proposed in former
 papers for the ~~introduction~~ of
 the system calling the true
 prescriptive and measures the
Middle instead of the lower
 series, and transferring the
 latter term to the tests checked
 in this paper formerly called
 prescriptive and measures ~~concerning~~
 the curriculum ~~measures~~

The Committee of the
General Assembly of the
State of New York
has the honor to acknowledge
the receipt of your letter
of the 10th inst. in relation
to the proposed amendment
to the Constitution of the
State of New York
relating to the
mode of electing
the members of the
Legislature.
The Committee has
the honor to inform you
that the same has been
referred to the
Committee on
the Judiciary and
the Committee on
the Administration of
Justice for their
consideration.
Very respectfully,
Your obedient servant,
The Committee.

* I had an opportunity in 3 June last of examining the
 best sections of this ~~part~~ part of the province in company with
 Dr. Hensley and Prof. Horn of Windsor, and Rev Mr Rand of Hantsport.
 The first and second columns in the above table represent
 the structure of this formation in the western part of Nova
 Scotia, where the true coal measures and upper coal measures
 are scarcely, if at all developed, and the Lower carboniferous ma-
 rine deposits attain their greatest thickness*. At Horton
 Bluff several faults oppose some difficulties to an accurate
 measurement of the thickness, but I have estimated it at 600
 feet in all, apparently destitute of true marine remains,
 and marked lithologically by a great proportion of dark and
 grey sandstones and shales. From the localities mentioned
 in the table, ^{these beds} they may be traced along the margin of the
 metamorphic country as far as the Shubenacadie River and
 probably as far as the valley of the Stuirake, 50 miles distant
 from Horton. They reappear along an antichlinal line
 parallel to the former, at Walton, Noel, and other places
 on the coast of the Bay of Fundy*. The intervening trough
 is filled with the marine limestones and the accompany-
 ing marls, red sandstones and gypsums. ^{with the exception of a limited space near the Kumbakon 11 mile River, occupied by beds which perhaps represent the Middle coal measures.} These two lin-
 es of appearance run in a North-eastern and South-
 western direction. ^{and are distant from each other from 10 to 15 miles} The waters of Cobequid Bay and
 Minas Basin perhaps fill another synclinal trough,
^{which however in the upper and narrower end of the bay appears more as a dip-slope along an antichlinal axis.} and we do not observe the lower coal measures again,
 until they are thrown up in a very disturbed condi-
 tion along the ^{South side of the} Cobequid mountains. ^{where we have another line of anticline running East & West} Here they appear
 as a continuous belt 80 miles in length, but it is not
 easy to establish any boundary between them and the
 true coal measures which are also present**. This appears
 to arise from the slender development of the marine parts of

* Geol Trans v 1, 389.

** See Trans v 4, 52.

* There in some localities, as at Tully, we have the coal measures approaching the base of the hills and underlain by conglomerates without any marine limestone, while at a great distance from the hills the marine limestones arise from beneath the true coal measures. In other places as at the creek R. the limestone appears ~~in the~~ under the coal measures and at least the greater part of them; and again at Salmon a limestone with crinoid ~~bed~~ joints appears to be inserted in the midst of true coal measures. This original irregularity of deposition is now complicated by a number of fractures. The best section that I have had an opportunity of examining in this district is that of the Tully River which appears

^{at the base of the Carboniferous system,}
to show, in descending order

- 1 Reddish & gray sandstone with a ^{estimated thickness} bed of conglomerate ~~the thickness estimated~~ 300 ft
- 2 Dark shales & gray sandstone with thin coal layers containing *Poacites* & *Sigmaria*, and probably representing the lower coal measures 200 ft
- ** 3 Coarse Conglomerate containing fragments of the ^{metamorphic} rocks of the Mountain, or 450 ft which it rests unconformably on

of the system near the mountains, and the disturbed condition of the whole. These hills indeed appear to have retained their position during the whole coal period and ~~the~~ semi-terrestrial conditions prevailed along their south side during the time when the marine limestones were being formed at a greater distance from their ~~base~~ ^{base}. There seems no reason to doubt that the shales in this section ~~great part of these beds, however, correspond~~ ^{and the con-} ly in fossils with the Horton Bluff series, ~~than with the true coal measures.~~ ^{that series,} Glomerate with the sandstones which underlie

Along the northern side of the Cabeguid range and its eastern continuation in the Pictou Coal field, I have observed no definite development of the beds now under consideration; but the ~~xxxx~~ ^{middle} and upper coal measures attain a very great importance, and the marine limestones ~~with~~ red sandstones and conglomerates are of great thickness, and appear to rest directly on the older metamorphic rocks.*

On the northern side of the wide coal formation of Cumberland ~~the~~ ^{Deposits} remarkable beds in the third column, represent the lower carboniferous coal measures in position and fossils, though in some respects different in mineral character. They are ~~unremarkable~~ ^{very} In their highly bituminous composition ~~the presence of this in a~~ ^{perfect state of preservation} and the almost entire absence of ~~deposits~~ corresponding to those of the Albert Mine appear to extend to the westward for a considerable distance along the South Side of the Coal field of New Brunswick.

On the Northern Side of that coal field ^{on the Baie de Chaleur} ~~in~~ ^{conglomerate} ~~xxxx~~ ^{interbedded with red and gray sandstone & shale} Sir W. C. Logan describes great beds of ^{calcareous} conglomerate as forming the base of the Carboniferous system. Their beds amounting to a thickness of 2766 feet at

*See from v. 1. 272

yielded no ~~other~~ Marine fossils but contained
 Carbonized remains of land plants
 It is scarcely necessary to state that these
 carboniferous coal measures, indicating the exist-
 ence of the terrestrial and fresh water fauna and
 flora of the coal at the very commencement of the
 period, correspond with the carboniferous state of Ir-
 land (Griffiths) the Lower coal measures of Scotland
 (Page), the Lower Carboniferous Series of the South of
 England and the
 near Conglomerate valley of the St. Mary's River proving
 part of the system. *

In Nova Scotia these older Coal Measures, as com-
 pared with the true coal measures, are more calcareous
 more abound in remains of fishes and have fewer vege-
 table remains and indications of terrestrial surfaces.
 They occur generally along the margins of the coal
 areas, near their old shores, and ^{as} we might expect in
 such circumstances, they are associated with ~~and~~ ^{or} repla-
 ced by beds of conglomerate derived from the neighbor-
 ing highlands of Silurian and Devonian date. Where
 these conglomerates are absent, we usually find
 very frequent alternations of ~~these~~ sandstones ~~and~~ ^{with}
 sandy and calcareous shales, giving a homogeneity
 of appearance with, at the same time, ^{very} frequent
 changes and differences in fossil character. The gene-
 ral aspect is that of muddy estuary deposits ~~by~~
^{very slowly} accumulating, and discoloured and darkened by
 decaying ^{organic} substances, partly of aquatic and partly of terrestrial origin
 Both

Both the supply of sediment and the growth and preservation of vegetable matter were ^{on a} smaller ^{scale} than in the true coal period, the only exception being the bituminous limestones and associated dark shales of the latter, which in composition and aspect often much resemble the beds now under consideration.

These characters cause the Lower carboniferous coal measures to present a very striking contrast with the coarse and often reddish sediments which prevail in the marine parts of the Lower Carboniferous series.

Before leaving this comparative view, it is necessary to remark, that it is precisely in those districts where the true coal measures are least developed that the Lower Series is most important. This is not likely to be a result of accident. It shows that the physical and vital conditions of the Coal Measures originated as early as those of the mountain limestone, that locally these conditions may have been contemporaneous throughout the whole period; but that in some localities the estuary and swamp deposits first formed were so completely submerged as to be covered by oceanic deposits; while in others early marine beds were elevated and subjected to the conditions of gradual subsidence and vegetable growth indicated ^{Coal measures} in the great ~~sections~~ of the South Goggins ^{Pictou and Sydney.} ~~Coal measures~~. Accordingly, though marine limestones are most abundant in the ^{Lower} ~~lower~~ part of the System, they occur ^{occasionally} ~~locally~~, as for instance near Wallace, in the Upper Coal measures. On the other hand, though the Coal flora is most abundant in

The true Coal Measures

in the true coal measures, yet locally beds containing *Sigillaria Elegans* and other plants occur under the lower part of the marine limestones. We have therefore in ~~Scotia~~ ^{beds containing} a series of ~~plants~~, estuary and fresh water fishes, and entomozoa extending throughout the Carboniferous System, and a parallel series of ^{contemporary} oceanic limestones ~~also extending throughout the period~~. The subject of this paper restricts me to the consideration of the former of these series in its older position. I propose now therefore to examine the fossil plants of the lower series - in connection with the indications which they afford of their conditions of growth and preservation.

Plants.

Lepidodendreae. — The plants of this family may be regarded as characteristic of the lower Carboniferous coal measures. *Lepidodendron Elegans* is very abundant at Waterford Windsor. At ~~the~~ Horton Bluff two beds contain stumps of these trees in situ. I have noticed one of these on the steepest known fossil forest in New Britain in one of the papers above cited. The second was observed last summer. Both occur in beds of dark gray shale not far removed from layers containing scales of fishes and ripple marks. The trees were all of small size and crowded. The soil in which they had been rooted

contained no *Stigmaria* but abundant
remains of slender cylindrical and
plumy fronds. The state of preservation of
the short trunks does not offer evidence
of *Stigmaria* identification of the species
but from the appearance of the
most perfectly preserved fronds and
the abundance of *L. Elegans* in the a
flattened state in the same beds
I expect that it was more plentiful
in these fossils than any other. *L.*
Elegans is a very easily charred species
and it ~~was~~ occurs in the upper
level measures.

Two other species of *Lepidodendron*
occur less frequently. ^{Both are very distinct from *L. Elegans*}
as there is no comparison of ~~any~~ ^{any} ~~of~~ ^{of} ~~the~~ ^{the} ~~fronds~~ ^{fronds} of *L. Elegans*
diameters. Both belong to the same group of slender stems
Lepidodendron and *L. Elegans* but the latter appears to
be identical with that ^{from the glacial stage,} ~~found~~ ^{found} as *L.*
by Jackson. I am not aware
that either of these species occur in
the upper members of the Coal
Series. One characteristic of the *Lepidodendron*
of the lower series is the
small size of their leaf scars and their
slender growth. A small *Lepidodendron* probably
all the fruit of *L. Elegans* was found at
Hutton.

and is also found at Spring Cape Bush in the
lower coal measures.

~~It does not correspond with any species of the genus
described from the same and short description~~

* This comes partly ~~with~~ in some respects
 out the species ~~noting~~ I in ~~Drinking~~
 for ~~types~~ but ~~found~~ ~~at~~ ~~P.~~ ~~It is~~
 chous I an ~~clays~~ ~~purple~~ ~~are~~
 a small ~~leaf~~ ~~near~~ ~~in~~ ~~the~~ ~~center~~ ~~of~~ ~~a~~
 on the upper part of a ~~seem~~ ~~and~~
~~same~~ ~~cover~~ ~~upward~~ and the ~~spine~~
 like the ~~acids~~ ~~as~~ ~~is~~ ~~with~~ ~~in~~
 the ~~acids~~ ~~Neurides~~ and ~~with~~ ~~(~~
~~largest~~ ~~traces~~ as of I ~~express~~ of the ~~and~~
 and ~~with~~ ~~for~~ ~~was~~ ~~the~~ ~~human~~ ~~in~~ ~~by~~
~~from~~ a ~~fine~~ ~~is~~ ~~with~~ ~~chert~~ ~~to~~ ~~the~~
~~surface~~. Of the to the ~~same~~
 like in ~~only~~ ~~spine~~ the ~~cell~~ ~~of~~
 then ~~Leptids~~ ~~are~~ ~~extended~~ ~~through~~
 the ~~low~~ ~~permeable~~.

Syllanure. — Out in ~~spine~~ has
 been ~~found~~ in the ~~Lower~~ ~~Carbon~~
~~series~~. It is a ~~spine~~ with ~~mann~~
~~inner~~. has the ~~shape~~ of S. ~~Parhyden~~
 but ~~has~~ ~~seen~~ as the ~~shape~~ ^{n.s. Anguilla} ~~but~~ ~~not~~ ~~express~~
~~surface~~. This ~~spine~~ occurs at ~~Wicks~~
 for ~~what~~ ~~place~~ the ~~spine~~ ~~has~~ ~~been~~ ~~found~~
 in S. ~~Prof~~ ~~Stevens~~ of ~~Wilkes~~ ~~and~~ ~~also~~
 at ~~Oriskany~~ — near the ~~highest~~ ~~part~~ of
 which in S. ~~Parhyden~~ it is ~~not~~ ~~near~~ ~~to~~ ~~the~~
~~inner~~ ~~series~~.

Anguilla ~~series~~ — ~~It is~~ ~~not~~ ~~found~~
 at ~~Oriskany~~ ~~but~~ ~~has~~ ~~been~~ ~~found~~ ~~at~~ ~~Oriskany~~

4
~~de Chaleur, Sir W. E. Logan describes great beds of calcareous
conglomerate with red and sandstone and
shale as forming the base of the Carboniferous system. These
beds amounting to a thickness of 2760 feet in the~~

In a paper published in the Proceedings of
the Geological Society in I stated as the
result of the examination of a great number
of specimens from the Peter River coal
that the greater part of the matter
returning coherent structure in that great
coal seam of 36 feet in thickness consists
of uniform wood and stymaria or Sept.
Caria. I have since seen various ^{discrepancies} state-
ments as to the true nature of the
textile matter of coal, and especially
of the fibrous anthracite or mineral charcoal
and have lately returned to this subject
^{with the aid of better instruments and specimens of a large suite of prepared specimens}
of investigation ~~and~~ ^{having returned}
~~after many trials of several~~
~~of various transparent the various forms of~~
~~coal tetrahedra~~ ^{the} ~~have~~ ^{just} ~~seen~~
^{the result they have perfectly agree with}
~~firmly~~ ^{my} ~~conclusions~~ ^{conclusions} and I hope
to arrive at a ^{truthful} ~~conclusion~~ as to
the mode of ^{accumulation} ~~formation~~ of at least the
coal seam above referred to. One
of my ^{results} ~~conclusions~~ is that the pec-
uliar perforated cells so characteristic
of mineral charcoal ^{and which have been compared to the cells of Geodes} are ~~new~~

canfers before altered by calcination
and that the same appearances
can be observed in the charcoal
of recent pine ~~and~~ and araucarias. Another
result is that ~~the~~ different pattern of the
same wood may appear in the form
of mineral charcoal a light brown
mass and according to the amount
of subaerial decay which they have
suffered before being embedded in
the soap. Wood deposited in great
part of its hydrogen of decay seems
to have been incapable of entering
into the composition of ordinary
bituminous coal.

Finally, that various eminent chemists have given
very different accounts of the charcoal of
the vegetable parts of coal. Some states it to
be of little use and a large mass of specimen
prepared. The last method they be able to be
a clue, re-examines the other ways & gives
more & the present has been established the following facts
1 That if you take the mass of the coal which
is to be examined & break
2 That the pieces of the coal and cells of
the mineral charcoal are of a granular texture
& canfers cells composed of a series of
they the ^{difference in the degree} ~~different~~ ^{of} are deposited with
3 That the

on the stage of evolution. during which the living
with his cellars left in. wherever a living
the we see the in the ~~effect~~ as of
in the plants themselves. ^{a measure of the 9th}
short period of time ^{which} ^{very}
~~on the stage with the present~~ ^{let}
time is not permitted.

11 Flora of the Lower Coal Measures

In Nova Scotia the lower coal measures are characterized by a great preponderance of *Lepidodendron*, ^{the leaves named *Pecopteris*} among other fossil plants, the middle coal measures are rich in *Sigillaria* and ferns as well as *Lepidodendron*, and the upper coal measures especially abound in *Conifers*, *Calamites* and ferns. These peculiarities may be local and dependent on the facilities for the preservation of particular kinds of plants, but they deserve more attention than they have hitherto received, in connection with the changes of physical condition which have occurred during this long period, and with the accumulation of the largest beds of coal in the middle coal period.

It must be careful that the flora of the lower coal measures is by no means rich in species; though locally as at Weston Bluff and Windsor (over)

There are great numbers of small
chardul plants, and it must
be regarded as still uncertain
whether the species were few
or an opportunity of studying
them in profusion.

(over)

1 Sepulchralium. In this group of plants Sepulchralium Eligius takes precedence as the most abundant species. At Horton and Wenden there are large numbers of perulate trunks and branches, sometimes with the leaves attached. In two distinct beds there are cut stumps, apparently useful to this species. They are of small size but ~~are~~ ~~found~~ very numerous and must have constituted dense groves of these trees. Their cuts appear to have been branching and fluted; at least no trace of stymaria was found in their underclays. They must have grown in sandy clay; and beds with poles and apple marks occur at no great distance both below and above them. The quantity of perulate trunks and branches overlying me often gives the impression of a forest and indicate that the trees had been violently broken off. These are the only beds containing cut trees that I have observed in

The *Leptocarpus* is a small, creeping plant, with a single, upright, branched stem, bearing small, green, pointed leaves. It is a very common plant in the low-lying, swampy areas of the coast, and is often found in the same places as the *Leptocarpus*. The *Leptocarpus* is a very common plant in the low-lying, swampy areas of the coast, and is often found in the same places as the *Leptocarpus*.

The lower coal measures
 A second species ^{rather} less
 abundant ~~is~~ ^{is} chief called
~~#~~ to *L. Elegans*, though a

comparison of specimens of
 different ~~ages~~ ^{ages} shows
 me to believe it distinct. It
 is distinguished by elongated oval
 areoles, having a small triangular
 leaf scars. The adjacent areoles
 are usually separated by a space
 of ^{the principal wrinkles are longitudinal but there is a fine transverse series} ~~pure~~ corrugated bark equal to
 then ~~own~~ transverse character.

From this character ~~which~~ can
 be observed even when the
 scars are not distinctly preserved,
 I have provisionally named the
 species *L. Corrugatum*. (See over)

A third species, still less
 abundant, has broadly rhomboidal
 areoles with rhombic scars each
 having three ~~punctures~~ ^{punctures} of vascular
 punctures. This species ~~I believe~~
 may be *L. Sternbergii*, at least I
 do not think I have seen any
 figure or description of that species
 giving the minute characters of the
 scars. ^{This species appears to be that figured by} ~~I Jackson as L. dilatatum from the Albert mine.~~

The first and third
 of these species are found in
 the middle coal measures

peculiarly only in the last specimens.

7
The dearticulated surface of well
preserved specimens of this species
presents prominent ^{scabs} ~~excrescences~~ with
the intervening spaces ~~completely~~ ^{marked}
by a very ~~at~~ delicate corrugated
transverse

but I have not seen the
 record from there. ^{It corresponds in some respects with No 28 of the Brander's list of plants from Sydney *}
 The only other April in
 my collection belonging to this
 genus is a fragment of a
 Lepidostrotus showing merely
 the suborbital marks left
 by the fall of the scales.
~~The third species may be that~~
~~figured by Jackson as L~~
~~from the earliest~~
~~mine~~ All the species above
 noticed are of the slenderly
 figured type represented by
 L. elegans. (see over)

2 Sigillariae. I have but
 one species of Sigillaria from the
 lower coal measures. It occurs
 at Horton, a specimen from which
 plate was presented to me by
 Prof Stuart of Acadia College.
 I have found the same or
 a similar species at the NW
 A of Ouslar in a bed of coal
 measures very near the base
 of the system. Both are lig-
 neous casts & imperfectly preserved;
 but in their present state they
 cannot be distinguished from
 S. angusta of Brongniart a slender

Along with the *Lepidodendron*
are found many stems which
at first sight I was disposed
to refer to *Knorria*, as represented
by the *Knorria imbricata* (Steinberg).
A careful comparison of a number
of specimens has however con-
vinced me that they are merely
decoctified specimens of *Lepi-
dodendron*, especially *L. elegans*.
In many such specimens the
areoles are represented by orate
elevations sometimes presenting an
imbricated appearance. *K. imbricata*
has been ascertained by Goeppert
to resemble *Lepidodendron* in structure
and I suspect that most if
not all the specimens of the
species are imperfect preserved
stems of *Lepidodendron*. *K. texana*
L & H is probably very distinct generally from
these *Lepidodendroid* *Knorrias*.

ribbed spines not very abundant in its lignous surface from *S. Pachyderma*, which is found in the lower coal measures in Scotland (Burr)

A *Stigmaria* not distinguishable from *S. Ficioides* occurs at Hutton, and Dr Huxley has a specimen with those peculiar stellate wrinkles which Hugh Miller has remarked for specimens from the ^{Scottish} lower coal measures. ^(S. stellata) Cylindrical ribbed protuberances of *Stigmaria* fill some of the beds at ~~7~~ at Windsor Park and perfectly indicate strata in which ~~large~~ *Sigillariae* have grown.

4 Filices The only fern hitherto found in the Hutton beds was discovered by Prof Stewart. It corresponds with *Sphenopteris adiantoides* (L & H) obtained by them from Larrow Colliery though I do not know from what horizon in the coal measures. At Morse River on the North side of Cobequid Bay in

[Faint handwritten notes, possibly bleed-through from the reverse side.]

The above is a list of the
 names of the persons who
 have been appointed to
 the various committees
 of the Board of Directors
 of the City of New York
 for the year 1890.

Handwritten text in a cursive script, likely a letter or document, written on lined paper. The text is written in a single column, starting from the top left and moving downwards. The handwriting is fluid and characteristic of the 18th or 19th century. The paper shows signs of aging, including discoloration and some staining.

Handwritten text in a cursive script, likely a list or ledger, with multiple columns of entries. The text is written on aged, slightly discolored paper.

present in the greater or deeper slender
 shape of the leaves, still have parallel
 veins, but in ~~the~~ ^{the} ~~same~~ ^{same} ~~idea~~ ^{idea} of the
 leaf and depicted in the ~~next~~
 and in perfect specimens slender
 shape can be detected between these.
 The veins are pretty constant and
 of the ~~of~~ ^{of} ~~main~~ ^{main} ~~of~~ ^{of} ~~apart~~ ^{apart}, but
 the ~~in~~ ⁱⁿ ~~main~~ ^{main} ~~is~~ ^{is} ~~very~~ ^{very} ~~small~~ ^{small}.

& Calamites A single ribbed stem from Thurston, and another from St Marys R may belong to this genus but neither were well characterized specimens.

The above slender list includes all the plants that I have hitherto obtained from the lower coal formation. Multitudes of fragments distinct of distinct characters are however found in these beds. The greater number ^{of these} I believe to be ~~stems~~ leaf stalks of ferns. ~~but there of which there were~~ ~~no doubt a greater number~~ ~~of species than what have yet~~ ~~been distinguished~~

of the same kind as that
seen from the other side of the
river. It is a very large
stone, and is very smooth.
It is very large and is very
smooth.

The above is a description
of the stone which is
seen from the other side of the
river. It is a very large
stone, and is very smooth.
It is very large and is very
smooth.

Fauna of the Lower Coal Measures

The animal remains from the rocks correspond in several ^{aspects} with those of the Middle Coal Measures, though I have no doubt that the species are in most cases distinct. They include Reptile, Fishes, Entomostraca, Crustacea, and a few Mollusks; and all as far as I am aware, altogether distinct from the fossils of the ~~Lower~~ ^{proposed} Marine members of the system.

Repetition.

Small quadruped were found at Horton Bluff by Sir W. L. Logan in 1841. Some years later Dr Worsley of Windsor obtained a fine series of foot-prints from the beds of corresponding age

at Painsboro. The footprints found by Sir W. L. Logan were the first traces of reptilian animals observed in America, but being imperfect they did not attract attention until the important discovery of a King in Pennsylvania and of Sir Edgell and the authors in Nova Scotia, had ~~proved~~ ^{proved} the certainty of the imitations and these earlier traces apparent. ~~See~~ ^{See} the plate from which is run in the Museum of the Canadian Geological Survey. On comparing these with the specimens found by Dr Hensley and myself, I have no doubt that they are ~~reptilian~~ ^{reptilian} footprints. They appear to have

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been made however by an
 animal moving under water,
 and partially supported by the
 fluid, so that only the joints
 of its toes reached the bottom,
 except in one place where
 an unusual pressure was
 exerted, perhaps with the view
 of turning or of stopping suddenly.
 The creature must have had
 strong and ~~flat~~ broadly pointed
 claws, by which it urged itself
 forward. One pair of feet,
 the hind pair I presume, had
 five claws three of them ~~much~~
 larger than the others, the
 other pair of feet may have
 had only three ^{or perhaps four} claws. These
 appearances would indicate a
 creature of the type of *Meuroperma*
 or *Meurobranchus*, and thus cor-
 respond with the impressions
 obtained by Prof. Owen from the
 bones of the *Denticipetor Acadicum*
 of the ~~upper~~ middle con-
 cretiones. The trail of the tail
 seen in ^{the other} footprints ^{referred to} from the middle
~~and measures~~ does not appear
 in the Winton specimen, but this
 may be due to the support afforded
 by the water, the other footprints
~~referred to~~ being probably subaerial.

~~These~~ ~~Paleolithic~~ ~~footprints~~

At Windsor Brook and Parnassos,
I have secured ~~indistinct~~ impressions
which ~~may have been of reptilian~~
~~origin~~ ~~reptilian~~ ~~origin~~ ^{to both} those above
referred to, ^{though left distinctly, and} but ~~rather~~ of interest
merely as indicating that ~~fish~~ small
batrachians may have been by no means
lacking. It is to be hoped that the rich
fish beds ~~now~~ of Horton may yet afford
some of their ~~other~~ remains.

Fishes Remains of fishes are
extremely abundant at Horton
and ~~Horton~~ Alford mine; but
much less so in any other beds
of this series that I have ex-
amined. At Lower Horton,
Galfray River, and Horton Bluff,
there are ^{many} beds, from a line
to three inches in thickness,
which may be regarded as
consisting of scales, teeth and
bones, ^{mixed with silicious sand, and} united by a calcareous
cement; and such beds with
still more numerous striae appear
in the shales covered with similar
remains, extending through several
hundred feet of ~~beds~~. Numerous
quantities of fish must have perished
in this place; and their remains
are scattered as if dispersed by currents

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[illegible]

after the decay of the animal
 matter. This, with the great
 number of beds containing
 such remains, indicates the
 long want of poles to the
 ground, and the accumulation
 of their remains in ~~the~~
 the natural course of the
 death of marine generations.
 The locality of the fish
 remains at ^{Worcester} is ^{very}
 limited in ^{at least to the Eastward} ~~any~~ ^{way}
 remains not being found
 at Windsor nor at Watton
 on the opposite side of the
 Estuary of the river, though
 plants occur at these places.
 This fact and the indications
 also in the older Metamorphic
 upon opposite Western Slopes,
 as well as the association
 of the remains with plants,
 erect trees, ^{striated} ~~cracked~~ ^{cracked} and
 worn & cracked beds, render
 it probable that this
 is an old stratum ~~with~~
~~tectate~~ flats acted on by the
 tides and by the inundations,
 and long revisited by fish
 perhaps for the purpose of
 spawning ^{in the same manner} ~~just~~ ^{with the}

The first of these is the fact that the
 Government has not yet decided upon
 a policy for the future of the
 country. It is true that the
 Government has a long history of
 successful administration, but it is
 not clear that it has the ability to
 deal with the problems of the future.
 The second of these is the fact that
 the Government has not yet decided
 upon a policy for the future of the
 country. It is true that the
 Government has a long history of
 successful administration, but it is
 not clear that it has the ability to
 deal with the problems of the future.
 The third of these is the fact that
 the Government has not yet decided
 upon a policy for the future of the
 country. It is true that the
 Government has a long history of
 successful administration, but it is
 not clear that it has the ability to
 deal with the problems of the future.

At the Albert Mine the
 fish remains are found throughout
 a ^{great} ~~considerable~~ thickness of rock
 and over a ~~considerable~~ ^{considerable} ~~distance~~
 area, since I have found
 them ^{in the conglomerate of these beds} ~~sparsely abundant~~, on the
 East side of the Petalichne
 above Doverton. They are
 usually entire, or at least
 in groups of scales. Representing
 the body of the animal or
 a part of it; and ~~thus~~ ^{after}
 appearing I have been buried
 in sediment before decay. In
 connection with this absence
 of preservation, it may be observed
 that the bituminous shales of
 the Albert mine must have
 been a semi-fluid impalpable
 mud charged with vegetable matter,
 and life, ~~to preserve~~ ^{to preserve} fatal to
 fishes when in a state of suspen-
 sion in ^{to more fatal to fishes} ~~water~~. I ~~very~~ ^{very} mention
 in connection with ~~this~~ ^{the} the
 removal of the ^{free} oxygen from water
 by the presence in it of large
 quantities of vegetable matter
 in a state of putrefaction, is
~~specifically fatal to all fishes~~
^{destructive to most fishes}
 except those furnished, like our
 Northern Ania and Lepidosteus,

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In the first of these ^{of Saurids} families
The detached scales indicate several
species of Palaeoninus which must
have been present in great numbers.

In the ~~Saurid~~ ^{Saurid} family, there are
teeth, jaws, and scales of a species
of Acrolepis or Pygopterus, which must
have abounded at Horton, and large
teeth having the characters of Centrodus
(McCoy)

~~The~~ The Callacanth family is repre-
sented by large rounded scales, dentary
bones and teeth of a fish belonging
I presume to the genus Rhinosaurus (Owen)
though the crop section of its teeth is
very round. In the crop section, these
teeth present a central cavity round
toward the point, elliptical farther
down, and surrounded by several
layers of radiating dentine, centered ex-
ternally by a thick layer of clear enamel,
their bases are deeply plicated.

To the Placoid order ~~belong~~ ^{belong}
~~Some fragments~~ ^{belong} Some fragments
of large spines, rarely found
in the Horton beds. ~~They are so~~
~~few and fragmentary as to~~
~~indicate only the occasional~~
~~presence, perhaps as the~~
~~from the sea of~~ ~~probable~~
~~which~~ ~~probable~~ They appear probable

tell having the character of *Crotalus*
 from observed at the top, and large
 of *Crotalus* or *Agkistrodon*, which must
 with, from a small scale of a species
 for the ~~known~~ ^{observed} reason, there are
 have been found in great numbers.
 species of *Potamogeton* which must
 the collected localities to be

Their bones are chiefly petrified.
 Layers of radiating strata, covered by
 green, sand, brownish & brown
 ground the front, exhibiting further
 with present a central conical brown
 head brown. In the top center, the
 of present & the lower & broader (very)
 brown and that of a fish looking
 better & large rounded scales, showing
 the ~~central~~ present is before.

[illegible]

In the genera, *Clavacanthus*, *Leptacanthus* and *Physimerus*, and a single tooth found with these has the characters of *Clavopitichius* (*Aspirer*) ~~Leptacanthus~~.

It is evident from the presence of the remains of large predaceous fishes, that there were present the ancient Winton estuary probably in far greater numbers than the remains now found would indicate. Their position may be one corner of the detached ~~rock~~ ^{state} in which the other fish remains occur, and accordingly many more patches of scales & teeth are associated with coprolites matter in a manner which indicates that they formed the debris of the food of the larger fishes.

Under this head I am inclined to place certain *Globularius*, about a line in diameter, which are very abundantly scattered over the surfaces of some of the beds. They have a thin carbonaceous coating ~~and~~ most externally a very finely granulated. They are filled with iron pyrites or calc spar, and the manner in which some of them have collapsed indicates that when recent they were tough and more brownish than appearance and their want of resemblance to any known plant of the coal measures, indicates me to believe that they are spores of fishes.

The first of these is the
 fact that the population
 of the world is increasing
 at a rapid rate. This is
 due to a number of causes,
 including improved medical
 care, better sanitation,
 and a general increase in
 the standard of living.
 The second fact is that
 the world's resources are
 being depleted at an
 alarming rate. This is
 due to the fact that the
 world is consuming more
 resources than it is
 producing. This is a
 serious problem, as it
 means that the world
 will eventually run out
 of resources. The third
 fact is that the world's
 climate is changing. This
 is due to the fact that
 the world is producing
 more greenhouse gases
 than it is removing. This
 is a serious problem, as
 it means that the world
 will experience more
 extreme weather events
 in the future.

The fourth fact is that
 the world's population is
 becoming more diverse.
 This is due to the fact
 that people are moving
 from one country to
 another. This is a
 positive development, as
 it means that the world
 is becoming more
 inclusive. The fifth fact
 is that the world's
 economy is growing.
 This is due to the fact
 that the world is
 producing more goods
 and services than it
 is consuming. This is
 a positive development,
 as it means that the
 world is becoming more
 prosperous.

Eutomostroaca. In a few layers at Boston, there are quantities of valves of bivalve crustaceans of several species. Some of them have ventral furrows like the *Gyrodina* of Konink, others are oval and smooth; but none of them appear to be identical with the *Gyrids* of the ~~lower~~ ^{Middle} Coal measures. As their remains of these creatures occur in but few of the rock beds I cannot attribute to them any important part in dismembering the remains of the rocks. Specimens of these ~~crustaceans~~ ~~crustaceans~~ ^{crustaceans} have been sent to Mr. Jones who I trust will be able to ~~use~~ examine and report on them.

Annelida. Some of the beds of Sandstone resting on clay, at Boston and Hingham N., are completely covered with cylindrical casts, apparently of the trunks and ^{columns} ~~columns~~ ^{the rock looks like a mass of fossilized macerons.} burrows of worms. Other beds are marked by projections on their undersides, which I suppose represent the ^{trunks} ~~trunks~~ of worms turning in the sand and turning to ascend again on reaching the stiff clay beneath. They are oval

projections with a deep groove along
 the centre, and more delicate pro-
 cesses extending from this to the margins.
 They would belong to the genus *Nereites*,
 but it seems scarcely worth while to
 give them a specific name (Figs 807)

Proposed with a deep groove along
the center, and from 1/2 inch for
was intended for the
the ~~small~~ ^{small} ~~the~~ ^{the} ~~small~~ ^{small}
but it seems to be with water &
for them a ~~large~~ ^{large} ~~small~~ ^{small} (1/2 inch)

20(a)

Mollusca of small Union-
like species from Pansher is
the only representative of this
Prinnc of the animal range
which that I have found.
It is not distinct, nor well
from species found above
the marine line; but
their peculiar form of broken
is compared to the plants
bearing beds, and does
not occur in the strictly
marine parts of the system.

On the surfaces of the beds
at Weston there are many singular
markings different from those which
unmistakable trails of annelids. Most
of them are mere scratches which may
have been caused by drift wood
or fins of fishes. One of the
most curious forms is a form
having on each side a series of

At the same time
the species from the
the only representative of the
series of the common
form that is found
it is not characteristic of
from species found where
the common form is not
this species from the
is compared to the
leaving both in the
but occurs in the
common form of the

At the same time
of the form there are
relationships different from the
series of the common
of them as well as the
have been found of the
the form of the
most common form is a
having a dark side a series of

transverse markings which may
 have been caused by the feet
 or fins of crustaceans or fish.
 At the termination of such
 tracks there is usually a
 series of curved scratches
 inclined to one side, as if
 the creature had raised
 itself from the bottom to
 swim off. ^(Fig 8) ~~There are also slabs with casts of~~
~~cracks & pittings which may be~~
~~seen elsewhere.~~

These markings, and the
 numerous smooth and dis-
 tinct strata surfaces at
 bottom, show that the process
 of deposition was slow and
 interrupted, and it is probable
 that many of these sur-
 faces especially those curved
 with fish scales long formed
 the bottom of clear water
 mantled by fish. On the
 other hand occasional
 beds of coarse sandstone
 and thick imperfectly bedded
 shales and the presence
 of beds with cut trees
 indicate occasional deposition
 of large quantities of sediment
 and important changes of
 level. In ~~fact~~ these
 respects the lower coal measures

The first of these is the fact that the
 temperature of the water in the
 river is not uniform. It is higher
 in the upper part of the river
 than in the lower part. This is
 due to the fact that the water
 in the upper part is not so
 much exposed to the sun as the
 water in the lower part. The
 temperature of the water in the
 river is also affected by the
 wind. When the wind is strong
 it causes the water to be mixed
 and the temperature is more
 uniform. When the wind is
 light the water is not so mixed
 and the temperature is more
 variable. The temperature of the
 water in the river is also affected
 by the current. When the current
 is strong it causes the water to
 be mixed and the temperature is
 more uniform. When the current
 is light the water is not so mixed
 and the temperature is more
 variable. The temperature of the
 water in the river is also affected
 by the bottom. When the bottom
 is rocky it causes the water to
 be mixed and the temperature is
 more uniform. When the bottom
 is sandy it causes the water to
 be less mixed and the temperature
 is more variable. The temperature
 of the water in the river is also
 affected by the vegetation. When
 there is a lot of vegetation along
 the banks of the river it causes
 the water to be less mixed and
 the temperature is more variable.
 When there is little vegetation
 the water is more mixed and the
 temperature is more uniform.

resemble those known in
the system, but the prevalence
of subaqueous conditions
was greater in the former.

At the very base of
the series we have in the
conglomerate & Vol. sandstone
evidence of great physical
changes and rapid deposition
~~and in the sea~~ occurring along
the shores, and in the
sandy limestones and the
accompanying sandstones many
and often indications of
similar changes with ~~a series~~
~~occuring~~ ~~character~~ of the ~~sea~~
occurring in the sea bottom,
and while on the one hand the
oceanic conditions of the marine
fauna limestones with brachiopods
and corals are absent on the
other hand the terrestrial remains
of the middle coal period are rare.
The peculiar ~~of these~~ character of these
beds in reference to ~~the~~ the life
of the period, & is that they afford
the first traces of ~~the~~ its plants
and shore animals, and that
they show ^{in the} swampy ~~and~~ ^{estuarine} ~~surfaces~~
of forest clad river valleys of the
old Silurian shores while they afford the

remains of fishes that may
have occasionally visited the
~~ocean~~ ^{not} washed coal reefs ~~that~~
of the distant sea.

~~These beds~~

The lower coal measures
contain no valuable beds of
coal. Their mudstones are
sometimes quarried for building,
and then laminated calcareous
shales rich in the phosphate
of lime of fish remains might
be used for agricultural purposes.
The high bituminous shales
of Albert have been used
for the manufacture of hydraulic
carbons. The singular and
anomalous bed or vein of
high bituminous coal matter
at Albert, is the most valuable
deposit hitherto found in this
series. The absence of large beds
of coal corresponds with the
want of terrestrial surfaces, and
of remains of sigillarioid ~~and sigillarioid~~
~~as well as~~ ^{and} coniferous ~~wood~~ trees,
the growth and accumulation of which,
and of the rank underground of
Calamites, poeites and ferns seems
to have characterized the coal
swamps of the middle coal measures.

A. C. C. C.

Edw. M. M. M.

1838

*Received of the Treasurer of the
Board of Directors of the
City of New York
the sum of \$100.00
for the purchase of
the land on which
the City Hall is
situated.*