

Since the publication of my memoirs on Devonian plants in the Journal of the Geological Society of London and in the Reports of the Canadian Geological Survey, I have watched with some interest the progress of discovery in the Devonian Flora of Scotland, and desire now to make a few remarks on new and critical forms and on opinions which have been expressed by workers in this field.

Previous to the appearance of my descriptions of Devonian plants from North America, Hugh Miller had described forms from the Devonian of Scotland, similar to those for which I proposed the generic name Psilophyton, and I referred to these in this connection in my earliest description of that genus.* He had also described what seemed to be plants allied to Lycopods and Conifers. Mr Peach and Mr Duncan had ~~also~~ made ^{additional} discoveries of this kind and Dr Hooker and Mr Salter had described some of these remains. More

* Journal Geological Society London 1859.

recently Messrs Peach, Cammuthers and Mr. Stok
have worked in this field, and in the
present year* Messrs Jack and Etheridge have
summed up the facts and have added
some that are new.

The first point to which I shall refer, <sup>and which will lead to the
other matters to be discussed,</sup>
~~and with which I shall connect some other~~
is the relation of the characteristic *Lepidodendron*
of the Devonian of Eastern Amer-
ica, *L. gasparrum*, to *L. nothum* of
Unger and of Salter. At the time when
I described this species, I had not access
to Scottish specimens of *Lepidodendron* from
the Devonian, but these had been well
figured and described by Salter, and had
by him been identified with *L. nothum*
of Unger, a species evidently distinct from
mine as was also that figured and de-
scribed by Salter, whether identical or
not with Unger's species. In 1870 I had
for the first time an opportunity to study Scottish
specimens in the collection of Mr. Peach and
on the evidence thus afforded I stated con-
fidently that these specimens represented a
species distinct from *L. gasparrum* though
apparently closely allied.** It differs from

** Report on Devonian
Plants of Canada,
* Journal London Geol Soc July 1877. 1871.

L. fuspearum in its habit of growth by developing small lateral branches instead of bifurcating and in its foliage by the absence or obsolete character of the leaf-bases and the densely placed and somewhat appressed leaves. If an appearance of swelling at the end of a lateral branch in one specimen indicates a strobile of fructification, then its fruit was not dissimilar from that of the Canadian species in its position & general form, though it may have differed in details. On these grounds I decline to identify the Scottish species with *L. fuspearum*. The *Lepidodendron* from the Devonian of Belgium, ^{described and figured by Cope*} has a better claim to such identification and would seem to prove that this species existed in Europe as well as in America. ^{Also seen in Mr. Peck's collection. Some fragments which resemble} It was distinct from Salter's species and probably belongs to *L. fuspearum*.†

In the earliest description of *Psilophyton* I recognized its probable generic affinity with Miller's dichotomous plants with Salter's roots and with Goeppert's *Haliserites Dechenianus* and stated that I had a little doubt that materials exist in the Old Red Sandstone of Scotland

† Proceedings Geol. Soc. of London, vol. 1871

* Observations sur quelques Plantes Fossiles des dépôts dévonniens

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for the reconstruction of at least one species of this genus? Since however Miller's plants had been referred to Crispeous roots and to fucoids and Goepfert's Halimantes was a name applicable only to fucoids, and since the structure and fruit of my plants placed them near to Sympods, I was under the necessity of giving them a special generic name, nor could I with certainty affirm their specific identity with any European species. The comparison of the Scottish specimens with woody rootlets though incorrect is in ~~in~~ one respect creditable to the accuracy of Salter, as in almost any state of preservation an experienced eye can readily perceive that branchlets of Perlophyton must have been woody rather than herbaceous, and their appearance is quite different from that of any true Algae.

The type of Perlophyton is my *P. princeps*, of which the whole of the parts and structures are well known, the entire plant being furnished in abundance and in situ in the rich plant-beds

of *fasci*. A second species *P. robustus* has also afforded well characterized fructification. *P. elegans*, whose fruit appears as "oval scales", no doubt bore sac-like spore-cases resembling those of the other species but in a different position and perfectly flattened in the specimens procured. The only other Canadian species *P. glabrum*, being somewhat different in appearance from the others and not having afforded any fructification must be regarded as uncertain.

The generic characters of the three first species may be stated as follows:—

Stems dichotomous, with rudimentary subulate leaves, sometimes obsolete in terminal branchlets and fertile branches; and in decorticated specimens represented only by punctiform scars. Young branches circinate. Rhizomata cylindrical with circular root-areoles. Internal structure of stem an axis of scalariform vessels enclosed in a sheath of unperfected woody tissue and covered with a cellular bark more dense externally.

Fruit naked sac-like spore-cases in pairs or clusters, terminal or lateral.

The Sutter specimens confirm the characters in so far as they are known, but not having as yet afforded fruit a internal structure they cannot be specifically determined with certainty. More complete specimens should be carefully searched for and will no doubt be found.

In Belgium M. Crepin has described a new species from the Upper Devonian of Condruz under the name *P. Concluserianum** It wants however some of the more important characters of the genus and differs in having a pinnate lamification giving it the aspect of a fern. In a later paper (1876) the author considers this species distinct from *Perlophyton* and proposes for it a new generic name *Rhacophyton*. In a note he states that Mr. Caruthers informs him that he regards *Perlophyton* as founded on the axes of *Lepidodendron* and on the fruit of ferns of the genus *Rhodesia* of Steud. In this statement I have

^{no other}
 published authority in the part of the
 English botanist, and it is certainly
 quite distinct of foundation in nature,
 My original specimens of *Perlephyton* are
 live plants with slender stems growing from
 rhizomes, and their leaves and fruits
 are attached to them, and *Rhodes*
 is merely a nominal genus formed
 to include certain ferns of ~~the~~ the
 Hymenophyllid group but otherwise of
 uncertain affinities. In the same
 note M. Cupin intimates that Mr
 Carruthers has abandoned his
Perlephyton dechemannii, published in
 the Journal of Botany for 1843, and
 in which he had included *Salters*
Lepidodendrium Nothum, and *Syapodites*
Mulleri and "rootlets" as well as
 Goepfert's *Holmites dechemannii* and a
 peculiar plant given to him by Sir
 P. Egerton! * Such a change of opinion
 must admit to be judicious. The fact
 that these plants could even for an
 hour be identified by a skilful botanist

~~no other~~
published authority in the part of the
English botanist, and it is certainly
quite distinct of foundation in nature,
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rhizomes, and their leaves and fruits
are attached to them, and Rhoden

* Mr Canuthus has elsewhere identified *Sepi-*
dodendrum notatum and *L. fuscescens* with
Leptophleum rhombicum and this with an
Australian species ^{collected} ~~found~~ by Mr Daintree in
Queensland and which I subsequently found
to be a species allied to the well known
Sepiododendrum tetragynum of the Lower
Carboniferous, and which had been
previously discovered by Mr Selwyn in the
Carboniferous of Victoria. See Canuthus paper
in the Journal of the Geological Society Vol 28
and my criticism in Vol 29 which last was
however not printed in abstract, and with some
~~very inaccurate and unfair comments by~~
~~way of "Description"~~ Comments under the head
of "Description" & which if present I would
have very early replied.

shows however how imperfect they are known and warrants some investigation of the causes of this obscurity and of the true nature of the plants.

The characters given by Mr. Carnothen in his paper of 1843 for the species *P. Sechemannii* are very few and general:—"Lower branches short and frequently branching, giving the plant an oblong circumscription!" Yet even these characters do not apply so far as known to Muller's friends a Sutter's willows or Sutter's Hahrentes. They merely express the peculiar mode of branching already referred to in Sutter's *Lepidodendron* Nothum. The identification of the former plants with the *Lepidodendron* and *Lycopodites* indeed rests only on mere juxtaposition of fragments and on the slight resemblance of the articulated ends of the branches of the latter plants to *Psilophyton*. It is contradicted by the ~~abrupt~~ ^{oblique ends} ~~termination~~ of the branches of the *Lepidodendron* or *Lycopodites* and by the apparently

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strobilaceous termination of some
of them.

Salters description of his *Sepulv-*
dendron is quite definite and accords
with specimens placed in my hands
by Mr. Peck:— "Stems half an inch
broad, tapering little, branches short
set on at an acute angle, blunt
at their terminations. Leaves in seven
to ten rows very short, not a line
long and rather spreading than closely
imbricate." These characters however
in so far as they go are rather
those of the genus *Sycopodites* than of
Sepulv-dendron from which this plant
differs in wanting any distinct leaf-
bases, and in its short crowded
leaves. It is to be observed ~~also~~ that
they apply also to Salters *Sycopodites*
Milleri and that the difference of
the foliage of that species may be
a result merely of different state of
preservation. For these reasons I am
disposed to place these two supposed
species together and to retain for

the species the name *Lycopodium*
Milleri, ~~it may be hazarded by for it, the~~
 description alone given, with merely
 the modification that the leaves are
 sometimes method of an inch long
 and secund.

Decorticated branches of the above
 species may no doubt be mistaken
 for *Psilophyton*, but are nevertheless quite
 distinct from it, and the slender branching
 dichotomous stems with terminations such
 as Miller graphically states are "like the
 tendrils of a pea" are too characteristic
 to be easily mistaken, even when neither
 fruit nor leaves appear. With reference
 to multiplication the form of *L. Milleri*
 renders it certain that it must have
 borne strobiles at the ends of its
 branchlets, or some substitute for these,
 and not naked spore cases like those
 of *Psilophyton*.

The remarkable fragment com-
 municated by Mr Philip Gorton to Mr
 Carruthers belongs to a third form
 and has I think been quite mis-

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understood. I am enabled to make this statement with some confidence from the fact that the reverse a counterpart of Mr Philip's specimen was in the collection of Mr Mrville Thomson and was placed by him in my hands in 1870. It was referred to ^{in 1871} in a paper on New Devonian Plants published in the Journal of the Geological Society ^{London} in the following terms:—

"In his recently published 'Paléontologie,' Schimper (evidently from inattention to the descriptions and want of access to specimens) doubts the Lycopodiaceous character of the species of this genus described in my papers in the Journal of this Society from the Devonian of America. Of these *L. Richardsoni* and *L. Matthewi* are undoubtedly very near to the modern genus *Lycopodium*. *L. Vanuxemii* is, I admit, more problematical; but Schimper could scarcely have supposed it to be a fern or a fucoid allied to *Caulerpa* had he noticed that both in my species and the allied

L. pennæformis of Goeppert, which he does not appear to notice, the pinnales are articulated upon the stem, and leave scars where they have fallen off. When in Belfast last summer I was much interested at finding in Prof. Thomson's collection a specimen from Caithness, which shows a plant apparently of this kind, with the same long narrow pinnae or leaflets, attached, however, to thicker stems, and rolled up in a circinate manner. It seems to be a plant in veneration, and the parts are too much crowded and pressed together to admit of being figured or accurately described: but I think I can scarcely be deceived as to its true nature. The circinate arrangement in this case would favour a relationship to ferns; but some Lycopodiaceous plants also roll themselves in this way, and so do the branches of the plants of the genus *Psilophyton*."

No figure of this curious plant was given, and Mr Carruthers if he noted the reference very probably did not connect it with the specimen which he received from Mr Philip Gesta. This

* Vol XXVII, P. 274

paper however published in the Journal
 of Botany for 1873 leaves no room to
 doubt that he has had in his
 possession the ~~original~~ ^{copy} of Thomson's specimen
 My interpretation of it however differs
 somewhat from his and since it is of
 some palaeontological interest I shall
 proceed to describe it from my
 point of view.

The specimen consists of a short
 axis or stem on which are placed short
 alternate branches which extend obliquely
 outward and then curve inward in a
 circinate manner. The lower ones can be
 seen to produce on their inner sides short
 lateral branchlets and upon these and
 also on the extremities of the branches are
 long narrow linear leaves placed in a
 crowded manner and which can
 substitute the tufts of linear bodies
 referred to by Mr. Carruthers. The
 specimen is thus not a spike of fructi-
 fication but a young stem or branch ^{of fructi-}
 which when unrolled would be of
 the form of those peculiar pinnate ^{fructification} ^{of the}
 podites of which *S. varroensis* of the

American *Devonian* and *L. pennaeformis* of the European Lower Carboniferous are the types, and it shows what might have been anticipated from other specimens that they were low tufted plants, circinate in vernation. The short stem attached to this plant is simply furrowed and bears no resemblance to the detached branch of *Lycopodites Mulleri* which lies on the same slab. As to the affinities of the singular type of plants to which this specimen belongs, I may quote from my Report on the Lower Carboniferous Plants of Canada, in which I described an allied species *L. plumula*.

"The botanical relations of these plants must remain subject to doubt, until either their internal structure or their fructification can be discovered. In the mean time I follow Goeppert in placing them in what we must regard as the provisional genus *Lycopodites*. On the one hand, they are not unlike the slender twigs of *Taxodium* and similar Conifers, and the highly carbonaceous character of the stems gives some colour to the supposition that they may have been woody plants. On the other hand, they might in so far as form is concerned be placed with algae of the type of Brongniart's *Chondrites obtusus*, or the modern *Caulerpa plumaria*. Again, in a plant of this type from the Devonian of Caithness to which I have referred in a former memoir, the vernation seems to have been circinate, and Schimper has conjectured that these plants may be ferns, which seems also to have been the view of Shumard. The following remarks on this group of plants are copied from a paper by the author, on new Devonian plants, in the proceedings of the Geological Society, March 1871.

On the whole these plants are most nearly allied to Lycopods and Ferns; and as they constitute a small but distinct group found only in so far as I know in the Lower Carboniferous and Devonian, they deserve a generic name, and I would propose for them that of *Psilophyton* a name sufficiently distinct from *Psilophyton* yet expressing very well their peculiar feather-like habit of growth. This genus may be defined for the present as follows:—

"Branching plants; the branches bearing long slender leaves in two or more ranks, giving them a feathery appearance. Venation arcuate. Fruit unknown, but analogy would indicate that it was borne at the bases of the leaves, or on modified branches with shorter leaves."

I would name the present species *P. Thomsoni*, and named characterize it by its dense tufted form and thick branches, until specimens more fully developed shall be found. The other species will be:—

- P. Pennaeiformis*, Goppert, Lower Carboniferous
- P. barroensis*, Dawson, Devonian
- P. plumula*, Dawson, L. Carboniferous

Shumard's *Filices gracilis* from the Devonian of Ohio and Stuart *Pinetes antecessors* from the Lower Carboniferous of Europe may belong to the same genus. The present specimen is thus the first appearance of this form in the Devonian of Europe.

Prof. Allee Nicholson has kindly placed in my hands a specimen from the Lower Ludlow of Ben Ledge near Ludlow, which from its regular ramification, its apparently woody structure and its traces of rudimentary leaflets may not improbably belong to some species of *Perlophyton*. If this reference be correct it would place this genus as low in Europe as in America.

The remarkable plants from the Skiddaw Slates described by Prof. Nicholson as *Butthotiephus*, *Harknessii* and *B. radiata*, have also been examined by me as well as some additional specimens collected by Mr. J. M. Dawson. Nicholson says of the latter species "~~If of vegetable~~ If its vegetable nature be

Mr. Suttin described in 1854 (*Annals London Geol Soc*) fragments of *Composita* woods having the structure of *Dadoxylon* ~~though~~ ^{though} very imperfectly preserved, and Prof. McCab has proposed this generic name ^{*Palaeocomposita*} for a specimen of *Composita* wood collected by Hugh Miller. ^{referred to as the testimony of the rocks,} From his description given in the Transactions of the Edinburgh Botanical Society I should infer that it may be generically identical with the woods referred to genus *Dadoxylon*, *Unger*, (*Strancomylon* of Klaus). The description however does not mention the number of rows of discs or their arrangement, or the structure of the medullary rays, and I have not seen the specimens. I have described three species of *Dadoxylon* from the ^{middle of the} Devonian of America ^{one of} ~~another~~ called from *Ornodoxylon*, and the somewhat exceptional *Protolaxites*, ^{which occurs in the Lower Devonian} all three have been carefully figured, and it is much to be desired that the Scottish specimens should be re-examined and compared with these.

considered, it can hardly be referred to the Algae. It seems not unlikely that both species belong to the same species and that this had the habit of growth of crumulation and resembled *St. Legeria* of the common Deciduous. If a land plant it is probably the oldest at present certainly known.

In studying the plants of the older rocks the botanist requires to be on his guard, as to the algae and Lichens which ~~must resemble~~ simulate land plants. In the latter group I know nothing more deceptive than the Graptolites of Hall's genus *Trochilites*. A specimen before me ~~from~~ from the collection of Col. Grant of Hamilton, in its ramification and appearance of foliage, bears the closest resemblance to a *Lycopodium* plant, though it is regarded as a polytrich allied to the graptolites. I have also seen what appears to be the base of a *Dictyonema* recently an appearance which might cause it to be mistaken for a moss and peculiar Psilophyton. This specimen is also from the collection of Col. Grant.

Mrs Jack and Etheridge have given an excellent summary of our present knowledge of the Devonian plants of Scotland in a recent memoir in the Journal of the Geological Society of London. From this it would appear that species referable to the genera *Calamites*, *Lepidodendron*, *Lycopodium*, *Perlophyton*, *Arthrostroma*, *Archaeopteris*, *Canopteris*, *Palaeopteryx*, *Stranvaeria*, and *Stemaria* have been recognised.

The plants described by those gentlemen from the Old Red Sandstone of the neighbourhood of Callender, I should suppose, from their figures and descriptions, to belong to the genus *Arthrostroma* rather than to *Perlophyton*. I do not attach any importance to the suggestion that their apparent leaves may be leaf-bases, as long leaf-bases like those of *Lepidodendrons* do not occur in these humbler plants of the Devonian. The stems with "delicate horizontal processes to which they refer may

possibly belong to *Ptilophyton* or to *Pinnularia*.

In conclusion, I need scarcely say that I do not share in the doubts expressed by some British palaeontologists as to the limits of the Devonian & Carboniferous Floras. In Eastern America where these formations are unconformable there is of course less doubt than in Ireland and Western America where they are stratigraphically continuous. Still there should be no hesitation as to the distinctness of their flora & fauna, inasmuch as the species are for the most part different and as I have elsewhere shown the physical conditions of the two periods were also different.*

It is however to be observed that some Stur and others have shown that *Calamites radiatus* and some other species distinctive of Devonian in character have been found in Europe in the Lower Carboniferous, it is not unlikely

* Reports on Devonian Plants & a Lower Carboniferous Plants, of Canada.

~~of is not unlikely~~ that the Devonian,
 flora like that of the Lethian, appeared
 earlier in America. It is also probable
 that it appeared earlier in the Arctic
 than in the temperate zone. Hence
 an Arctic or American flora really
 Devonian may easily be mistaken
 for Lower Carboniferous by a botanist
 acquainted only with the fossils of
 the temperate regions of Europe. Even
 in America itself, it would appear from
 discoveries made in Virginia and Ohio, that
 Devonian forms lingered longer there
 than farther to the North-east*. Still
 these facts when properly understood do not
 invalidate the inference in any locality
 where the two formations are well
 developed. That ~~they have~~ ^{would be altogether to be expected} led to serious
 errors in the reference of plants to ~~any~~
^{these higher} ~~lower~~ ^{groups} cannot however be doubted.

I trust that Scottish workers in
 this interesting though difficult branch of
 investigation will be encouraged by the

* Andrews in 2d Vol of Palaeontology of Ohio, Meek, Report
 on Fossil Plants from Western Virginia, Philos. Soc. of Washington
 1875;

Since they have already attained to
 still more diligent study of it; and I
 would add that the smallest and
 most obscure fragments of plants should
 not be neglected. Such specimens when
 placed in their due relation with
 others previously obtained may reveal
 the most important truths, ~~and even~~^{or even}
 if by themselves unintelligible may be
 rendered valuable by subsequent discoveries.
 Collectors should also endeavor to secure
 every portion of any specimen they may
 find, and should keep all the fragments
 referring to any one plant together, Careful
 work of this kind will be sure to be
 rewarded by important discoveries.

