February, 1878.

(From the Canadian Naturalist, Vol. VIII. No. 7.)

NOTES

ON SOME

SCOTTISH DEVONIAN PLANTS.

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(Read before the Edinburgh Geological Society, 20th Dec. 1877, D. Milne Home, Esq., LL.D., President, in the chair.)

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.

Previously 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 recognized what seemed to be plants allied to Lycopods and Conifers. Mr. Peach and Mr. Duncan had made additional discoveries of this kind, and Sir J. Hooker and Mr. Salter had described some of these remains. More recently Messrs. Peach, Carruthers and McNab 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, and which will lead to the other matters to be discussed, is the relation of the characteristic *Lepidodendron* of the Devonian of Eastern America, *L. Gaspianum*, 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

* Journal Geological Society, London, 1859.

† Ibid, 1877.

these had been well figured and described by Salter, and had been identified with *L. nothum* of Unger, a species evidently distinct from mine, as was also that figured and described 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 confidently that these specimens represented a species distinct from *L. Gaspianum*, perhaps even generically so.* It differs from *L. Gaspianum* 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 closely 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 and general form, though it may have differed in details. On these grounds I declined to identify the Scottish species with *L. Gaspianum*. The Lepidodendron from the Devonian of Belgium described and figured by Crepin,† has a better claim to such identification, and would seem to prove that this species existed in Europe as well as in America. I also saw in Mr. Peach's collection in 1870, some fragments which seemed to me distinct from Salter's species, and possibly belonging to *L. Gaspianum*.‡

In the earliest description of *Psilophyton* I recognized its probable generic affinity with Miller's 'dichotomous plants,' with Salter's 'rootlets,' and with Goeppert's *Haliserites Dechenianus*, and stated that I had "little doubt that materials exist in the Old Red Sandstone of Scotland for the reconstruction of at least one species of this genus." Since, however, Miller's plants had been referred to coniferous roots, and to fucoids, and Goeppert's *Haliserites* was a name applicable only to fucoids, and since the structure and fruit of my plants placed them near to Lycopods, 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 one respect creditable to the acumen of Salter, as in almost any state of preservation an experienced eye can readily perceive that branchlets of

* Report on Devonian Plants of Canada, 1871.

† Observations sur quelques Plantes Fossiles des dépôts Devoniens.

‡ Proceedings Geological Society of London, March 1871.

Psilophyton must have been woody rather than herbaceous, and their appearance is quite different from that of any true Algae.

The type of *Psilophyton* 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 Gaspé. A second species, *P. robustius*, 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 imperfect 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 Scottish specimens conform to these characters in so far as they are known, but not having as yet afforded fruit or 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 Condroz under the name *P. Condrusianum*, [1875]. It wants however some of the more important characters of the genus, and differs in having a pinnate ramification giving it the aspect of a fern. In a later paper [1876] the author considers this species distinct from *Psilophyton*, and proposes for it a new generic name *Rhacophyton*. In a note he states that Mr. Carruthers informs him that he regards *Psilophyton* as founded on the axes of *Lepidodendra* and on the fruit of ferns of the genus *Rhodea* of Stur. For this statement I have no published authority on the part of the English botanist, and it is certainly quite destitute of foundation in nature. My original specimens of *Psilophyton* are low plants with slender stems growing from *rhizomata*, and their leaves and fruits are

attached to them, while *Rhodea* is merely a provisional genus formed to include certain ferns of the Hymonophyllid group, but otherwise of uncertain affinities. In the same note M. Crepin intimates that Mr. Carruthers has abandoned his *Psilophyton Dechenianum*, published in the Journal of Botany for 1843, and in which he had included Salter's *Lepidodendron nothum* and *Lycopodites Milleri* and "rootlets," as well as Goeppert's *Haliserites Dechenianus* and a peculiar plant given to him by Sir P. Egerton! * Such a change of opinion I must admit to be judicious. The fact that these plants could, even conjecturally, be identified by a skilful botanist, shows however how imperfectly 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. Carruthers in his paper of 1873 for the species *P. Dechenianum*, 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 Miller's fucoids or Salter's rootlets or Goeppert's *Haliserites*. They merely express the peculiar mode of branching already referred to in Salter'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 decorticated ends of the branches of the latter plants to *Psilophyton*. It is contradicted by the obtuse ends of the branches of the *Lepidodendron* and *Lycopodites*, and by the apparently strobilaceous termination of some of them.

Salter's description of his *Lepidodendron* is quite definite, and accords with specimens placed in my hands by Mr. Peach:— "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

* Mr. Carruthers has elsewhere identified *Lepidodendron nothum* and *L. Gaspianum* with *Leptophleum rhombicum*, and this with an Australian species collected by Mr. Daintree in Queensland, but which I subsequently found to be a species allied to the well known *Lepidodendron tetragonum* of the Lower Carboniferous, and which had been previously discovered by Mr. Selwyn in the Carboniferous of Victoria. See Carruthers' paper in the Journal of the Geological Society, vol. 28, and my criticism in vol. 29, which last was however only printed in abstract, and with some comments under the head of "Discussion," to which if present I could have very easily replied.

far as they go, are rather those of the genus *Lycopodites* than of *Lepidodendron*, from which this plant differs in wanting any distinct leaf-bases, and in its short crowded leaves. It is to be observed that they apply also to Salter's *Lycopodites 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 *Lycopodites Milleri*. It may be characterized by the description above given, with merely the modification that the leaves are sometimes one-third 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 which, 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 fructification, 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 communicated by Sir Philip Egerton to Mr. Carruthers,* belongs to a third group, and has I think been quite misunderstood. I am enabled to make this statement with some confidence, from the fact that the reverse or counterpart of Sir Philip's specimen was in the collection of Sir Wyville Thomson, and was placed by him in my hands in 1870. It was noticed by me in a paper on New Devonian Plants, in the Journal of the Geological Society of London in 1871, 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 species of *Lycopodites* 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

* Journal of Botany, 1873.

appear to notice, the pinnules are articulated upon the stem, and leave scars where they have fallen off. When in Belfast last summer I was much interested by 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 vernation, and the parts are too much crowded and pressed together to admit of being accurately figured or 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 themselvea in this way, and so do the branches of the plants of the genus *Psilophyton*."

No figure of the plant was given, and Mr. Carruthers, if he noticed the reference, very probably did not connect it with the plant which he received from Sir Philip Egerton. His figure however, published in the Journal of Botany for 1873, leaves no room to doubt that he has had in his possession the counterpart of Thomson's specimen, of which a figure is given in this paper. My interpretation of it differs considerably from his, and as the matter is of some palæontological interest, I shall proceed to describe the specimen from my point of view.

The specimen consists of a short erect stem, on which are placed somewhat stout alternate branches, extending obliquely outward and then curving inward in a circinate manner. The lower ones appear to produce on their inner sides short lateral branchlets, and upon these and also upon the curved extremities of the branches, are long narrow linear leaves placed in a crowded manner, and which are the "tufts of linear bodies" referred to by Mr. Carruthers. The specimen is thus not a spike of fructification but a young stem or branch in vernation, and which when unrolled would be of the form of those peculiar pinnate *Lycopodites* of which *L. Vanuxemii* of the American Devonian and *L. pennæformis* 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 of this plant is simply furrowed, and bears no resemblance to the detached branch of *Lycopodites Milleri* which lies at right angles to it on the same slab (see figure). 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 have 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."

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

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

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

Pt. pennæformis, Goeppert, L. Carboniferous.
Pt. Vanuxemii, Dawson, Devonian.
Pt. plumula, Dawson, L. Carboniferous.

Shumard's *Filicites gracilis*, from the Devonian of Ohio, and Stur's *Pinites antecedens*, from the Lower Carboniferous of Silesia, may possibly belong to the same genus. The present specimen is apparently the first appearance of this form in the Devonian of Europe.

Mr. Salter described in 1857 * fragments of fossil wood from the Scottish Devonian, having the structure of *Dadoxylon*, though very imperfectly preserved; and Prof. McNab has proposed † the generic name *Palæopitys* for another specimen of coniferous wood collected by Hugh Miller, and referred to by him in the "Testimony of the Rocks." From Prof. McNab's description, I should infer that this wood may after all be generically identical with the woods usually referred to *Dadoxylon* of Unger (*Araucarioxylon* of Krans). The description, however, does not mention the number and disposition of the rows of pores, nor the structure of the medullary rays, and I have not been able to obtain access to the specimens themselves. I have described three species of *Dadoxylon* from the Middle and Upper Erian of America, all quite distinct from the Lower Carboniferous species. There is also one species of an allied genus *Ormoxylon*, besides the somewhat exceptional *Prototaxites*, which occurs in the Lower Erian, not far above the top of the Upper Silurian. All these have been carefully figured, and it is much to be desired that the Scottish specimens should be re-examined and compared with them.

Prof. Alleyne Nicholson has kindly placed in my hands some ancient plants which though not Scottish nor Devonian are of interest in this connection. One of these is a specimen from the Lower Ludlow of Bow Bridge. From its regular ramification, its apparently woody structure, and its traces of rudimentary leaflets, it may not improbably belong to the genus *Psilophyton*. If so, this genus occurs at about as low a horizon in Europe as in Canada.

The remarkable plants from the Skiddaw slates described by Nicholson as *Buthotrephis Harknessi* and *B. radiata* ‡ have also been examined by me, as well as some additional specimens from the same formation collected by Dr. G. M. Dawson. Nicholson says of the latter species:—"If its vegetable nature be conceded, it can hardly be referred to the Algae." It seems not unlikely, as Nicholson indeed suggests, that both plants may belong to the same species, and that this had the habit of growth of *Annularia* and resembled *A. laxa* of the American Devonian.

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* Journal London Geological Society.

† Transactions Edinburgh Botanical Society, 1870.

‡ Geological Magazine, Vol. VI.

If a land plant it is probably the oldest at present certainly known.*

With these plants, Prof. Nicholson sent a fibrous body from the Upper Llandeilo of Hart Fell, near Moffat, which at first sight had the appearance of a fragment of coarse-grained wood. On microscopic examination of it, however, I concluded that it had been a bundle of spicules of a sponge of the type of *Hyalonema*. This I still believe to be its true nature.

In studying the plants of the older rocks, the botanist requires to be on his guard as to the Algæ and Zoophytes of these formations which simulate land plants. In the latter group I know no forms more deceptive than those of Hall's genus *Inocaulis*, which is regarded as a relative of the Graptolites. A specimen now before me, from the collection of Col. Grant, of Hamilton, Ontario, in its ramification and appearance of foliage, bears the closest resemblance to a lycopodiaceous plant, and I have seen what appears to be the base of a *Dictyonema* from the Niagara formation, which might readily be mistaken for a small and peculiar species of *Psilophyton*.

Messrs. Jack and Etheridge have given an excellent summary of our present knowledge of the Devonian Flora of Scotland, in the Journal of the London Geological Society. From this it would appear that species referable to the genera *Calamites*, *Lepidodendron*, *Lycopodites*, *Psilophyton*, *Arthrostigma*, *Archæopteris*, *Caulopteris*, *Palæopitys*, *Araucarioxylon*, and *Stigmaria* have been recognized.

The plants described by those gentlemen from the Old Red Sandstone of Callender, I should suppose, from their figures and descriptions, to belong to the genus *Arthrostigma*, rather than to *Psilophyton*. I do not attach any importance to the suggestions referred to by them, that the apparent leaves may be leaf-bases. Long leaf-bases, like those characteristic of *Lepidofloyos*, do not occur in these humbler plants of the Devonian. The stems with delicate "horizontal processes" to which they refer may belong to *Ptilophyton* or to *Pinnularia*.

In conclusion, I need scarcely say that I do not share in the doubts expressed by some British Palæontologists as to the distinctness of the Devonian and Carboniferous Floras. In Eastern

* Since the above was written, Lesquereux has described supposed land plants from the Cincinnati Group (Lower Silurian) of Ohio. Saporta has discovered what he regards as a fern in rocks of similar age in France, and Claypole will shortly describe an apparently lepidodendroid tree (*Glyptodendron*) from the Clinton Group of Ohio; but neither of these is quite so old as the Skiddaw plants.