Phascaceae are but little further developed than those of *Buxbaumia*. But what I wish to point out here is that the prothallium of *Schizaea* is at just the same stage of evolution as the hypothetical Alga postulated by Goebel as the ancestor of the Mosses.

Many other points call for consideration, but their discussion would go beyond the scope of such a preliminary account as the present, and must be deferred. I hope, however, to shortly offer a further account of the present prothallium as well as those of other species of *Schizaea*.

It will be seen that, whatever interpretation we place upon it, the prothallium of *Schizaea* is a highly interesting form. But does not the weight of evidence justify its recognition as a relatively primitive type, which probably represents the character of the common Alga-like ancestor of both Ferns and Bryophytes more nearly than any plant hitherto described?

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ON AN UNEXPLAINED POINT IN THE ANATOMY OF HELMINTHOSTACHYS ZEYLANICA.—It has not been, I believe, hitherto recorded that in *Helminthostachys zeylanica* there are a number of small passages or canals running through the cortex from the neighbourhood of the stele to the external surface of the rhizome. These canals bear a definite relation to the leaf-insertion: one being situated in front of each leaf, opening out on to the surface immediately above the insertion of the 'stipule' of the leaf to which it belongs, not in the median line of the rhizome but well down towards the under side. The passage may, in fact, be regarded as a backward prolongation into the cortex of the space that lies between the 'stipule' and the stem as a narrow canal running right up to the stele.

The presence of these canals exercises a considerable influence upon the stele, and occasions certain modifications in structure which, I think, may best be explained by describing the manner of the departure of the leaf-trace, which the woodcut is intended to illustrate. The figure *A* is a diagrammatic longitudinal section of the stele in the neighbourhood of the leaf-gap, while *B* and *C* represent transverse sections taken at the levels *aa* and *bb* respectively. The xylem is represented by dark shading, the phloem by light, the parenchymatous tissue being left unshaded; the dotted line indicates

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the endodermis. The leaf-trace is supplied with a large arc of xylem which separates off from the stele, leaving a gap in it which affects the whole of the vascular ring, endodermis, phloem, and xylem; so that the parenchyma in the centre of the stele becomes continuous with that of the cortex. Passing towards the apex of the stem the xylem ring soon becomes complete again, and shortly afterwards so does the (external) endodermis, but the phloem ring remains for a

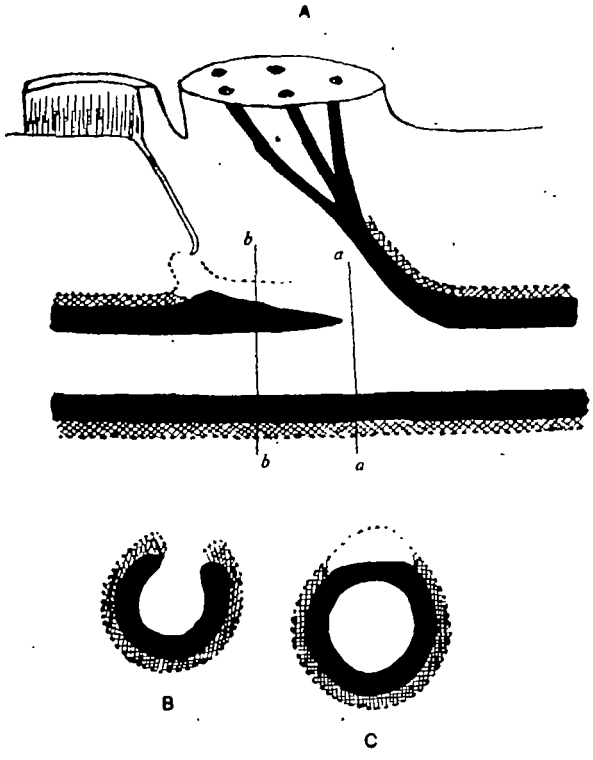


FIG. 19.

considerable time interrupted by a ridge or strand of parenchyma continuous with that which forms the leaf-gap, lying on the outside of the xylem ring, and eventually covered in externally by the endodermis. The strand consists of cells similar to those of the pith, and easily distinguished from the elements of the phloem by their greater size, rounded outline, and dense starchy contents.

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This ridge of parenchyma runs forward for some distance, finally ending in a small obliquely truncate conical projection inclined somewhat towards the apex. The endodermis forms a complete sheath around the projection except at its apex. The parenchymatous strand therefore communicates with both pith and cortex at the leaf-gap, and with the latter again at its forward termination.

The xylem ring, having closed up again after the leaf-gap, becomes especially thick opposite the projection, so that it forms a small outward protrusion underneath it. Immediately in front of this point the phloem ring becomes complete once more. The endodermis sheathing the projection usually bulges out in a saccate manner on the side nearest the apex, so that the open surface of the cone faces obliquely backwards. It is immediately above this aperture that the internal termination of the canal is situated. The canal runs from the surface of the stem obliquely backwards towards the tip of the projection, but just before its blind end it usually bends slightly forwards towards the apex.

In transverse sections of the stem the canal appears as a very narrow slit at different depths in the cortex according to the level of the section; the cortical cells in contact with it are arranged more or less radially around it. The termination of the canal occurs at the point where the trace of the leaf next above is about to depart from the opposite side of the stele.

These structures are of constant occurrence in all plants I have examined, and they acquire additional interest when it is stated that they are also present in the young plantlet. Some preparations made by Dr. Lang from young plants attached to prothalli, which he was kind enough to let me examine, show this to be the case, and that a canal is found in relation to the earliest leaves, even to the very first, which (allowance being made for the fact that the young plant at this stage is in the protostelic condition) is essentially similar to that described above.

Although suggestions are possible it is not easy to find an entirely satisfactory explanation for these curious structures. In the first place it is possible that they represent the last indications of vestigial axillary buds. Although at the present day *Helminthostachys* does not normally branch at all, Farmer[1] finds that branches frequently

[1] Farmer, On the structure and affinities of *Helminthostachys Zeylanica*. Annals of Botany, Vol. xiii. No. LI, 1899.

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arise from adventitious buds upon old parts of the rhizome. Possibly *Helminthostachys* or its ancestors branched more copiously, and Farmer's adventitious buds are due to the fact that this latent capability may still be stimulated into action under certain conditions. The fact that these buds are most frequently found upon almost decorticated fragments of rhizome appears to give colour to this suggestion.

It may also be suggested that they represent glandular organs of some kind; but, at the present day, the cells surrounding them give no particular evidence of a glandular nature.

D. T. GWYNNE-VAUGHAN.

GLASGOW.

ON SECONDARY THICKENING IN ANGIOPTERIS EVECTA.—For some time past Professor Farmer and the writer have been engaged upon an investigation into the structure of certain Marattiaceae. Various interesting features have come to light, amongst which is secondary thickening in *Angiopteris evecta*.

As is well known the steles of this plant are concentric in structure, the xylem being surrounded by the phloem. Both these tissues are arranged in an irregular manner, and between them there may often be seen elements exhibiting a marked radial arrangement, exactly presenting the appearance usually associated with that of a cambium. This cambium does not by any means surround the xylem, but is of local occurrence. There can be no doubt that the tissue in question owes its presence to post-embryonic merismatic activity, in fact to the existence of a cambium, though restricted to localized areas.

Additional evidence is afforded by the fact that on the inner side of this tissue semi-lignified elements with protoplasmic contents are often formed.

The only other view that could be held regarding this formative tissue is that its occurrence is due to the retention of the arrangement of primary meristem. It is, however, extremely doubtful if such a tissue would retain its characteristics for so long a time, for the best cases of secondary tracheides, accompanied by a cambium, were seen in the lower and older regions of the plants.

Secondarily formed tracheides have also been seen in the petioles, but not in the roots.

It may also be mentioned that outside the stele there is evidence of a tentative cambial activity. The latter is again irregular in its

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