L. squarrosum, Forst., as described by C. E. Jones¹. The material of *L. volubile* and *L. salakense* examined consisted of herbarium specimens collected by Raciborski in Java.

L. A. BOODLE, Jodrell Laboratory, Kew.

THE VASCULAR STRUCTURE OF THE OVULE OF CEPHALOTAXUS.—The seed of *Cephalotaxus* possesses a thick coat, consisting of an outer fleshy and an inner woody layer, thus perfectly resembling that of *Ginkgo* and the Cycads. This outer fleshy layer I regard, with Čelakovský, as homologous with the fleshy aril of *Taxus*. Strasburger has found that the vascular bundles traversing this fleshy portion, one on either side of the seed, are characterized by their *inverted orientation*, i.e., by having their xylem directed outwards, and their phloem inwards towards the woody layer of the seed-coat. This peculiar orientation of the bundles tends to indicate that the outer fleshy layer of the seed-coat is equivalent to a *ligular* structure. When ligules are sufficiently well-developed to possess a vascular strand, the orientation of the latter must necessarily be inverted in relation to the foliar organ on which they are inserted. The ligules of *Isoëtes* and Lycopodiaceae have been regarded by Čelakovský and others as homologous with the *outer integument* of ovules; the velum of *Isoëtes* and Ferns being homologous with the inner integument. This view, which is most probably correct, would lead us to regard the outer fleshy layer of the seed-coat of *Cephalotaxus* as an outer integument, for its bundles are shown to exhibit the orientation required by those of a ligule.

Unfortunately, the aril of *Taxus*, which Čelakovský also regards as an outer integument, possesses no vascular bundles with which to compare those in the ovule of *Cephalotaxus*. But yet another character, which Strasburger does not appear to have remarked, in the outer integument (as I prefer to term it) of *Cephalotaxus* calls for special attention. As above stated, there is a single bundle on each side of the seed. It is greatly extended in the tangential direction, and situated on the innermost side of the outer and in close proximity to the woody inner integument. The secondary centrifugal xylem of the bundle is two or three layers thick. Besides this, however,

¹ C. E. Jones, British Association, Section K, 1898. Ann. of Bot. Vol. xii, p. 558.

(and this is the point of my whole note), *well-developed centripetal xylem* occurs, the tracheides composing it extending along the whole tangential face of the centrifugal xylem in considerable quantity. A very interesting and important point in connexion with this diploxylic structure is the fact that there are two sets of protoxylem, as has been also shown for bundles of a similar structure in the sporophyll of *Cycas*, peduncle of *Stangeria*, &c. One of these protoxylems is attached to the centrifugal, the other to the centripetal xylem. The significance of the fact is this: that it indicates clearly, in my opinion, the derivation of a collateral bundle possessing such a structure from a concentric strand of which the phloem, which in the ancestors of the plant was attached to the outer side of the 'centripetal' xylem, has completely disappeared. This is also my explanation of the occurrence of centripetal xylem elsewhere, as in the peduncle of some Cycads, and the foliar organs of Cycads and Coniferae. I regard *Cephalotaxus* as the most ancient of the Coniferous genera, and therefore, supposing the Coniferae to be derived from some ancient Fern-stock, we should expect to find it exhibiting characters in its most primitive organs similar to those which we find in Cycads and *Ginkgo*. Now the two most primitive foliar organs of any plant are, to my mind, the *cotyledon* and the *ovular integument*. In the former I have already shown the absolutely Cycadean character of the structure of the vascular bundle, with its enormously developed centripetal xylem. In the latter a similar diploxylic structure of the bundle, as has been shown above, also predominates. Two conclusions may be drawn from these facts, viz., (1) That *Cephalotaxus* is the most primitive of the Coniferae; (2) That this genus forms in some measure a connecting link between Cycadaceae and Coniferae, and helps us to trace, however faintly, a fragment of the line of descent of the latter group.

I am much indebted to Prof. F. W. Oliver, of University College, London, for the supply of material for this research.

W. C. WORSDELL, Kew.

ON THE PRESENCE OF VERMIFORM NUCLEI IN A DICOTYLEDON.—In consequence of the interesting communication of Nawaschin and Guignard concerning the fusion of a vermiform nucleus with the polar nuclei in *Lilium Martagon*, I undertook last

Worsdell, Wilson Crosfield. 1900. "The vascular structure of the ovule of *Cephalotaxus*." *Annals of botany* 14, 317–318.

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