NOTES.

NOTE ON THE PRESENCE OF A 'TENT-POLE' IN THE SEED OF CEPHALOTAXUS PEDUNCULATA.—In a recent paper published in the 'Annals of Botany'¹ the view was expressed that, apart from *Ginkgo*, the nearest known relatives of the genera *Taxus*, *Torreya*, and *Cephalotaxus* are to be sought among the Palaeozoic group Cordaitales. The relatively isolated position of the three genera has also been urged in another paper,² in which the suggestion has been ventured that in view of their structural differences from the great majority of Conifers, coupled with certain archaic features reminiscent of Palaeozoic times, these three genera deserve to rank as an independent phylum (Taxales) co-ordinate with the Ginkgoales and the Coniferales (in the restricted sense). Like *Ginkgo biloba*, in fact, the Taxales were claimed as 'links with the past'.

The object of the present note is to draw attention to another fact which appears considerably to strengthen the Cordaitalean affinity. This is the presence, in the seed of *Cephalotaxus pedunculata*, of a small apical prolongation of the female prothallus

FIG. 1. *Cephalotaxus pedunculata*.
t.p. = tent-pole. x = position of proembryo.

FIG. 2. *Cycadinocarpus angustodunensis*.
(Modified from Renault.)

which, surrounded by a moat-like depression into which the archegonia open, props up the nucellar membrane somewhat like a 'tent-pole'. (The comparison of this process to a 'tent-pole', first made by Hirasè³ while describing it in *Ginkgo*, is so appropriate that this convenient term may usefully be adopted as a technical name.) This apparently insignificant organ of obscure function has long been known as a notable point in the structure of the few petrified seeds that have been found

¹ Sahni, B.: On Certain Archaic Features in the Seed of *Taxus*, &c. Ann. Bot., xxxiv. 131, 1920.

² Phil. Trans. Roy. Soc., ccx. 253, 1920.

³ Hirasè, S.: Études sur la fécondation et l'embryogénie du *Ginkgo biloba*. Journ. Coll. Sci., Imp. Univ., Tokyo, 1895.

attached to Cordaitlean shoots. The same feature is to be observed with suspicious constancy in a number of detached Palaeozoic seeds which have for good reasons been attributed to the Cordaitales, and it may safely be regarded as a strong Cordaitalean characteristic.¹

Fig. 1 is from a longitudinal section prepared from a seed of *Cephalotaxus pedunculata* after removal of the integument and all but the apical region of the female prothallus. Fig. 2 represents the corresponding parts (and a portion of the integument) in *Cycadinocarpus augustodunensis*; it has been inserted to facilitate a comparison between the recent and fossil seeds. A fairly well developed tent-pole is seen in Fig. 1; the position of the archegonia corresponds with that in Fig. 2, but at the stage examined a proembryo had already been formed in the position marked by a cross.

The presence of a tent-pole in *Cephalotaxus pedunculata* naturally suggests that this organ should be looked for elsewhere in the group. In 1905 Coulter and Land² published a figure of *Torreya taxifolia*, Arnott, in which the female prothallus shows a very striking cone-like apex: it would be interesting to know whether this may be homologized with a tent-pole. It is not unlikely that a search for this organ may prove successful in other members of the group.

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DIVISION OF THE NUCLEI IN *SYNCHYTRIUM ENDOBIOTICUM*, PERC.

—The life-history and mode of infection of *Synchytrium endobioticum*, a problem which has baffled a number of previous students, has recently been fully investigated by K. M. Curtis ('Phil. Trans. Roy. Soc.,' Ser. B, vol. ccx, p. 409).

The protoplasm of the resting sporangium of this organism is unusually dense, being crowded with deeply staining granules, and Curtis was unable to observe mitosis in connexion with the development of zoospores in the sporangium although mitosis was clearly recognized during the corresponding stages in the sorus. She was led to the conclusion that in the resting sporangium the primordia of the zoospores arise from chromatic granules discharged by the primary nucleus.

While making microscopic observations of this organism, in connexion with the problem of immunity, I had recently occasion to investigate the effect of various fixatives; among these Perenyi's fluid was employed and was found, probably owing to its poor fixation, to leave the normally dense cytoplasm in a transparent condition. As a result I was so fortunate as to be able to observe very definite mitoses in a developing resting sporangium which showed six dividing nuclei. Five of these are represented in the accompanying figure, the sixth was found in the adjacent

¹ See the works of Ad. Brongniart and of C. E. Bertrand cited in my paper on *Taxus* above referred to. Also Seward, Fossil Plants, iii. 333, 1917; Coulter and Chamberlain, Morphology of Gymnosperms, p. 197.

² Coulter and Land: Gametophytes and Embryo of *Torreya taxifolia*. Bot. Gaz., xxxix, Pl. A, Fig. 5, 1905.

Sahni, Birbal. 1921. "Note on the presence of a 'tent-pole' in the seed of *Cephalotaxus pedunculata*." *Annals of botany* 35, 297–298.

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