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.

section. The spindles are developed apparently within the nuclear membrane, and there is possibly some indication of the presence of centrosomes. The chromosomes are small and are crowded on the equatorial plate and could not be counted. There

Semi-diagrammatic drawing showing mitosis in resting sporangium of *Synchytrium endobioticum*, Perc. $\times 600$.

is no reason to doubt that in the resting sporangium, as in the sorus, the zoospore nuclei are the product of indirect division.

As circumstances have made it impracticable for me to continue the work in question it has seemed worth while to place this single observation on record.

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IMPERIAL COLLEGE OF SCIENCE,
January, 1921.

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