

Tannin sacs.—In transverse section the tannin sacs are often barely distinguishable from the resin canals, by reason of their structural similarity. They occur abundantly in the cortex and throughout the fundamental tissue, and especially in close proximity to or within the limits of the vascular bundles. To me these appear to be the structures referred to by Mr. Seward in his description of *Rachiopteris Williamsoni*, when he says, "there are smaller canals in the peripheral part of the phloem of each bundle."²⁸ In longitudinal section these sacs are seen to be of about the same diameter as in the transverse section, except in the cortex, where they assume the form of cylindrical cells about three or four times longer than broad. The contents are much lighter colored than those of the resin canals, and often present a well defined granular appearance. They readily yield the characteristic reactions for tannin.

Resin canals.—Throughout the sub-cortical zone, scattered among the sclerenchyma cells and also central to each of the isolated strands, are rather broad canals of indefinite length. Throughout the fundamental tissue, particularly in the neighborhood of the vascular bundles, there are also numerous canals which differ but slightly in their structural aspects from the surrounding cells. In all cases, however, they are at once recognizable by the rather dark red resinous mass which each contains. In longitudinal section the canals are of indefinite length. The contents are often septate. These structures appear to me to be comparable with the black, resinous masses of variable size to be met with not only in the Topeka specimen, but in most of the European specimens of *Myeloxylon*.

Mucilage canals.—Throughout the ground tissue of *Angiopteris* there may be seen broad openings bounded by more or less tangentially elongated cells. These are the canals from which issue the very large volume of mucilage freely liberated when the stipe is sectioned. These canals are always limited by cells which differ but little from those of the surrounding tissue, except that they are more or less elongated tangentially. Here

²⁸ Ann. Bot. 8: 214.