Phoradendron growing in the Arizona deserts upon various hosts, such as species of *Acacia*, *Quercus*, *Fraxinus*, and *Populus*, that the osmotic concentration of the tissue fluids of the parasite is generally greater than that of the host. The concentration of the fluids of such parasites in this semidesert region is also greater than and usually about twice as great as that of similar plants found in the mountain rain-forests of Jamaica. These results quite agree with our expectations, but in a further paper the same investigator[11] clearly demonstrates the errors that would be involved in generalizing broadly on insufficient data.

The later investigations have to do with the tissue fluids of epiphytic Bromeliaceae, Orchidaceae, Piperaceae, and Gesneraceae, and these are shown to possess a decidedly lower concentration than those from terrestrial vegetation. In the mountain rain-forests of Jamaica the epiphytes show 37–60 per cent of the concentration commonly found in herbaceous terrestrial vegetation and 28–45 per cent of the concentration characteristic of ligneous soil plants. The epiphytes of the Jamaican rain-forests show lower concentrations than related plants of the same habit growing in the subtropical forests of Florida. The exactness of the data and quantitative character of the comparisons make these investigations important, and lead us to look forward for the further results promised in the study of parasitism by quantitative methods.—Geo. D. Fuller.

Bennettitales.—Two cones of the Bennettitales from the British Cretaceous, one of them a new species, have just been described by Stopes.[12] The first and most important is the one upon which she has founded the new species *B. albianus*, the specific name referring to the strata in which the specimen was found. Only a small piece of a single cone was found, but it was very well preserved. After a study of the topography, the entire fragment was cut, yielding 2 longitudinal and 5 transverse sections, the latter passing through the seeds and the former through their stalks. The most striking feature of the cone is its large size, not less than 70 mm. in diameter and probably more. The seeds are innumerable, as many as 600 showing in a single transverse section of the fragment. The seeds are 5–6 mm. long and 1.2 mm. in diameter, thus contrasting with the more or less ovoid seeds already described. The interseminal scales are fused around the apex of the seed. The embryo has 2 cotyledons and a rather massive hypocotyl and radicle.

The other specimen, *B. maximus*, was described from superficial characters by Carruthers in 1870. The present study shows that the vascular axis is very small for such a large plant and the cones are bisporangiate, the first petrified bisporangiate cones which have been found in England. The cones

[11] Harris J. Arthur, On the osmotic concentration of the tissue fluids of phanerogamic epiphytes. Amer. Jour. Bot. 5:490–506. 1918.

[12] Stopes, Marie C., New Bennettitean cones from the British Cretaceous. Phil. Trans. Roy. Soc. London **208**:389–440. *pls. 19–24.* 1918.

are very young but do not seem to have been well preserved. If material in this stage and somewhat older stages could be secured, it would help immensely in comparing the Bennettitales and the Cycadales.—C. J. CHAMBERLAIN.

Cytology of the basidium.—A cytological investigation of the basidium of *Eocronartium muscicola*, one of the Auriculariales parasitic upon mosses, was undertaken by FITZPATRICK[13] because he had noticed that the nuclei are of unusual size, and because very little cytological work has been done in this order. The mycelium, which is intracellular and extends throughout the host, is composed of binucleate cells. The cells of the sporophore are also binucleate, and, during division, it is seen that the number of chromosomes in each of the 2 nuclei is 4. During the development of the basidium, the 2 nuclei fuse, the resulting nucleus passes into synapsis, and in later stages of division shows 4 chromosomes, which is also the number at the second division, so that the total number of chromosomes in the cell is reduced. Toward the close of the second division a transverse wall appears in the middle of the basidium and is soon followed by two more walls, so that the basidium consists of a filament of 4 cells. The sterigmata, which are large in proportion to the cells from which they arise, are not quite simultaneous in their appearance. The chromatin becomes drawn out into a slender thread as the nuclei pass into the young spores, and there is no connection with the centrosomes, as has been reported for some basidia. How the binucleate mycelium arises from the uninucleate spore has not yet been determined.—C. J. CHAMBERLAIN.

Orientation of roots.—HOLMAN[14] has investigated the influence of the medium upon the orientation of primary terrestrial roots. He shows that the failure of roots grown in air to reach a vertical position is due to lack of mechanical resistance to the advance of the root tip after the flattening of the primary geotropic curvature, rather than to differences in water content in the medium, or changes in geotropic sensitiveness, or to thigmotropism. His observations have been extended to secondary roots,[15] and here also he finds that when they have been displaced from normal position with respect to gravity, and the first curvature of response has been flattened, mechanical resistance is necessary to a complete reaction to normal position. The mechanical resistance hinders flattening of the primary curvature of the root tip, and passively depresses the tip as it moves forward, thus reinforcing and completing the geotropic response. —C. A. SHULL.

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[13] FITZPATRICK, H. M., The cytology of *Eocronartium muscicola*. Amer. Jour. Bot. 5:397–419. *pls. 30–32*. 1918.

[14] HOLMAN, RICHARD M., The orientation of primary terrestrial roots with particular reference to the medium in which they are grown. Amer. Jour. Bot. 3:274–318. 1916.

[15] ———, Influence of the medium upon the orientation of secondary terrestrial roots. Amer. Jour. Bot. 3:407–414. 1916.