

these stalks to the petiole ranged from the base of the petiole to the base of the blade of the leaf. Observations made on trees in the state park at Spencer, Indiana, and on street trees in Crawfordsville and Ladoga, Indiana, revealed the same conditions. Neither the age nor the vigor of the tree seemed to make any difference in the relative number or kind of stipules produced.

When one sees a leaf with stipules like those in figures 1 and 2, there seems to be nothing unusual; but on observing one with stipules like those in figures 3, 5 and 11 where one sees apparently the normal stipule plus something else, there is a question. Are these structures a part of the so called "normal stipule", or are they structures originating in the axils of the stipules? Some leaves would seem to indicate that they were simply enlargements of the normal stipule (fig. 12). But other leaves show the slender stalks of the unusual stipules coming from the axils of the normal stipules. Even when these stalks come apparently from different places on the petiole, they can usually be traced by a ridge on the petiole back to the axil of the normal stipule (figs. 10 and 11). Sometimes three of these stipules may be found on one leaf (fig. 14), or one may fork as is shown in figures 10 and 13. Or, this stipule may be sessile at the base of the leaf blade, appearing at first glance as a lobe of the leaf (fig. 9). The blade of the stipule may be very simple and entire as is seen in figure 4, A; or it may be aciculated and variously lobed as is shown in figure 6. The lobes of the stipule are frequently similar to those of the leaf blade.

By late summer, a few of these stipules had fallen, leaving only a slight scar. As far as the writer could ascertain, only a very few of these unusual stipules might be classified as "early deciduous". A great many of the leaves examined late in the autumn still retained their stipules. There seemed to be no tendency, except in a few instances for the stipules to be shed before the leaves fell.

In conclusion it might be said that all the trees examined had at least a few leaves with unusual stipules, but some trees showed a much larger proportion of stipulate leaves than others. Whether or not there is something inherent in the tree that causes it to produce these unusual stipules is not known. Observations of certain trees of opposite tendencies made from year to year, and seedlings from these trees might in a measure help to solve the problem. But before a definite conclusion can be formulated, it seems necessary to study a large number of trees of different localities, and also to study the origin of these unusual stipules morphologically.

DEVELOPMENT OF SPOROGENOUS TISSUE IN THE FOOT OF THE SPOROPHYTE OF PORELLA NAVICULARIS.

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From fresh material of *Porella navicularis* sent from Corvallis, Oregon, in the fall of 1920, quite a number of young sporophytes were

fixed in one per cent chromo-acetic acid and later sectioned for class use. Whole buds were used for the sectioning, the sections being longitudinal and 15μ in thickness. Modified triple was used for staining the sections.

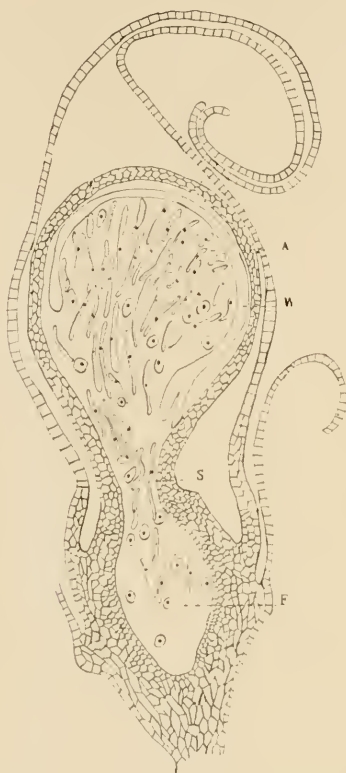


Fig. 1. Longitudinal section of bud of *Porella* showing unusual development of sporogenous tissue. x 45. A, sporangium; W, sporangium wall; S, stalk of sporophyte; F, foot of sporophyte.

On examining the slides, one was noticed which was different from the others. The gametophyte tissue surrounding the young sporophyte was apparently normal, but the sporogenous tissue had grown so vigorously that it occupied nearly the whole of the sporophyte. The cells of the foot, stalk and sporangium wall were shrunk and crowded out of place—the spores and elaters occupying most of the foot and stalk as well as the sporangium (fig. 1).