is true that a few plants have been raised from the hybrid *Polystichum aculeatum* (*cruciatum*), yet I have sown spores from half-a-dozen ferns each year for six years without raising a single plant, and if this hybrid had been even moderately prolific there should now be thousands of plants in existence. Other hybrids, such as *Lastrea remota*, *Asplenium germanicum*, and *Asplenium marinum*, v. *microdon* are to all intents and purposes sterile. This difference in fertility markedly distinguishes a variety from a hybrid species; the progeny of a hybrid species is almost nil.

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THE DISTRIBUTION OF LATICIFEROUS TISSUE IN THE LEAF.—In the autumn of 1886, Mr. L. A. Boodle and Miss A. Calvert, who were then working with me as research students, undertook, by my advice, an investigation of the course of the laticiferous tubes in the leaves of plants belonging to various natural orders. Our object was especially to test the accuracy of Haberlandt's view that the laticiferous tubes serve as conductors of assimilated food-material, a view on which doubt had already been cast by the observations of Schimper. Mr. Percy Groom's paper 'On the Functions of Laticiferous Tubes,' in No. x. of the ANNALS OF BOTANY, has suggested to me that a short summary of the results obtained, though not leading to any very positive conclusions, may be worth publication. The observations were made on sections, both transverse and superficial. The following account is taken, with only verbal alterations, from notes which I made at the time.

EUPHORBIACEAE.

Euphorbia cotinifolia. Laticiferous cells run in immediate contact with the spongy parenchyma, occasionally sending out branches between its cells.

Other cells or their branches very constantly occur in close contact with the palisade parenchyma. Some branches of the cells run immediately below the epidermis of both surfaces of the leaf, and in some

cases penetrate between the epidermal cells, and may even reach their free surface.

Observations of my own on the leaves of *Manihot Glaziovii* show that only very short branches are given off by the laticiferous tubes (here of course vessels) which accompany the bundles.

Artocarpeae.

Ficus Cooperi. The epidermis is here either one or two cells in thickness. The laticiferous cells constantly send out branches which pass up to and between the chlorophyll-containing cells of the mesophyll. The ends of these branches often reach the epidermis, and where the latter is two cells thick, may penetrate between the cells of the inner layer, and reach the outer. The cell-walls of the outer epidermal layer are sometimes much indented by the ends of the laticiferous cells. The latter reach the epidermis on both surfaces, but more often on the upper than on the lower surface. In the veins, where there is no assimilating tissue, the laticiferous cells also reach the epidermis, but no endings of branches were found here.

Converging palisade cells, similar to those shown by Haberlandt, sometimes occur, but it does not appear that they converge towards laticiferous cells.

F. bengalensis. The upper epidermis is three cells thick. Branches of the laticiferous cells penetrate between the palisade cells to the epidermis, and then between the cells of the latter, sometimes even reaching the cuticle. Most of these branches run approximately at right angles to the surface, but this is not always the case. Here also the laticiferous cells run more frequently to the upper than to the lower surface.

F. elastica. The laticiferous cells penetrate the epidermis on both sides of the leaf. They apparently spread more in the epidermis and in the spongy parenchyma than in the palisade tissue.

The relation of the palisade cells to the collecting-cells ('Sammelzellen' of Haberlandt) was well shown.

F. religiosa. Here the epidermis is only one cell in thickness on both sides of the leaf. Laticiferous cells occasionally reach the epidermis.

F. retusa. The epidermis of both surfaces is two cells thick. Laticiferous cells often reach the epidermis, and occasionally penetrate to

the cuticle, on both sides of the leaf. In other cases a laticiferous cell runs longitudinally along the base of a series of 'collecting cells.' The latter cells are often rich in tannin. In some cases palisade cells were found converging towards a laticiferous cell, as shown by Haberlandt.

F. infectoria. Here tannin sacs are much more abundant, and laticiferous tissue less so, than in other species examined. No relation of the latter to the assimilating tissues could be made out.

The results obtained in this genus were summed up as follows :— No *constant* relation between assimilating and laticiferous tissue, such as is maintained by Haberlandt, was found. On the other hand, in isolated cases arrangements quite like those figured by him were met with. In these leaves the laticiferous cells appear to traverse all tissues equally.

Lobeliaceae.

In *Siphocampylus*, sp. laticiferous vessels were found immediately below the epidermis of the leaf, but were not observed to penetrate it [1].

Compositae.

In *Hypochaeris radicata* the laticiferous vessels accompany the phloem of the bundles, and their branches were not found to penetrate far into the mesophyll.

Aroideae.

In *Alocasia*, sp. no relation could be traced between the laticiferous vessels and the assimilating tissue of the leaf.

In *Xanthosoma*, sp. branches are in many cases given off from the laticiferous vessels, which reach the assimilating tissue, and often penetrate to the epidermis.

The observations were not carried further, as they did not promise to lead to any definite physiological results. Fragmentary as they are, they may serve to supplement and confirm the statements of Professor Schimper and Mr. Groom.

In the case of *Ficus* I have regarded the 'aqueous tissue' as forming part of the many-layered epidermis.

[1] Cf. De Bary, Comp. Anat., Eng. ed., p. 434.

It seems most probable that the laticiferous tubes are related functionally, as well as anatomically, to the secretory sacs of other plants. The exact distribution of the branches is, I think, largely determined by their following the line of least resistance during their sliding growth between the surrounding elements.

All necessary references to the literature of the subject will be found in Mr. Groom's paper.

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