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IV. Histological Notes, II.

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and become thickened, the dry walls having a well-marked pitted appearance. These tendrils have but little tendency to coil round any fixed object, but are markedly influenced by light. They turn away from light, as do also the branches, and therefore afford a very well-marked example of negative Heliotropisie. The interest in these tendrils is considerable. First, on account of their being negatively heliotropic, or turning away from the light; and second, on account of their morphological nature. They are stem organs, the apex of each branch developing a series of hairs. Each epidermal cell on one side of the club-shaped extremity developing a large glandular branching hair, and thus losing all the appearance of an epidermis. In the cells of the tendril both rounded and acicular crystals of calcium oxalate are to be met with. I am indebted to I. Anderson-Henry, Esq., for the specimens examined.

IV. *Histological Notes*, II. By W. R. M'NAB, M.D.,
Edinburgh.

3. *On a Modification of Schultz's Process*.—In order to separate the cells of plants, Schultz recommended that portions of the tissue should be placed in chlorate of potash and nitric acid. No quantities whatever are stated, and the strength of the acid is also omitted in all accounts of Schultz's process that I have read. I tried taking a little chlorate of potash and a little nitric acid, as advised in Naegeli and Schwendener's book on the microscope, and in placing the portions of tissue to be operated on in the test tube, I had the satisfaction of seeing them instantly dissolved, abundance of nitrous fumes being at the same time given off. Professor Church kindly came to my assistance, and by placing the tissue in a test tube, with 2 drachms of nitric acid of sp. gr. 1.10, with 3 grains of chlorate of potash, a mixture was obtained which gave good results. The action was slow, and after keeping portions of tissue in the solution for a fortnight, the cells could be separated. No nitrous fumes are given off, and as the action is slow, it is quite under control.

Specimens of scalariform vessels, prepared in this way,

are exhibited. They are from *Pteris aquilina*, and show that each cell forming the vessel can be separated. It is also to be noticed that the ends are not hexagonal pyramids, but the cells are obliquely cut across, the vessel thus being continuous. In some specimens I have observed that no cell wall exists at the junction, merely the bars of thickening matter giving a sort of gridiron appearance, while a free channel must exist between the component parts of the scalariform vessel.

4. *On the Fibre in the Stem of Muntingia*.—In August last, I. Anderson-Henry, Esq., of Hay Lodge, directed my attention to an Australian plant, *Muntingia*, which, he informed me, yielded a useful fibre. Having just concluded the investigation of New Zealand flax, I thought it might be interesting to compare the *Muntingia* fibre with that of flax, hemp, Manilla hemp, and New Zealand flax, all of which I had just examined. On making sections of the stem of *Muntingia*, abundance of bast cells were observed between the cambium and the epidermis. The epidermis of the stem produces numerous hairs, underneath it are a few layers of sub-epidermal cells, then the bast cells in bundles, alternating with soft bast and divided by the expanded ends of the medullary rays. The wood cylinder was well developed, and had a well-marked pith in the centre. The walls of the bast cells are thin, and of comparatively little strength, and, from the close way in which they are united into bundles, it would be impossible to separate the ultimate bast cells so as to render the plant available for the manufacture of fine fabrics. The quantity of fibre in the stem is very considerable, but I do not think it could be used except for the manufacture of ropes.

5. *On the adventitious Roots of the Cherry Laurel*.—In a paper on the adventitious roots of the Cherry Laurel, published in the Botanical Society's Transactions, vol. x. p. 314, I stated that there seemed to exist a peculiar matrix between the loose cells of the pileorhiza, which could be brightly coloured by the long action of carmine. This was considered to be owing to the gelatinous degeneration of the walls of the cells at the growing point. This view turns out to be correct, as it has been observed by other authors. Hofmeister ("Hand. der Phys. Bot.,"

vol. i. p. 425) mentions, that the walls of neighbouring cells become gelatinous in the pileorhiza of many plants, such as *Secale*, *Allium Cepa*, and *Angiopteris evecta*. In some plants the cells of the pileorhiza do not separate but always remain attached, as in *Lemna*, *Pistia*, and *Cuscuta*.

6. *On the Stem of Cynara Scolymus*.—Professor Dyer recently directed my attention to the stem of *Cynara Scolymus*. At first sight the stem exactly resembles that of a monocotyledon, the bundles being all isolated and scattered up and down in the cellular tissue (primitive tissue) of the stem. In the ordinary dicotyledonous stem the fibro-vascular bundles are all united to form a solid cylinder, and no distinction is to be noticed between the fibro-vascular bundles proper to the stem, and those running to the leaves. In other dicotyledonous stems, however, these bundles are often separate, and if, instead of forming a cylinder with a ring of cambium, the individual bundles remain separate, then the stem will resemble very much the stem of a monocotyledon. In dicotyledons, according to Sach's "Lehrbuch," p. 542, we have the secondary fibro-vascular bundles of the stem, forming either outside the leaf bundles (exogenous), or internally to them (endogenous). In *Mirabilis*, *Amaranthus*, *Atriplex*, &c., the secondary fibro-vascular bundles of the stem form outside the leaf bundles. The leaf bundles are, therefore, near the centre of the stem, and these remain separate, while the stem bundles unite and form a closed cambium ring. In other stems the leaf bundles unite, and have a closed cambium ring. This ring of cambium soon ceases to grow, and a new one grows outside, which in turn disappears. In this way numerous circles of fibro-vascular bundles are formed. Many *Bauhinias*, *Phytocrenes*, &c., have a stem of this kind. In *Cynara*, the secondary stem bundles form after the leaf bundles, and more internally all the bundles remain separate, and do not form a cambium ring. These bundles anastomose with each other, and when the stem is examined in transverse section the apparently monocotyledonous nature of the stem is very evident. The same kind of stem is found in *Cucurbita* and *Nymphæaceæ*. In *Piperaceæ*, *Bignoniaceæ*, and *Aralia*, the internal ascending

bundles remain isolated, while the leaf bundles form a cylinder, having a closed cambium ring, an interesting modification of the form found in *Cynara*. Such stems would be very puzzling to the Palæontological botanist, and might lead to their being placed in a wrong division of the flowering plants.

7. *On the Periderm of Acer campestre*.—The young stems of *Acer campestre* give a very good demonstration of periderm. In the autumn the shoots of the first year become more or less invested with a covering of cork, periderm. On examining the stem in transverse section, the pith, wood cells, and cambium layer are distinctly visible. Outside the cambium layers of soft bast and thickened bast cells are observed, then the cork cambium and numerous cork cells forming a thick external layer. The epidermis with its appendages is thrown off. The periderm is in general cracked longitudinally, because the cells remain of uniform diameter; hence, as the cells at the periphery are of the same size as those next the cork cambium, splitting must take place. The formation of the periderm is well seen in the young shoots of the black currant. If a section be made in the autumn then a layer of cork cells can be observed below the epidermis. A transverse section of the black currant shows pith, wood cells, and cambium layer. Outside the cambium comes a quantity of soft bast, no thickened bast cells being visible. Externally the epidermis is to be seen covered with hairs, then several rows of sub-epidermal cells, and then the cork cells. After the formation of the cork cells, the epidermis, with all its appendages, is thrown off in the same way as in the *Acer campestre*.

8. *On the thickened Cells in the Leaves of Pines*.—Under the epidermis of the leaves of pines, peculiar elongated thickened cells are to be met with, which resemble bast fibres in their general characters. On a careful examination of a transverse section of the leaf, the fibro-vascular bundles can be observed, but no bast cells are visible, the bundles being surrounded by soft cellular tissue; while underneath the epidermis, and therefore widely separated from the fibro-vascular bundles, these peculiar thickened cells are to be seen. As the true bast cells always form a

portion of the tissues of the fibro-vascular bundles, it is evident that, from their position, these thickened cells are not to be considered as bast, but rather as sub-epidermal cells. Dr Hooker describes and figures numerous bast cells in the scales of the cones of *Welwitschia*. In that plant, however, the fibro-vascular bundles in the scales are only very slightly developed, and do not form any of the true bast cells, while the thickened cells occurring so abundantly under the epidermis seem to be only thickened sub-epidermal cells. These thickened sub-epidermal cells occur in *Lycopods*, and I have no doubt that what some observers call liber in *Lepidodendron*, must be considered as only a series of greatly developed and thickened sub-epidermal cells.

V. *On the effects of Pruning certain Coniferous Trees and Shrubs.* By Mr M'NAB, Curator, Royal Botanic Garden.

My attention was recently directed to a note of a correspondent in an English periodical inquiring if the method of pruning conifers adopted by me is a good one, and requesting to know if I prune *Wellingtonias*, *Deodars*, *Thujas*, also *Picea* and *Abies*. The editor remarks that I do prune some trees to induce an upward growth. For the benefit of those wishing information on this subject, I have much pleasure in giving, through the medium of the Botanical Society, some detailed observations on the results of my long experience in pruning Conifers.

The circumstance which first led me to turn my thoughts more directly to this subject, was the rude state in which the *Deodar* was formerly seen in many nursery establishments throughout the country, and the great difficulty experienced in finding a couple of well-shaped plants to match. Of recent years this difficulty has become less, branch-pruning or fore-shortening being now generally adopted in all well-regulated nurseries.

Deodar Pruning—Beneficial Effects.

There are few species of Coniferous plants on which would recommend the knife to be used. The *Deodar* is