

plished chiefly by turgor increase, the greater surface curvatures reducing the contact areas and so setting the cells free. Kubart ascribes to chemical alteration a larger share in the process, still attributing, however, the chief place to turgor, e.g., *Syringa*. Fitting excludes such alteration in the case of petals studied by him and sees, in a general sudden increase in volume of the cells, the active cause. I find in *Ampelopsis* and in *Impatiens* positive evidence against Loewi's view of the matter, separation not being found to involve any change in the shape of the cells, while evidence of chemical alteration, involving both primary and secondary membranes, has been clearly seen. Similarly, abscission of the corolla in *Gossypium* is without doubt accompanied by a decrease in turgor, being otherwise similar in operation to *Ampelopsis* (leaf, tendril, internode). But in this form the primary membrane dissolves first, and this is not preceded, at any rate to an appreciable extent, by alteration of the secondary membrane. Hannig's explanation of the process in *Salvia*, etc., and Kubart's in part of that in *Nicotiana* accord with my own, the latter finding in the organic acid released from the cells involved the agent of dissolution.

Different are, e.g., *Lonicera*, *Syringa*, *Hydrangea*, and a number of others, chiefly, however, in that the secondary membranes are also attached, but more vigorously, and showing marked and measureable swelling. The collenchyma behaves peculiarly—the thickened walls resisting attack and lying free in the mucilaginous matrix. Aside from the last mentioned observation¹⁴ Tison recognizes, in essence, this type of abscission. Kubart would designate it as "maceration."

Finally, abscission may be accompanied by growth, usually longitudinal, but, as regards the axis of the organ, may be more or less oblique. The growth (under special conditions very limited in amount) may or may not be accompanied by cell divisions, the occurrence of which has impelled earlier observers to regard the separation tissue as a secondary meristem. Before growth sets in, however, the cell walls are altered chemically (but only slightly) often in a restricted transverse zone about the cell, and the elongation of the wall takes place here (Loewi). But this chemical alteration may not be so restricted, but may rather be very general, as in the collenchymatic region of the leaf of *Populus* and of *Euonymus*, producing a condition directly comparable with that in the leaf of *Lonicera*, above cited, so that we may agree with Loewi in saying that there is no sharp line of demarkation to be drawn between these processes, the one

¹⁴Hannig (12, p. 428) appears not to have observed this peculiar behaviour, and no one else, so far as I can determine, has done so.