Art. III.—*Functions of Leaves.*

The leaves spring from the buds chiefly of young branches, and by their number, forms, and colour, consti­tute the chief ornament of trees. If they exhibit less splendour than flowers, they enjoy a longer existence. They furnish to animals a large part of their subsistence, afford them shade and shelter, and spread everywhere beneath and around us, that “ all-refreshing green,” on which the eye, fatigued and distracted by the glare of other colours, always loves to repose.

We have already discoursed largely of the functions of the leaves as organs of respiration and of transpiration. Besides this transpiring power, the leaves exercise also an absorbent function. From the experiments of Bonnet it appears, that the leaves of many herbs, when laid upon water, absorb equally well by both surfaces, but those of trees only by the under surface : and these facts correspond with the observations of Decandolle and Rudolphi, as to the existence of stomata on these surfaces respectively. The power of the leaves to absorb moisture from the air was also abundantly proved in many of the experiments of Hales and Du Hamel, and more recently by those of Knight. This absorption appears to be carried on by the minute vascular terminations which open at the pores ; and is apparently performed by the same vessels, which, at a different time, and under different circumstances of tem­perature and humidity, execute the function of exhalation.

Beside the aqueous fluids given off by leaves, others are sometimes afforded, which seem to be secreted by peculiar organs. On the leaves of different plants, mucilaginous, saccharine, resinous, or oily fluids are sometimes seen ; or if invisible by the eye, they are often sensible to taste and smell. In some leaves, these secretions appear to proceed from minute glandular organs, seated in the cellular tissue; in others, small follicles in the cuticular texture seem to furnish them. Of the structure of these minute organs little is known, and still less of the mode in which they execute their functions. Of the influence of light on the secreted fluids of the leaf we have already spoken ; and also of the mode in which it contributes to the production of its green colour. Bonnet has likewise shown that light ex­erts a great power over the motion or direction of leaves, of which some notice will be hereafter taken.

Art. IV.—*Functions of Roots.*

So nearly does the root agree in structure with the trunk, that, as Malpighi observes, we may consider it as a produc­tion of the trunk beneath the soil. From the principal root or stock proceed the buds that give origin to the pri­mary rootlets ; and these give off finer ramifications, at the extremities of which are formed the spongioles or spon- gelets, which are the true absorbents of the root. These fine absorbents take up the nutrient matter from the earth, and convey it to the root, from whence it is sent to the trunk. Where these absorbents extend, the earth is exhausted of its nutrient matter, and not in the neigh­bourhood of the larger roots. In a severe winter, Du Hamel found these fine rootlets to die, and to be abun­dantly replaced by others, when the temperature became milder. Not only the root, but the branch of a tree, readily produces rootlets, if it be amputated, and set to grow in water or in soil. The form of the root is much influenced by the texture of the soil. If the soil be easily penetrable, the root descends in the form of a long tap-root ; but if it be hard and resisting, then the root re­mains shorter, and divides into lateral branches. Du Ha­mel remarks that roots extend into that portion of soil which is richest, while the barren parts are nearly destitute of them ; so that the qualities of the soil, as well as its tex­ture, exert the greatest influence on their direction and

growth. In regard, however, both to composition and tex­ture, different soils are best suited to different kinds of roots. We have before remarked, that the elongation of roots and rootlets is made by the addition of new matter to their extremities, not, as in succulent branches, by the simple extension of parts already formed. The diametral growth of roots is effected, like that of the trunk, by the formation of new layers between the bark and wood.

Art. V.—*Functions of Flowers.*

Flowers may be regarded not only as the last, but the most elaborated organs of the vegetable system. Whether we contemplate the beauty of their forms, the splendour of their colours, or the delicious fragrance which they breathe around us ; or whether, with a physiological eye, we sur­vey the delicacy of their structure, and investigate the pe­culiar functions which they perform, we cannot but feel the greatest admiration of the skill with which, in a compass so small, and by means apparently so simple, such a series of actions, terminating in results so varied and important, can at once be combined and regulated.

The flower is attached to the plant that bears it by the peduncle, on the extremity of which is placed the cup or calyx, which, in its turn, supports the corolla, and the organs of reproduction. Of these organs, the male parts consist of one or more stamens, formed by the filament, bearing on its top the anther, which contains the fecunda­ting particles, named pollen. The female organs consist of one or more pistils, the style of which bears on its top the stigma, and terminates below in the ovary that contains the rudiments of the seeds. For an account of the structure of these several parts, we refer to our former article.

Various as are the forms, colours, and functions of the several parts of the flower, yet, in structure, they are so similar, that, under a change of circumstances, almost any one part or organ can be made to assume the character of any other. Thus, not only are the petals of the corolla, or the stamens and pistils, sometimes abortive, but, at other times, the stamens become simple filaments or petals, or the petals take the form of stamens. Sometimes, again, the style of the pistil changes into a petal : in other in­stances, the petal becomes a floral leaf, or the calyx is changed into real leaves. In like manner, as leaves, or their petioles, are sometimes transformed into claspers and tendrils, so the peduncles and petals of the flower now and then exhibit similar transformations. Nor are these transformations confined to leaves and flowers ; they extend to the more solid and permament members of the plant. Thorns, we before remarked, were but abortive branches ; and as a branch, by surrounding it with earth, may be made to throw out rootlets instead of buds, so a root, when brought into light and air, will, on the contrary, put forth buds. Even an entire tree may be inverted, and the roots and branches, by being placed in circumstances respectively opposite to their nature, may be made gradually to assume each other’s character, and execute each other’s functions. These facts demonstrate a great uniformity of structure in all parts of vegetables, and show with what facility modifi­cations of form and of function are induced, by varying the application of those external agents and conditions, con­cerned in the development of vegetable organization.

1. *Colours of Flowers.*—The *colours* of flowers are not less diversified than their forms. They present every variety of tint and every shade of intermixture ; and not unfre­quently the same flower, at different times, or even at the same time, exhibits great diversity of colour. Grew re­marked that no flower has its proper colour in the bud ; that many of them are then pale or white ; and that the full and proper colour is formed only when they expand. Even after their expansion, the colour of some flowers, as that of the rose, may be made to disappear by secluding it