action of light; and hence, if this agent be wholly excluded, these vegetable products are either sparingly formed, or not at all produced. When formed, they become mixed with the sap in its course through the leaves, and variously change its sensible properties, so as to constitute juices proper to each species of plant. Thus blended with the sap, they are conveyed, more or less abundantly, through the organized parts, and impart to them those properties of colour, odour, taste, &c. observed in the several textures. Sometimes the gummy and resinous matters exude on the surface of the tree, or stagnate in the vessels or cells of the bark and wood, forming those collections and concretions to be found in different parts of those textures. All these ingredients of the proper juice serve, in vegetation, purposes different from those of the mucilage, starch, and sugar, from which the secretion called *cambium* is derived, and which is more immediately employed in the production or nourish­ment of new vegetable matter.

In these operations of light on plants. It is probable that the several species of rays that compose the solar beam ex­ert specific but varied actions. The violet rays, or rather the invisible rays associated with them, were observed by Senebier to act most powerfully in producing the green colour of plants; and he likewise ascertained that they act by their own peculiar quality, and not by their heating or illuminating power. This agrees with the acknowledged power of this portion of the solar beam in producing decom­position, since it is through the decomposition of carbonic acid in plants that their green colour is obtained. The ex­periments of De Saussure also shew, that by this decom­position of that acid gas, not only is oxygen gas expelled from the plant, but the proportion of its carbon increased ; but whether this carbon contributes to the formation of any of the more active ingredients of the proper juices, or of those which impart colour, or whether the calorific power of the solar beam acts in their production, nothing yet known enables us to determine.

chap. ii.**—or** the functions **or** the indidual members **AND ORGANS OF VEGETABLES.**

Sect. I.—*Of Buds, and of the Members and Organs produced from them.*

Art. I.—*Of Buds.*

Having thus exhibited a brief outline of the leading facts which constitute vegetation, as exemplified in the nutrition and growth of plants, we have now to notice, in a manner still more brief, the functions of certain parts and organs which serve different uses, and afford various products ; and more especially those by which the continuance of their race is maintained. Some plants pass rapidly through the several stages of their existence, and having produced their seeds, fade and die ; others continue for one or more years ; and many prolong their existence to very distant periods. Even in these latter, the more active organs of vegetation, after producing their fruits and seeds, fade and fall like plants of shorter duration ; and when the season adapted to the growth of *annuals* returns, then also *peren­nials* reproduce all the organs necessary to growth and fructification. In ordinary cases, reproduction in annuals is continued only by seeds ; in perennials, both by seeds and buds. For an account of tne species of buds, and of their formation and structure, we must refer to our former article : at present we can only afford space for a few ob­servations on those varieties of buds which produce branches, leaves, and flowers.

During summer and autumn, when perennial plants add to their bulk by the formation of new layers, they also form new buds on the sides and at the extremities of their branches. These buds continue to enlarge through the autumn, and in part through the winter ; so as to be ready, on the return of spring, to shoot forth, and supply the place of those that annually decay. Some buds chiefly pro­duce wood, others leaves, others flowers, and others both leaves and flowers ; and this variety of production may be so modified by culture as to enable us often to substitute one species of bud for another. The wood and leaf buds are the result of vigorous growth, and are primarily of the same structure. As the plant approaches to maturity, or when the vigour of its growth abates, then flower-buds augment in number.

Buds naturally remain attached to the parent tree, and there execute their allotted functions ; but they may also be made to grow as individuals, or be transferred, in vari­ous modes, to another stock, and perform the same func­tions on it, as on their proper parent. Though supplied then with sap from a different tree, they retain the power of effecting in that fluid the same changes, and forming with it the same products as they would have produced on their native stock. The bud of the tree, therefore, like the embryo of the seed, must be held to possess individuality of character, and to be capable of producing new indivi­duals perfectly similar to itself. To the embryo of the seed, however, as to every organised body, is assigned certain periods of infancy, maturity, and decay, which may be varied in duration from accidental causes, but can never, beyond certain limits, be changed. What is true of the primary embryo of the seed, is true also of all the buds propagated from it, whether they remain on the parent stock, or are transferred to another. Hence, when the period arrives in which the function of reproduction natu­rally ceases in the buds of the parent tree, all the buds, growing on foreign stocks, indicate the same character of age, and cease to bear fruit ; and for the permanent con­tinuance of the species recourse must then be had to a seminal progeny. Mr. Knight has very ingeniously applied these principles to account for that failure in bearing fruit which the oldest and best varieties of trees in the cyder districts exhibit. Although grafts from these trees still grow on foreign stocks, yet they do not now yield fruit as formerly, because the trees, from which they have been taken, have outlived the fruit bearing period.

Art. II.—*Functions of Branches, Thorns, and Tendrils.*

In its progressive growth, the bud, under its various forms, gives origin to branches, with their various appendages of thorns and tendrils, of leaves and flowers. The functions of the branch may be considered as similar to those of the trunk ; which indeed it so nearly resembles in structure and growth, that, if cut off and planted. It readily, in many species, puts forth rootlets and buds, and becomes a perfect tree.

The thorns of trees may be regarded generally as abortive branches, which assume their form chiefly from defective nutrition ; and hence, as Malpighi observed, they often disappear under higher culture. Sometimes, however, they derive their origin from the degeneration of other organs, as from the stalks of leaves and flowers. They serve as a defence to plants, and protect them from the ravages of animals.

The several varieties of *fulcra* called claspers and ten­drils have the same structure as branches ; and, like thorns, sometimes originate from abortive leaves and flowers. Their obvious use is to connect the different parts of a plant with one another for mutual support, or to attach themselves, for the same purpose, to the bodies near them. Sometimes this purpose is assisted by means of a viscous secretion which they yield, and which glues them to neigh­bouring bodies with much force.