mucilaginous fluid is first seen to flow from beneath the re­maining bark, or, in certain circumstances, from the alburnum. It differs in appearance from the proper juice, and was nam­ed *cambium* by Grew. To observe the process more com­pletely, Du Hamel enclosed the stems of young elms and cherry trees, from which portions of bark had been removed, in glass tubes, closed at each end by cement. For a few days, the glass was obscured by vapour, which gradually disappeared; so that it was then easy to see what passed within. At first, a small tubercle appeared beneath the upper lip of the wound, and one still smaller at the lower lip. After this, granules of gelatinous matter issued from the alburnum: they were isolated, and had no connection with the tubercles just mentioned; their colour was at first greyish, but, in about twelve days, passed to a greenish tint. All these new parts continued to extend through the sum­mer; the tubercle from the upper lip of the wound enlarged greatly, but that below, very little; so that it was princi­pally by the growth from above that the wound was healed. The bark of the cicatrice having been formed by the union of new productions from the upper and middle part of the wound, was very rough, and in some places entirely wanting; but all the regenerated parts duly performed their appro­priate functions, and the stems augmented so much as, in some instances, to burst asunder the glass tubes that en­closed them.

While Du Hamel’s experiments showed that new wood was not produced from the old, they did not prove that it was produced by liber. Accordingly, with the view of clear­ing up this matter, Mr. Knight instituted new experiments, by which he was led to adopt the idea, that wood is not the produce of bark, but is formed by matter sent down from the leaves, this matter forming both new wood and new bark.

Du Petit Thouars, from observing, in the Isle of France, what takes place in the formation of the branches of *Dracaena,* and other monocotyledonous plants, has come to the conclusion, that woody fibres are the prolongation of the buds or germs which are developed. He looks upon buds as in fact fixed embryos, which send roots downwards to form new wood and bark, and shoots upwards to form new branches. According to this theory, the young shoot may be regarded as the plumule, the pith as the cotyledon, and the fibres of the wood and bark as the roots. The cam­bium he considers as useful in nourishing the bud roots. An important feature in this ingenious theory is, that it is applicable both to exogenous and endogenous plants. Va­rious objections, however, have been urged against it by De- candolle and others, and farther observations are still re­quired to confirm it.

Decandolle does not deny that buds, or the leaves which they produce, have some influence in the formation of wood, but the action, he says, is entirely physiological, and depends on their elaborating the descending sap by which the young wood is nourished. While Du Petit Thouars attributes to the buds the origin of woody fibres, and to alburnum and liber their nutrition, Decandolle thinks that leaves pro­duce the nourishment, and that the fibres are developed by the liber and alburnum. These opinions embrace the chief points under dispute, and further elucidation of them is required before we can come to a decided conclusion relative to the origin of wood. Physiologists seem at all events now to be agreed on this, that the formation of wood de­pends, in some measure, on the action of leaves freely ex­posed to the sun or bright light. We have before remarked that, when the parts of plants have been once formed, they continue permanent, unless removed by accident or disease; that vegetables possess no power of removing decayed or­gans by *internal* absorption, as occurs in the animal sys­tem; but that their powers of regeneration are confined to the reproduction of parts or organs which have been removed by decay, by accident, or disease.

Art. V.—*Of the changes which the Sap undergoes in the Leaves from the agency of Light.*

In what has hitherto been said, we have supposed the functions of nutrition and growth in plants to be carried on, as in seeds, by the combined agency of water, heat, and air, without the access of light. Light is injurious to the growth of seeds, by impeding the change of *fecula* into sugar, which is so favourable to germination ; and that it also retards the formation of saccharine matter in plants, is proved by many facts familiar to every one in the culti­vation of celery and other plants, which, when secluded from light, not only lose their colour, but acquire a mild, and even sweetish taste. If a plant, says M. Achard, be covered with a glass vessel. It is observed sometimes to change from a sweet to a bitter taste ; but if the vessel be opaque, the same plant, in its subsequent growth, will retain its sweet­ness. In the year 1774, the late Professor Robison ob­served, that tansy, mint, and other plants, which had grown in a dark coal mine, although they throve well in darkness, lost their colour, their odour, and their taste. But when they were brought up and set to grow in day-light, their white parts died down, and the stocks then produced the proper plants in their usual dress, and having all their dis­tinguishing properties. When deprived of light, says Dr. lrvine, all plants nearly agree in the qualities of their juices. The most pungent vegetables then grow insipid ; the highest flavoured, inodorous; and those of the most variegated co­lours are of a uniform whiteness. Vegetables which grow in a natural situation, he adds, readily burn when dry; but a vegetable, bred in a dark box, contains nothing inflam­mable. The results of analysis perfectly accord with these observations; for etiolated plants are found to yield more saccharine matter, carbonic acid and water, and less inflam­mable matter than those which are green.

From the facts above stated. It appears, that, when de­prived of light, plants continue to grow; that the juices which support this growth are then nearly alike in all; and that they acquire their peculiar properties as to colour, odour, taste, and inflammability, only when vegetation proceeds under the direct influence of light. To the agency of the air, therefore, we may ascribe those changes in the vegetable juices, which render them fit for nutrition and growth; while light bestows on them those more obvious and active qualities, on which their colour, odour, savour, and combus­tibility more immediately depend. The first scries of effects resembles those which were exhibited in the germination of seeds, from which process light is excluded; the second series is superadded to the former, and is directly attribu­table to light. It is on the leaves and succulent stems of plants that light chiefly acts; and it is in those parts that the proper juices, which give colour and peculiar charac­ter to plants, more especially reside. Are we then able to trace out the mode in which it produces any of these singular effects?

In all periods of active vegetation, plants uniformly con­vert the oxygen gas of the atmosphere into an equal bulk of carbonic acid gas; and if, at the same time, they grow in obscurity, they soon lose their green colour and become white. On the other hand, if they be made to grow in impure air under exposure to sunshine, they not only resume their green colour, but occasion a production of oxygen gas. This curious discovery was first made by Priestley. It has since been extended and confirmed by the experi­ments of Ingenhousz, Senebier, Woodhouse, and Davy; and more lately the subject has been treated with still greater precision by De Saussure. From the united labour of these writers we learn, that air, which has been depraved by animal respiration or combustion, is again, in certain circumstances, rendered pure by the aid of plants; that the