ployed the attention of the philosophical observer, and many and various opinions have been given to the public; but it is only since modern chemistry made those discoveries which may justly be regarded as the most splendid triumphs of experimental science, that any thing rational and satisfactory has been advanced. * * * * * *

The fact cannot be too often repeated and impressed on your minds, that plants are living beings, possessed of powers which enable them to convert into their own material substance, matters of a nature apparently very different from it, without keeping this in view, we should be forced to look for all the different productions of plants ready formed in the soil where they grow, and to suppose that these are simply taken up by their roots, and deposited in the different parts of the plant; an idea too incongruous to be admitted. On the contrary, they do not even take up those principles which are most abundant in the soil where they grow; but select particular parts of them, although these are not found, in general, forming in their uncombined state any part of the vegetable frame. * * * * * *

The ultimate components of all the various substances produced by vegetables have been found the same, differing only in the quantity and the mode of their combination; and the parts of the soil which supply these have been found to be much fewer than was previously supposed. * * * * * *

Every soil fit for yielding nutriment to vegetables may be supposed to consist of earth, water, air, a small proportion of metallic oxyds, and decomposed vegetable and animal matters, in which are included salts, gases, and vegetable extracts.

Earth which is the essential basis of all soils, is, as it is commonly spoken of, a compound of different earths: the most general of which are *Calcarious earth, Argillacious earth, Silicious earth, Magnesian earth, and Ferruginous earth.*

1. Calcarious Earth comprehends lime usually combined with carbonic acid, in a state of limestone, chalk, shells and marl, which is a mixture of carbonate of lime with clayey and sandy matters; but lime is sometimes, also found in combination with sulphuric acid, forming a substance called gypsum; and more rarely with phosphoric acid. When too much calcarious matter is contained in a soil, it is unfertile, owing to its absorbing moisture, and consequently remaining too dry. But the case is different when the calcarious matter is mixed with silica, for then the moisture absorbed remains in a free state, and not so united with the chalky matter as to disappear and be useless to plants. But the absorbing properties of all calcarious soils are not alike; and a great difference depends on the degree of comminution of the calcarious matter. Thus 100 parts of calcarious sand retain, according to Professor Schubler's experiments, 29 parts only of water, whilst 100 parts of the same matter in the state of fine powder retains 85 per cent. In the first case, when calcarious earth and silica predominate in an arable field, they produce a hot and dry soil.

Argillacious Earth, comprehends clay which is generally mixed with silicious sand and mineral substances, and is very retentive of moisture.

3. Silicious Earth is almost entirely composed of sand. The water passes so readily through it, that very little is retained for the purposes of vegetation; and soils which contain much of this earth are, therefore barren and unprofitable. In the form of sand it retains 25 per cent. only of water, while 100 parts of it, as it occurs with clay in an arable field, retains 280 per cent. of water.

4. Magnesian Earth is not so commonly found as the earths we have already noticed. The magnesia it contains is combined with carbonic acid, and mixed with silicious particles. It approaches nearest to the nature of clayed earths in its power of retaining moisture; that power enabling it to retain 4½ times its own weight of water. This renders it, when it predominates, very prejudicial to vegetation; while it increases, when added in moderate proportions, the fertility of a dry sandy soil.

Ferruginous Earth consists of those oxyds of iron, known by the names of ochres and pyrites, mixed with silicious matter. These oxyds, in particular the pyrites, when in considerable quantity in a soil, if it contains little calcarious matter, are extremely injurious to vegetation. The pyrites is a compound of sulphur and iron, and is converted by exposure to air and moisture into sulphate of iron, which destroys plants by over-stimulating them.

Vegetable earths have the least specific gravity, and sandy soils the greatest, whether they be dry or moist; the vegetable earths contain, besides vegetables in a state of decay, animal matter and a large proportion of salts, which are chiefly common salt, sulphates of magnesia and of potash, nitrates of lime, and carbonates of potash and of soda.

Such are the earths generally contained in soils; when any one of them abounds, the compound earth is named after the component; as for instance, a calcarious soil, an argillacious soil, &c.

The principal difference which characterises the various kinds of earths, is their power of retaining the next component of soils, WATER. Water, as forming a part of soils is either chemically combined with the earth, or merely mechanically mixed with it, and retained in combination by cohesive attraction. In the former, it is of no use to vegetables; in the latter, it is essentially necessary for their support. If the soil be not sufficiently retentive, the plant is starved for nothing can be taken up from the