earth that is insoluble; and as we shall show afterwards, water itself is a principal part of the food of plants. If the soil be too stiff and retentive, the water remains upon its surface, and does not percolate to a sufficient depth to be applied to the roots; and if the vegetable be of a succulent kind, the herbaceous part remaining constantly surrounded with moisture has its vegetative powers weakened, and rots. This is particularly the case in winter; for, as the vital energy of the plant is then much lowered by cold, a disease of the vegetable takes place, similar to what happens in a leucophlegmatic state of the animal body, from which the plant rarely recovers. The most efficient soil, as far as winter is concerned, is that which contains a due mixture of carbonate of lime, sand and pulverised clay, with some vegetable or animal matters; and in which the materials are so mingled as to remain loose and permeable to the air. This is calculated not only to retain the water in proper quantity; but also to absorb it from the atmosphere, which is one great source of the supply that vegetables require; for water, as has been already remarked, is requisite for rendering the other matters in soils sufficiently soluble to be taken up by the roots of plants.

All the earths are more or less soluble in water; thus lime is taken up readily in its pure state; and also if the water contains much carbonic acid in solution, when the lime is in the form of chalk, or a carbonate, in the proportion of about 1-680 part of its weight. Clay is soluble in a minute proportion in rain water; silica even may be retained in solution by the aid of carbonate of potash; and in the minute state of division in which it is precipitated from an alkaline solution, it is soluble in 1000 parts of water; 200 parts of pure water hold one of magnesia in solution.

Air is, also, a necessary component of soils. Atmospheric air is absolutely necessary, as we know, for carrying on the process of germination; the more pulverulent, therefore the soil is, the more air it is capable of containing, and consequently is the better adapted for supporting vegetation. But a soil which is too sandy, the water not being retained, although it appears to be loose, yet does not contain so much air enveloped in it as it required; for the small particles of which it is composed apply more closely to each other, and lie in a smaller compass than the aggregated masses of a better soil, which touch at a few points only, and, therefore, have more and larger interstices between them. When the soil is too retentive, the water which remains on its surface evaporates in summer, and deposits the clayed particles which it had suspended, a kind of paste is left, which hardening, by being baked, as it were, in the heat of the sun, no air can penetrate to the parts beneath it; nor can that which has been already used in the vegetative process, and which is unfit to carry it further on, escape; and we know that as atmospheric air is vitiated by the roots of growing plants, and during the germination of seeds, a constant renewal of it is requisite for supporting the vigour of vegetables. It is the oxygenous portion of the atmospherical air contained in the soil which is vitiated by the functions of the roots of plants.

* * * The last component of soils which we have to mention, has always been regarded as the most important of the whole. We allude to animal and vegetable matter in a state of decomposition, from which the black mould which constitutes the richness of soils is almost altogether formed. But the analysis of some of the most fertile soils has proved, that their fertility does not depend on the presence of a large proportion of those substances. Thus Sir H. Davy found that the soil of a very fertile field in East Lothian, contained nine parts only in the hundred of decomposed animal and vegetable matter; and a soil from the low parts of Somersetshire, long celebrated for yielding crops of wheat and beans without manure, contained five parts of these principles only in the hundred. It is indeed, true that the carbonaceous matter contained in plants can be derived most easily from decomposing animal and vegetable substances; but these also yield salts, which prove highly stimulating to growing plants; and although plants seem to attain great bulk and vigour when much manure is applied, yet they are over stimulated, and their growth is connected with disease, in the same manner as in an overfed and pampered animal. The natural state of both is altered; premature age succeeds and death arrives long before the period when he should be naturally expected. Those plants also, which are intended for food for man and animals, when reared upon soil of the kind we are now noticing, yield less nutriment in the same bulk, than that which more healthy plants yield; and it is also of an unwholesome kind. Upon the whole, we may truly assert, that more harm is done by loading soils artificially with much animal and vegetable matter, than the natural deficiency of it in soils can occasion.

When a Botanist examines a space of ground, he forms an estimate of the nature of the soil, by observing the kind of plants, or weeds, as they are termed, which it naturally, produces, and draws his conclusions from the knowledge he possesses of the relation which always subsists between the plant and the soil. If the plants are those which have divided roots, he concludes that the soil is pulverulent and easily penetrated; but if the roots are thick and fleshy, that as they require a humid soil, it is probable that it is damp and retentive. Some kinds of plants grow on one soil, but are never found on another; some require a large supply of carbonaceous matter, or a rich fertile soil; others, he knows, glean the little they require in the