

properties may not be familiar to some; very many may be entirely ignorant of them; but what can be more appropriate subjects for study and investigation than the air which supports our lives from its first moments, the water which is to us daily food, or the composition of that food, which by the curse of labor we are obliged to earn—a curse, however, changed by mercy into a blessing, when the intellect is used to lighten the toil of the body. Is a knowledge of these substances useless? then the knowledge of those things nearest to us, and with which we hold constant relation, is useless; and if these are, those which are more remote must of consequence be more so, and all knowledge is vain; and if knowledge be nothing, then men are on a level with brutes—nay, below them. The most noted properties of these substances can be easily understood and as easily learned as the multiplication table, and will enable the tiller of the ground to understand many facts of great use to him which are now incomprehensible, and give him, as the fruits of labor, pleasure as well as profit.

The substances which I have mentioned above, namely, carbon, oxygen, hydrogen and nitrogen, are combined with each other, and form many substances, of which it is not my province here to speak. I will mention some whose constitution it is proper to know.

Carbon and oxygen form carbonic acid, whose uses and properties I have spoken of above. Hydrogen and oxygen form water, which serves either as such, or by its elements, to produce a large part of the mass of vegetable matter; it moreover is the vehicle for the transportation of food to the plant, and causes matter by dissolving it, to assume a form, giving to it the properties of food.

Hydrogen and nitrogen, form ammonia, of which I shall speak particularly, when I come to speak of guano. All these are formed by chemical combination in which the original elements lose their characteristics, and, indeed, assume others sometimes the reverse of any which previously existed. Thus carbon, a hard solid, and oxygen, a gas, form a gas. Hydrogen and oxygen, two invisible gases, form water. The air is, as I have before stated, composed of nitrogen and oxygen in the proportion of very nearly four parts of the former to one of the latter; not in chemical combination but as a mere mechanical mixture. Besides these, the air also contains watery vapor, carbonic acid, and ammonia, the latter two in small quantities relatively, but still in immense quantities absolutely, and of vast importance. Though the above substances are of such vast consequence in vegetable life, and form nearly all of the woody fibre, leaves, stem, juices, gum, sugar, starch, acid, gluten, and albumen, (the last two being the nutritive principle in wheat, corn, &c.,) yet they are of no