

ed varies from 3 to 10 per cent. The average quantity formed by the respiration of an ordinary sized man in 24 hours is 40,000 cubic inches, which weigh about 3 lbs., and contain about 11 ounces of carbon. Respiration occasions also an exhalation of water, and the quantity thus exhaled in 24 hours has been estimated from 19 to 24 ounces a day. The quantity of carbonic acid thrown off from the lungs, varies according to circumstances. It is most at mid-day, and least at night. It is greater in old age than in youth; and it is diminished by fatigue and debilitating causes. The inference from the numerous and interesting experiments upon this subject is, that in animal respiration, the volume of oxygen consumed is greater than the carbonic acid that is formed, that the carbonic acid is exhaled ready formed, and that the oxygen, which disappears, is absorbed into the blood to fit it for its uses in the animal economy. If pure oxygen is breathed sufficiently long to arterialize the blood, it acts like a poison, showing that a certain degree of dilution of oxygen in the air by azote or nitrogen, is requisite to render it subservient to its intended purposes in animals. If the chemical properties of the atmosphere are thus altered, and its purity vitiated by respiration, how is this impurity corrected, so as to enable the atmosphere to continue its important action in the animal system? By the respiration of vegetables:—leaves are the lungs of vegetables, and perform an office in them, similar to that performed by the lungs in animals, with this exception, that vegetable respiration occasions a chemical change in the air, directly opposite to that caused by the breathing of animals. Animals consume oxygen, and throw out carbon; vegetables consume carbon, and throw out oxygen. The sap of the plant, absorbed by the roots is conveyed to the upper surface of the leaf, where it is acted upon, partly by the solar ray, but principally by light independently of

warmth. When the sap is thus digested it is transmitted to the under surface of the leaf, where it undergoes a change analagous to that produced by respiration in the animal system. Dr. Smith in his remarks upon the philosophy of health, observes, "This operation, which is strictly analagous to that of respiration in animals, in which carbonic acid is always generated, and expired, is carried on chiefly in the night. In this manner, under the influence of the solar ray, the leaf decomposes carbonic acid; retains the carbon, and returns the greater part of the oxygen to the air in a gaseous form; at night, in the absence of the solar ray, the leaf absorbs oxygen, combines this oxygen with the materials of the sap to produce carbonic acid, which as soon as formed, is evolved into the surrounding air, the carbonic acid gas, exhaled during the night, is *re-absorbed* during the day, and oxygen is evolved; and this alternate action goes on without ceasing; whence the plant deteriorates the air by night, by the abstraction of its oxygen, and exhalation of carbonic acid, and purifies it by day, by the evolution of oxygen and the abstraction of carbonic acid." "The experiments of De Saussure have proved that the upper strata of the air contains more carbonic acid than the lower, which are in contact with plants, and that the quantity is greater by night than the day, when it undergoes decomposition." Some physiologists have considered the absorption of oxygen by the leaves of plants, and the evolution of carbonic acid at night from them, as an *exact* analogy with animal respiration: This is incorrect: Leibig observes, "The carbonic acid which has been absorbed by the leaves and by the roots together with water ceases to be *decomposed* on the departure of day-light. It is *dissolved* in the juices, which pervade all parts of the plant, and escapes every moment thro' the leaves, in quantity corresponding to that of the water which evaporates."

Carbonic acid is always present in