

transforms them into oxygen, which renews the air, and sugar, starch, and other substances, which are the food of the animal.<sup>1</sup> These products the animal burns, thereby forming once more carbonic acid and water, which return to the plant and so pass through the cycle again and again. The changes in energy which accompany this process are quite different from the chemical changes. Starch and sugar and oxygen, formed in the leaf of the plant, are compounded of carbonic acid, water, and sunshine. This sunshine, or solar energy, when changed into the chemical energy of the carbohydrate, is preserved and transmitted to the animal.<sup>2</sup> In his body it is set free as muscular force and heat, and then dissipated. Accordingly, when carbonic acid and water are combined to form sugar and oxygen in the leaf, it is always a new store of solar energy which they bear, and while matter goes round and round, energy is being constantly degraded and lost. The one process is cyclic, the other moves steadily in one direction from

<sup>1</sup> Our knowledge of photosynthesis is largely based upon the classical work of N. T. de Saussure, "Recherches Chimiques sur la Vegetation." Paris, 1804.

<sup>2</sup> Only after the establishment of the principle of the conservation of energy was it possible to gain a clear conception of the energetics of metabolism.