have to perform in connection with nutrition, is to assign a place and form in the animal to this food, which is already of the proper composition manufactured, as it were, in the laboratory of the vegetable kingdom.

The elements of respiration are those compounds from which the element nitrogen is absent, such as sugar, gum, and starch; they consist of carbon, hydrogen, and oxygen, but not containing nitrogen; they, therefore, cannot form flesh, and cannot, in this sense, be considered nutritious. The experiments of *Magendie* have shown that animals fed solely on these substances will die; but as they are invariably present in food, what are their uses? They serve as fuel to keep up the heat of the animal body. The bodies of our animals are always above 40 degrees over the average temperature of our climate, and the supply of heat necessary to sustain this temperature is produced by the union of the oxygen contained in the air they breathe with the carbon within the body, thus producing the same gas as if a piece of charcoal were burned in the open air—carbonic acid gas; and as a certain amount of heat is the necessary result of burning a piece of charcoal unites with oxygen within the body, the amount of heat generated *must* be the same as if such carbon were consumed in the open air, and experiment has proved that the amount of heat thus produced is amply sufficient to sustain the temperature of the animal body.

The most accurate observations have shown that the heat of the blood of animals is the same in all regions, whether at the equator or in the polar regions. The quantity of heat necessary to keep up this uniformity of temperature must obviously vary with the climate. The inhabitants of the tropics, for instance, can sustain the temperature by a less expenditure of heat, where the surrounding air equals the temperature of the body, than the inhabitant of the polar region, where air is 100 degrees colder than the body; but we find that the food in the Tropics is vegetable, containing not more than 10 per cent. of carbon or combustible matter, while the food of the inhabitants of the Polar region consists of blubber, train oil, and tallow, containing 80 per cent. carbon.

Air is condensed by cold and expanded by heat, so that the quantity of air in a given volume varies with the temperature. The size of capacity of the chest of an animal is a constant quantity, and therefore the volume of air taken in at each inspiration may be considered uniform; hence, in a cold climate more air must be taken in at each inspiration, the air being condensed, than in a warm climate where the air is expanded; more oxygen is therefore taken in, and as oxygen once taken into the system never leaves it as such, but enters into combination with carbon, so more of the latter must be supplied in cold than in hot climates. Anything, in fact, that increases the supply of oxygen, must occasion an *increased demand for food*. Exercise, for instance, increases the supply by making our respiration more rapid; we therefore consume more food after exercise, than when at rest.

Our clothing is in fact an equivalent for food. The more warmly we are clad, the less urgent becomes our demand for food; because, the loss of heat by cooling, and consequently the amount of heat to be supplied by the fuel or food, is diminished.

Two forces exist in connection with animal life—the one, vitality, the cause of life, which is always endeavouring to sustain and increase the mass—the other, the chemical force, the gas oxygen, always present in the air we breathe, endeavouring to waste and destroy the animal substance, by entering into chemical union with the elements of organic matter. These forces are placed in antagonism. When vitality has the ascendency, the body increases; when the chemical force triumphs the result is waste. When the chemical force succeeds in the waste of the body, it resolves it into the elements carbonic acid, ammonia, and water; but these are the very substances upon which plants subsist. Thus, we find death and destruction in one kingdom of nature, the source of life and activity in another.

Cold depresses the vital functions (the cause of increase); while, by condensing the chemical force, oxygen, (the cause of waste), it increases its power. We, accordingly, find that cattle do not fatten so well in cold as in hot weather. In fact, the animal body is a *furnace*, which must be kept up to a certain heat. The food is the fuel, the air we expire the same as the gases which passes up the chimney; and the excrements are the ashes. This furnace must, therefore, be supplied with more or less fuel according to the temperature of the external air. If, then, we wish to keep up the vital functions of our cattle in proper action, we must support the heat of their bodies, which we may do in either of two ways, viz., adding more fuel, that is food, to the furnace; or, we may keep their bodies warm. Warmth, in point of fact, supplies the place of food which we may thus economize. An experiment performed by Earl Ducie at his Whitfield Farm will place this in a clearer light.

100 sheep were folded by tens in pens, each 10 by 22 feet, having a covered shed attached 12 feet by 10. They were kept in from October to March. Each sheep consumed on the average 20lbs. of Swedish turnips daily. Another 100 were put by tens into pens of the same size, *but without sheds*; they were kept in during the same time, and consumed on the average 25lbs of Swedish turnips daily. The only difference in the treatment consisted in the former having a shed into which they could go to protect themselves from the wet and cold. This protection was equivalent to a certain proportion of food, and we find that those that were deprived of it consumed one-fifth more food. In the latter case, the additional quantity of food arose wholly from the necessity of adding more fuel to keep the furnace at its proper temperature. This is proved by the fact that the sheep that had the sheds increased on the average 3lbs. each more than the others.

There are many illustrations of this principle—*That warmth is a substitute for food; and, therefore, by protecting cattle from the cold, we economise food.*

The excess of those principles containing nitrogen is deposited as flesh, while the excess of those destitute of that element, as sugar, starch, &c., is deposited as fat.

The fattening of cattle is similar to the growing of corn plants; we endeavour to produce an unnatural increase of some particular part of the plant, as the gluten of wheat, and this we accomplish by artificial means—by manure. The fattening of cattle is the same. We want to produce an unnatural increase of part of the body; and we do this by putting the animal in an unnatural state.