

which latter, decaying on the shore, or in the ooze at the bottom, restore the alkali to the earth. The conditions under which the vegetation of the coal formation grew, and was preserved, being similar to those of peat, the soils became exhausted of potash, and are seen in the fire-clays of that period.

Another effect of vegetation on sediments is due to the reducing or de-oxidizing agency of the organic matters from its decay. These, as is well known, reduce the peroxide of iron to a soluble protoxide, and remove it from the soil, to be afterwards deposited in the forms of iron ochre and iron ores, which by subsequent alteration become hard, crystalline and insoluble. Thus, through the agency of vegetation, is the iron oxide of the sediments withdrawn from the terrestrial circulation; and it is evident that the proportion of this element diffused in the more recent sediments must be much less than in those of ancient times. The reducing power of organic matter is farther shown in the formation of metallic sulphurets; the reduction of sulphates having precipitated in this insoluble form the heavy metals, copper, lead, and zinc; which, with iron, appear to have been in solution in the waters of early times, but are now by this means also abstracted from the circulation, and accumulated in beds and fahlbands, or by a subsequent process have been redissolved and deposited in veins. All analogies lead us to the conclusion that the primeval condition of the metals, and of sulphur, was, like that of carbon, one of oxidation, and that vegetable life has been the sole medium of their reduction.

The source of the carbonates of lime and magnesia in sedimentary strata is two-fold:—first, the decomposition of silicates containing these bases, such as anorthic feldspars and pyroxene; and second, the action of the alkaline carbonates formed by the decomposition of feldspars, upon the chlorids of calcium and magnesium, originally present in sea-water; which have thus, in the course of ages, been in great part replaced by chlorid of sodium. The clay, or aluminous silicate which has been deprived of its alkali, is thus a measure of the carbonic acid removed from the air, of the carbonates of lime and magnesia precipitated, and of the amount of chlorid of sodium added to the waters of the primeval ocean.

The coarser sediments, in which quartz and orthoclase prevail, are readily permeable to infiltrating waters, which gradually remove from them the soda, lime, and magnesia, which they contain; and if organic matters intervene, the oxide of iron; leaving