

strata destitute of neutral soluble salts may be first examined. Between such sedimentary strata and the waters charged with organic and mineral matters from decaying vegetation, there are important reactions. The composition of these waters is peculiar. They contain, relatively to the sodium, a large amount of potassium salts, besides notable quantities of silica and phosphates, in addition to the dissolved organic matters and the earthy carbonates, and in some cases ammoniacal salts and nitrates or nitrites. The sulphuric acid and chlorine are moreover not sufficient to neutralize the alkalis, which are perhaps in part combined with silica or with an organic acid.

§ 5. The experiments of Way, Voelcker, and others have shown that when such waters are brought into contact with argillaceous sediments, they part with their potash, ammonia, silica, and phosphoric acid and organic matter, which remain in combination with the soil; while, under ordinary conditions at least, neither soda, lime, magnesia, sulphuric acid, nor chlorine are retained. This power of the soil appears from the experiments of Eichhorn to be in part due to the action of hydrated double aluminous silicates; and the process is one of double exchange, an equivalent of lime or soda being given up for the potash and ammonia retained. The phosphates are probably retained in combination with alumina or peroxyd of iron; and the silica and organic matters also enter into insoluble combinations. It follows from these reactions that the surface-waters charged with the products of vegetable decay, after having been brought in contact with argillaceous sediments, retain little else than sulphates, chlorids, or carbonates of soda, lime, and magnesia. In this way the mineral matters required for the growth of plants, and by them removed from the soil, are again restored to it; and from this reaction results the small proportion of potash salts in the waters of ordinary springs and wells as compared with river-waters. From the waters of rivers, lakes, and seas, aquatic plants again take up the dissolved potash, phosphates, and silica; and the subsequent decay of these plants in contact with the ooze of the bottom, or on the shores, again restores these elements to the earth. See a remarkable essay by Forchhammer on the composition of fucoids, and their geological relations, *Jour. fur Prakt. Chem.*, xxxvi, 388.

§ 6. The observations of Eichhorn upon the reaction between solutions of chlorids and pulverized chabazite, which, as a hydrated