

vide means for the continuous solvent action of water. This influence is particularly observable among liverworts, mosses, and similar moisture-loving plants.

2. By their decay, plants supply an important series of organic acids, which exert a powerful influence upon soils, minerals, and rocks. The humus, or organic portion of vegetable soil, consists of the remains of plants and animals in all stages of decay, and contains a complex series of organic compounds still imperfectly understood. Among these are humic, ulmic, crenic and apocrenic acids.³²² The action of these organic acids is twofold. (1) From their tendency to oxidation, they exert a markedly reducing influence (ante, pp. 584, 611, 766). Thus they convert metallic sulphates into sulphides, as in the blue marine muds, and the abundant pyritous incrustations of coal-seams, shell-bearing clays, and even sometimes of mine-timbers. Metallic salts are still further reduced to the state of native metals. Native silver occurs among silver ores in fossil wood among the Permian rocks of Hesse. Native copper has been frequently noticed in the timber-props of mines; it was found hanging in stalactites from timbers of the Ducktown copper mines, Tennessee, when the mines were reopened after being shut up during the Civil War. Fossil fishes from the Kupferschiefer have been incrustated with native copper, and fish-teeth have been obtained from Liguria completely replaced by this metal. (2) They exert a remarkable power of dissolving mineral substances.³²³ This phase of their activity has probably been undervalued by geologists.³²⁴ Experi-

³²² See J. Roth, "Allgemeine und Chemische Geologie," 1883, p. 596.

³²³ Prof. Sollas has noticed the formation of minute hemispherical pits on limestone by the solvent action of a lichen, *Verrucaria rupestris* (Brit. Assoc. 1880, sects. p. 586). See also J. G. Goodchild, *Geol. Mag.* 1890, p. 464.

³²⁴ This has been strongly insisted upon by A. A. Julien in a memoir on the