

attack the hydrated peroxide of iron, they remove it in solution, and the decomposed rock or soil is thereby bleached. This may be observed where pine-trees grow on ferruginous sand, a rootlet one-sixth of an inch in diameter being by its decay capable of whitening the sand to a distance of from one to two inches around it.³²⁶ It has recently been proposed to ascribe mainly to the operation of the humus acids the thick layer of decomposed rock above noticed (p. 595) as observable so frequently south of the limits of the ice of the Glacial Period, and the inference has been drawn that, even where the surface is now comparatively barren, the mere existence of this thick decomposed layer affords a presumption that it once underlay an abundant vegetation, such as a heavy primeval forest-growth.³²⁷ Nor is the chemical action confined to the superficial layers. The organic acids are carried down beneath the surface, and initiate that series of alterations which carbonic acid and the alkaline carbonates effect among subterranean rock masses (ante, p. 611).

3. Plants insert their roots or branches between the joints of rock, or penetrate beneath the soil. Two marked effects are traceable to this action. In the first place, large slices of rock may be wedged off from the sides of wooded hills or cliffs. Even among old ruins, an occasional sapling ash or elm may be found to have cast its roots round a portion of the masonry, and to be slowly detaching it from the rest of the wall. In the second place, the soil and subsoil are opened up to the decomposing influences of the air and descending water. The distance to which, under favorable

³²⁶ Kindler, *Poggend. Annal.* xxxvii. 1836, p. 203. J. A. Phillips, "Ore Deposits," 1884, p. 14.

³²⁷ Julien, *Amer. Assoc.* 1879, p. 378.