

The most important agents by which these changes are effected are water, oxygen, carbonic acid, and ammonia, which are among what are termed atmospheric agents. Changes of temperature also produce important effects.

Rain water carries down with it the substances above named, and distributes them through the soil, and even into solid rocks. Nearly all rocks contain silica chemically united with alumina, lime, potash, soda, magnesia, or protoxide of iron, forming what are termed silicates, and these are soluble in water containing carbonic acid. Water it is true takes them up in very small proportion, especially of silicate magnesia, but in a long series of years extensive effects are in this way produced.

The oxygen of the air being also carried into the soil and rocks, converts the protoxides of iron into the state of peroxide, which is the cause of the changes of color in many rocks (whose surfaces and sometimes the interior also) assume reddish or yellowish aspects.

The disintegration of rocks lying at or near the surface, and also of soil, is hastened by the expansion and contraction resulting from changes of temperature, especially where cold winters prevail.

The freezing of the absorbed water causes expansions which open seams in the hardest rocks, so as to give more ready access to the percolating water with its carbonic acid and other destroying agents.

By these and other means of minor importance rocks are constantly being acted upon, and parts of their constituents are dissolved and carried into the depths of the earth to reappear in spring water. We often hear of "pure spring water," but none such exists in nature; it all contains alkaline, earthy and metallic salts, though usually in very small proportions.

Rocks which have been deprived of considerable proportions of their constituents, so as to readily crumble, are said to be disintegrated or rotten, and if the rock be free from grains of quartz or other nearly indestructible minerals of sensible size, the operation will be continued until the mass be converted into a stiff clay. This is the case with some amphibolite or hornblende, as noticed in Chapter II. Most of the limestones of Carroll, Frederick, and Washington counties also produce a stiff soil, owing to the absence of sand or grains of quartz.

The granular limestones of Harford, Baltimore, and Howard vary from almost pure to those containing 10 to 20 per cent. of sand, of quartz with mica, talc, etc., and sometimes even more.

Carbonic acid and water are unceasingly dissolving and removing the lime from the surfaces of limestones, leaving, however the insoluble matters behind to constitute earth or soil. It appears, therefore, that the soil and earth resting