

Of all the agents of consolidation and change in rocks, the chemically active waters are, to my mind, the most potent; and it appears to me probable that dry heat and pressure alone would be unable to produce any general and wide-spread rock alteration if it were not for the intervention of the percolating waters found in all rocks, so far as man has been able to penetrate the earth. These waters convey the heat and other chemically active agencies to the places where they can act. Metamorphosed or altered detritus forms the oldest known rocks of the Lake Superior district; and we know of the original rocks only by the remains of that *débris* now found in them. From the character of that *débris* it appears that here the original rocks were of igneous or volcanic origin; that is, they made up the early-formed crust of the earth, or else were produced by the earth's primitive volcanic activity.

When the muds, sands or shingle have been consolidated, they are found to form rocks that differ not only in the fineness of the material in them, and in their chemical and mineral composition, but also according to the different agencies and conditions to which they have been subjected.

Thus it is that the muds have formed the rocks known as the argillites, shales, most schists, and some gneisses; the sands have formed sandstones, quartzites, some schists, and most gneisses; while the shingle generally finds its expression in the conglomerates.

The term argillite is used to indicate those consolidated muds that were largely composed of clay or argillaceous material; but the argillites are commonly known as slates—a term properly applied to an argillite only when it has been subjected to pressure and chemical action to such an extent that it has the property of splitting indefinitely into thin plates that have no relation to the original structural or sedimentary planes of the rock. This property of being cleaved or split is known as cleavage, and it is by no means confined to that variety of argillite known as slate.

When quartz sands form a sandstone which subsequently has been greatly altered or indurated, so that the rock is composed of a very hard, compact mass of quartz grains, this variety of sandstone is known as quartzite.

The terms schist and gneiss are used to designate all those