

plex system of evidently plutonic igneous rocks was ever connected with any superficial volcanic activity. No such connection has yet been definitely ascertained, but it may be regarded as highly probable. If the most ancient gneisses with their dikes and bosses were the deep-seated portions of the successive uprisings of the igneous magma which culminated in volcanic eruptions, we may hope eventually to discover some trace of the materials that were thrown out to the surface and accumulated there. In some of the overlying pre-Cambrian masses of sedimentary rocks abundant lavas, tuffs, and agglomerates have been found, indicating the outpouring of volcanic material at the surface during the deposition of these sediments. The vast scale of these volcanic eruptions may be inferred from the fact that in the Lake Superior region the accumulated materials discharged at the surface attained a thickness which has been estimated at more than six and a half miles. It may be eventually discovered that some of these superficial manifestations of volcanic action have been connected with bosses, sills, or dikes that form part of the body of the gneiss below.

It must be confessed that much detailed work among the lower gneisses in all parts of the world is needed before the many problems which they present are solved. But the following conclusions regarding them may now be regarded as certain:—these rocks are in the main various forms of original eruptive material, ranging from highly acid to highly basic; they form in general a complex mass belonging to successive periods of extrusion; some of their coarse structures are probably due to a process of segregation in still fluid or mobile, probably molten, material consolidating below the surface; their granulitized and schistose characters, and their folded and crumpled structures point to subsequent