moving masses of ice, such as still exist in the Polar regions of the globe, seem to have extended at least over all the Temperate Zones. The powerful influence of these cyclopean plowshares in tearing away and grinding down the rock surfaces over which they passed, is attested everywhere today, not only by the smooth, worn and often polished surfaces of the rocks themselves, but in the immense accumulations of gravel, sand and boulders, met with on all sides. Other less potent agencies, even plants and animals, have contributed in no small degree to the formation of those surface deposits, notably the growth and decomposition of plants, such as mosses, grasses, scrubs, etc., which constitute the bulk of the peat bogs so prevalent, especially in these northern regions; and even the small insignificant earthworm lends his aid towards pulverizing the earth. In fact, the whole history of the globe has been one succession of demolition and reconstruction. What were the clays, sands and sands of one age, became the rocks from whence clays and earths of succeeding periods were derived.

SIMILARITY OF MINERAL CONSTITUENTS.

It follows, then, that notwithstanding the almost infinite variety of rocks which go to constitute the crust of the earth, the substances of which they are chiefly composed are in reality similar. But to be more explicit, in regard to their actual composition, mineralogists have ascertained that most of the rocks of the globe are really composed of but thirteen of the sixty-six elementary substances known to science. These are the gases, oxygen, hydrogen, nitrogen, chlorine, the non-metallic elements, carbon, sulphur, silicon; the metals calcium, sodium, potassium, magnesium, aluminium and iron. The combination of these various elements really reduces the actual materials constituting the rocks, as they are most commonly known, at least, to some half-dozen ordinary substances. Chief amongst these are silex or quartz, which is almost pure silica; feldspar, which is a combination of silica, alumina, potash, lime, soda and water; some varieties contain a little iron manganese, magnesia and acids. Carbonate and sulphate of lime, which are combinations of carbonic acid and calcium or lime, that is, simply ordinary limestone, and sulphuric acid and calcium which is gypsum or plaster. Steatite or soapstone is a combination of silica, magnesia, protoxyd of iron, carbonic acid, water, etc. These, then, with occasional admixtures of other and rarer minerals, are the chief constituents of all rocks, and consequently of all soils derived from them.

ORDINARY ROCKS.

The most common rocks, and those found in almost all countries, are granites, orgranitoids, sandstones, slates, limestones, and trap or igneous rocks. These are all simply different combinations of the foregoing minerals; for instance, true granite is a crystalline rock composed of quartz, feldspar and mica. The absence of any one of these ingredients, or its substitution by another mineral, simply results in another variety of granite. A sandstone, again, may be composed of the self-same minerals, but in a finer state of aggregation; quartz or feldspar being almost always present in both. Slates are only the same ingredients in a still more minute state of combination, where the particles have been ground into an almost impalpable powder. Just in proportion, then, as one of these minerals may preponderate over the others, do the rocks vary in character. An excess of silex makes a sandstone hard and gritty; a slate silicious or flinty. An excess of alumina or clay, renders both softer. The presence of lime in any rocks has a still more softening influence upon them, and where an excess of lime, or rather carbonate of lime occurs, we have the well known limestone. Most limestones contain impurities, such as silex alumina, magnesia, etc., the finest forms being white marble and calcspar.

OTHER CHARACTERISTICS OF ROCKS.

Of course all these varieties of rock vary exceedingly in hardness, color, and degrees of consistency, while the presence of some foreign mineral not unusually gives a distinctive character to each; for instance, sandstones are said to be quartzose or silicious, argillacious or clayey, calcarious containing lime, micacious containing fine scales of mica, fine-grained, gritty, conglomerate, etc.; also, porous and friable, *i.e.*, capable of absorbing much moisture and easily crumbled. Slates, again, are silicious, or cherty, arrenaceous or sandy, calcarious, shaly, when they split into thin leaf-like pieces, micaceous, carbonaceous, phmbaginous, talcose, aluminous, bituminous, etc. But I fear many of you will begin to weary of all this geological dissertation on rocks, and to ask yourselves what has all this to do with soils and their cultivation. Well, I shall endeavour to explain the intimate connection of the two subjects. The aluminous minerals mentioned as constituting so large a portion of the earth's crust, give to the soils their clay proper, when this clay is unmixed with the other ingredients, especially with sand, it is in the form known as plastic clay, or potters' clay—a tough impervious material, unfit for the support of vegetation, from the fact that the roots of plants are unable to penetrate it. Here is a dried specimen of pure clay only fit for coarse pottery or earthenware.* It is from the Exploit's Valley. A similar clay is frequently found under our peat bogs in this neighborhood, and I believe the fact of its being so dense as to prevent the surface waters penetrating downward, has been the chief cause of the collection of those swampy accumulations of vegetable matter. The silex in the rocks gives to the soils the sand which is

*A specimen of purely aluminous clay such as frequently occurs in this country, was to be exhibited and explained here.