Mineralogy—No. I.

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Last year the articles in the Review on mineralogy assumed that the teacher using them possessed text-books on the subject. Those articles, therefore, were intended merely as suggestive aids in using such books. This year, however, I shall go more into details, assuming the reader is without any aid beyond her own honest endeavor to learn what she can of the inorganic world around her. For, fascinating as the study of organic nature is, many stories equally attractive are written in the rocks of our shores, mountains, brooks or fields, and in the dust beneath our feet.

To begin our study of mineralogy, then, the first requisite is a small collection of familiar material for examination. Have your pupils help you gather samples of soils and common rocks. In studying these you will familiarize yourself and your class not only with the terms used to describe minerals, but with the association and distribution of different rocks and soils. It matters little where we begin; but, to make a start, let us study soils. Get samples of sand, clay and humus (black mud). On examination the pupils will soon discover that humus consists mainly of decayed leaves and wood. (Here is a chance for a lesson on the formation of peat and coal). It is, therefore, organic, and has less bearing upon our subject than the other two. For the purposes of this article, however, sand and clay need more detailed study. Rub sand over a piece of window glass. Does it scratch the glass? Do the same with clay. With these, get samples of sandstone and shale, which are common nearly everywhere. (The shale is not very abundant in the southern half of Nova Scotia). Powder these rocks, and compare the product with sand and clay. Let some of the powdered shale soak in water awhile. Does it get sticky like clay? The children will now say that sand and clay are formed from sandstone and shale. But might not the reverse be true, *i. e.*, the rocks formed from the soils? Perhaps stratification will help us decide this. How did sandstone and shale get into the layers as we see them in the face of cliffs? Look at the mud in the gutters after a heavy rain; or take a tumbler in which a mixture of soils is shaken in water. The materials will separate into layers according to their coarseness or density—fine clay remaining on top. If these could now be pressed together and dried, they would form layers of rock, the clay becoming shale; and the sand, sandstone. A layer of pebbles at the bottom of the tumbler, if stuck together, would form conglomerate. In nature, pebbles and sand grains get cemented together, usually by iron rust, or sometimes by lime, both of which are found in the water that soaks through the soils. Have you ever seen rocks the color of iron rust?

In the tumbler experiment, was there a sharp division line between the sand and the clay? Were not some of the finest sand and coarsest clay mixed? This will show why some soil is loam, and why some shale is gritty. You will also see why some soil is gravelly. You will perhaps find some rocks midway, in texture, between sandstone and conglomerate. These are often called "millstone grit." Can you find their original in the tumbler experiment?

We have, then, accounted for the formation of three rocks—sandstone, shale and conglomerate—from soils. But where did the soils come from? Plainly, they *may* have come from the rocks just mentioned; but we can trace them back further to unstratified, igneous rocks. These were forced up from depths where no soils could have had a part in their making. One of the commonest igneous rocks is granite. A study of it, therefore, will be extremely profitable. Procure, at first, specimens of *binary* granite—granite made up of quartz (glassy) and (usually) flesh-red feldspar. Try the hardness of these on glass. Which breaks with the more uneven surface? You will probably find that the quartz breaks irregularly, but the feldspar with a more or less smooth surface. On breaking as large a piece of feldspar as you can get, see if there is any constant angle between two adjoining faces. When a mineral breaks always in some definite way, we speak of that property as *cleavage;* while an irregular mode of breaking we describe as fracture. Feldspar has fairly good cleavage, but ordinary white or glassy quartz has none.

Now study gray granite. What mineral gives the color, quartz or feldspar? Powder red feldspar. Is the powder red? The color of a mineral when powdered is called its *streak*. Do the two feldspars studied differ in streak so much as in color? The streak is usually important in studying colored minerals. Of course all white or gray minerals have a white streak. What color is smooth ice? You see its streak after it has been skated upon.