

Chemical Composition of the Rocks.—It is only quite recently (1860), that we have had many reliable analyses of the rocks, and even now the table which we present is not complete. But the subject has become one of great interest, especially in its bearings upon metamorphism, which is now a most important part of the science. The analyses in the following table have been derived chiefly from Bischoff's Chemical Geology, though some have been taken from American analysts.

The column of specific gravities has been added chiefly to enable any one to determine the weight of rocks, a problem which every one has often occasion to solve. The specific gravity shows us how much heavier a given quantity, say a cubic foot, of the rock is than the same quantity of distilled water. Now since a cubic foot of water weighs 1000 ounces avoirdupois, multiply the number of cubic feet in the mass, whose weight you seek, and this product by the specific gravity, and you will obtain the weight in ounces, which divided by 16 will give it in pounds. Thus, suppose a mass of Greenstone measures 20 cubic feet, then $20 \times 1000 \times 2.85 \div 16 = 3562.5$ pounds.

This table might perhaps more logically have been placed at the end of Section II.; but there is an advantage in knowing something about the characters of the rocks before studying their chemical composition.

SECTION IV.

OPERATION OF ATMOSPHERIC AND AQUEOUS AGENCIES IN PRODUCING GEOLOGICAL CHANGES.

The basis of nearly all correct reasoning in geology, is the analogy between the phenomena of nature in all periods of the world's history: in other words, similar effects are supposed to be the result of similar causes at all times.

This principle is founded on a belief in the constancy of nature; or that natural operations are the result of only one general system, which is regulated by invariable laws. Every other branch of physical science, equally with geology, depends upon this principle; and if it be given up, all reasoning in respect to past natural phenomena is at an end.

It does not follow from this principle that the causes of geological change have always operated with equal intensity, nor with entire uniformity. How great has been the irregularity of their action is a subject of debate among geologists.

It is important to ascertain the *true dynamics* of existing causes of geological change; that is, the amount of change which they are now producing. For until this is done, we can not determine whether those causes are sufficient to account for all the changes which the earth has undergone.

The elements of these atmospheric and aqueous agencies are