

investigation of rocks in the field are few in number, and simple in character and application. The observer will be sufficiently accoutred if he carries with him a hammer of such form and weight as will enable him to break off clean, sharp, unweathered chips from the edges of rock-masses, a small lens, a pocket-knife of hard steel for determining the hardness of rocks and minerals, a magnet or a magnetized knife-blade, and a small pocket-phial of dilute hydrochloric acid, or better still some citric acid in powder.

Should the object be to form a collection of rocks, a hammer of at least three or four pounds in weight should be carried: also one or two chisels and a small trimming hammer, weighing about  $\frac{1}{4}$  lb., for reducing the specimens to shape. A convenient size of specimen is  $4 \times 3 \times 1$  inches. They should be as nearly as possible uniform in size, so as to be capable of orderly arrangement in the drawers or shelves of a case or cabinet. Attention should be paid not only to obtain a thoroughly fresh fracture of a rock, but also a weathered surface, wherever there is anything characteristic in the weathering. Every specimen should have affixed to it a label, indicating as exactly as possible the locality from which it was taken. This information ought always to be written down in the field at the time of collecting, and should be affixed to or wrapped up with the specimen, before it is consigned to the collecting bag. If, however, the student does not purpose to form a collection, but merely to obtain such chips as will enable him to judge of the characters of rocks, a hammer weighing from  $1\frac{1}{2}$  to 2 lbs., with a square face and tapering to a chisel edge at the opposite end, will be most useful. The advantage of this form is that the hammer can be used not only for breaking hard stones, but also for splitting open shales and other fissile rocks, so that it unites the uses of hammer and chisel.

It is, of course, desirable that the learner should first acquire some knowledge of the nomenclature of rocks, by carefully studying a collection of correctly named and judiciously selected rock-specimens. Such collections may now be purchased at small cost from mineral dealers, or may be studied in the museums of most towns. Having accustomed his eye to the ordinary external characters of rocks, and become familiar with their names, the student may proceed to determine them for himself in the field.

Finding himself face to face with a rock-mass, and after noting its geotectonic characters (Book IV.), the observer will proceed to examine the exposed or weathered surface.