

*a.* Shape.—If the fragments are chiefly rounded, the rock may be sought in the sand and gravel series (p. 224), while if they are large and angular, it may be classed as a breccia (p. 230). Some mineral substances, however, do not acquire rounded outlines, even after long-continued attrition. Mica, for example, splits up into thin laminæ, which may be broken into small flakes or spangles, but never become rounded granules. Other minerals, also, which have a ready cleavage, are apt to break up along their cleavage-planes, and thus to retain angular contours. Calc-spar is a familiar example of this tendency. Organic remains composed of this mineral (such as crinoids and echinoids) may often be noticed in a very fragmentary condition, having evidently been subjected to long-continued comminution. Yet angular outlines and fresh or little worn cleavage-surfaces may be found among them. Many limestones consist largely of sub-angular organic débris. Angular inorganic detritus is characteristic of volcanic breccias and tuffs (p. 238).

*β.* Size.—Where the fragments are hard, rounded, or sub-angular quartzose grains, the size of a pin's head or less, the rock is probably some form of sandstone (p. 231). Where they range up to the size of a pea, it may be a pebbly sandstone, fine conglomerate or grit; where they vary from the size of a pea to that of a walnut, it is an ordinary gravel or conglomerate; where they range up to the size of a man's head or larger, it is a coarse shingle or conglomerate. A considerable admixture of sub-angular stones makes it a brecciated conglomerate or breccia; but where the materials are loosely aggregated, the deposit may be some kind of glacial drift, such as moraine-stuff or boulder-clay (p. 235). Large angular and irregular blocks are characteristic of coarse volcanic agglomerates (p. 240).

*γ.* Composition.—In the majority of cases, the fragments are of quartz, or at least of some siliceous and enduring mineral. Sandstones consist chiefly of rounded quartz-grains (p. 231). Where these are unmixed with other ingredients, the rock is sometimes distinguished as a quartzose sandstone. Such a rock when indurated becomes quartzite (p. 311). Among the quartz-grains, minute fragments of other minerals may be observed. When any one of these is prominent, it may give a name to the variety of sandstone, as felspathic, micaceous (p. 186). Volcanic tuffs and breccias are characterized by the occurrence of lapilli (very commonly *cellular*) of the lavas from the explosion of