

4. **Fragmentary Materials.**—Under this title may be included all the substances which, driven up into the air by volcanic explosions, fall in solid form to the ground—the dust, ashes, sand, cinders, and blocks of every kind which are projected from a volcanic orifice. These materials differ in composition, texture, and appearance, even during a single eruption, and still more in successive explosions of the same volcano. For the sake of convenience, separate names are applied to some of the more distinct varieties, of which the following may be enumerated.

(1) **Ashes and sand.**—In many eruptions, vast quantities of an exceedingly fine light gray powder are ejected. As this substance greatly resembles what is left after a piece of wood or coal is burned in an open fire, it has been popularly termed *ash*, and this name has been adopted by geologists. If, however, by the word ash, the result of combustion is implied, its employment to denote any product of volcanic action must be regretted, as apt to convey a wrong impression. The fine ash-like dust ejected by a volcano is merely lava in an extremely fine state of comminution. So minute are the particles that they find their way readily through the finest chinks of a closed room, and settle down upon floor and furniture, as ordinary dust does when a house is shut up. From this finest form of material, gradations may be traced, through what is termed volcanic sand, into the coarser varieties of ejected matter. In composition, the ash and sand vary necessarily with the nature of the lava from which they are derived. Their microscopic structure, and especially their abundant microlites, crystals, and volcanic glass, have been already referred to (pp. 239–241).

(2) **Lapilli or rapilli** (p. 239) are ejected fragments ranging from the size of a pea to that of a walnut; round, subangular, or angular in shape, and having the same indefinite range of composition as the finer dust. As a rule, the larger pieces fall nearest the focus of eruption. Sometimes they are solid fragments of lava, but more usually they have a cellular texture, while sometimes they are so light and porous as to float readily on water, and, when ejected near the sea, to cover its surface. Well-formed crystals occur in the lapilli of many volcanoes, and are also ejected separately.