

disintegration of which they have been formed. Thus we have *felsite-tuffs*, *trachyte-tuffs*, *basalt-tuffs*, *pumice-tuffs*, *porphyrite-tuffs*, etc. A few varieties with special characteristics may be mentioned here.¹²⁵

Trass—a pale yellow or gray rock, rough to the feel, composed of an earthy or compact pumiceous dust, in which fragments of pumice, trachyte, graywacke, basalt, carbonized wood, etc., are imbedded. It has filled up some of the valleys of the Eifel, where it is largely quarried as a hydraulic mortar.

Peperino—a dark-brown, earthy or granular tuff, found in considerable quantity among the Alban Hills near Rome, and containing abundant crystals of augite, mica, leucite, magnetite, and fragments of crystalline limestone, basalt, and leucite-lava.

Palagonite-Tuff—a bedded aggregate of dust and fragments of basaltic lava, among which are conspicuous angular pieces and minute granules of the pale yellow, green, red, or brown basic glass called palagonite. This vitreous substance is intimately related to the basalts (p. 298). It appears to have gathered within volcanic vents and to have been emptied thence, not in streams, but by successive aeriform explosions, and to have been subsequently more or less altered. The percentage composition of a specimen from the typical locality, Palagonia, in the Val di Noto, Sicily, was estimated by Sartorius von Waltershausen to be: silica, 41.26; alumina, 8.60; ferric oxide, 25.32; lime, 5.59; magnesia, 4.84; potash, 0.54; soda, 1.06; water, 12.79. This rock is largely developed among the products of the Icelandic and Sicilian volcanoes; it occurs also in the Eifel and in Nassau. It has been found to be one of the characteristic features of tuffs of Carboniferous age in Central Scotland¹²⁶ (Fig. 23).

Schalstein.—Under this name, German petrographers have placed a variety of green, gray, red, or mottled fissile rocks, impregnated with carbonate of lime. They are inter-stratified with the Devonian formations of Nassau, the Harz and

¹²⁵ On the occurrence and structure of tuffs, see J. C. Ward, Q. J. Geol. Soc. xxxi. p. 388; Reyer, Jahrb. Geol. Reichsanst. 1881, p. 57; Geikie, Trans. Roy. Soc. Edin. xxix.; Vogelsang, Z. Deutsch. Geol. Ges. xxiv. p. 543; Penck, op. cit. xxxi. p. 504. On the basalt-tuffs of Scania, F. Eichstadt, Sveriges Geol. Undersökn, ser. c. No. 58 (1883). On the metamorphism of tuffs into lava-like rocks, see Dutton's "High Plateaux of Utah" (U. S. Geograph. and Geol. Survey of Rocky Mounts.), 1880, p. 79.

¹²⁶ Trans. Roy. Soc. Edin. xxix. p. 514.