

as an essential constituent. This term will include a large proportion of the rocks hitherto classed as trachytes, but in which the felspar proves to be plagioclase and not sanidine.<sup>191</sup>

**Pyroxene-andesite**—consisting of labradorite or oligoclase, with augite (less frequently a rhombic pyroxene) and abundant magnetite, sometimes with hornblende or mica, forming a dark heavy basalt-like compound, with a compact sometimes more or less distinctly vitreous ground-mass. Composition: silica, 57.15; alumina, 16.10; protoxide of iron, 13.0; lime, 5.75; magnesia, 2.21; potash, 1.81; soda, 3.88. Mean specific gravity, 2.75–2.85.

It was formerly supposed that the pyroxene of the andesites was always augite. But rhombic forms of the mineral have now been frequently detected. Under the name of Hypersthene-andesite, certain Tertiary or recent rocks, stretching over vast areas in Western America, have been described as associated with other andesites and basalts. They are black to gray, or reddish-gray, in color, and vary in texture from dense, thoroughly crystalline forms, to others approaching white glassy pumice, the base under the microscope ranging from a brown glass to a holocrystalline structure. The magnesian silicate is pyroxene, chiefly in the orthorhombic form as hypersthene, but partly also augite. An analysis of the pumiceous form of the rock gave 62 per cent of silica, while the percentage of the same constituent in the glass of the base was found to rise to 69.94.<sup>192</sup>

Pyroxene-andesite occurs in dikes, lava-streams, plateaus, sheets, and neck-like bosses in regions of extinct and active volcanoes, as in the Inner Hebrides, Antrim, Transylvania, Hungary, Santorin, Iceland, Teneriffe, the Western Territories of North America, the Andes, New Zealand, etc. Many of the rocks of these regions now classed under this name have long been known and described as dolerites and basalts. Indeed, there is the closest relation between them and the true olivine-bearing dolerites and basalts. The latter occur among the Tertiary volcanic plateaus of Britain, interstratified with rocks which, not containing olivine, have been placed among the andesites. Neither in their mode of occurrence nor to the eye in hand specimens is there any

<sup>191</sup> Hague and Iddings, Amer. Journ. Sci. xxvii. (1884), p. 460.

<sup>192</sup> Whitman Cross, Bull. U. S. Geol. Survey, 1883, No. 1. Hague and Iddings, Amer. Journ. Sci. xxvi. (1883), p. 226; xxvii. (1884), p. 457.