

The general absence of water-worn pebbles in the tuffs underlying the Madeira lavas is very striking, and contrasts with the frequent occurrence of gravel-beds under so many of the Auvergne lavas. It simply proves that Madeira, like the volcanic mountains of Java, or like Mount Etna or Mona Loa in the Sandwich Islands, could not, for reasons before given, p. 475, support a single torrent so long as eruptions were frequent on its slopes. The period, therefore, of fluvial erosion must have been subsequent to the formation of the central nucleus of ejectamenta, *c*, fig., p. 513, and of the lavas, *d*, *ibid.* When we infer that these were of supramarine origin as far down as the line *p*, *t*, and perhaps lower, it follows that a lofty island, 4000 feet or more in height, must have resulted, even if no upheaval had ever occurred.

The movements which upraised the marine deposits of San Vicente may or may not have extended over a wide area. How far they modified the form of the island, or added to its height, is a fair subject of speculation; and whether the steep dip of the lavas seen in the ravines intersecting the slopes of the mountain, *f h* and *e g*, can be ascribed to such movements. The lavas of more modern date, near Funchal, may be imagined to remain comparatively horizontal, because they have escaped the influence of disturbing forces to which the older nucleus was exposed. Without discussing this point (so fully treated of in reference to Palma), I may observe that unquestionably different parts of Madeira have been formed in succession. Near Porto da Cruz, for example, on the northern coast, trachytes of a gray, and trachytic tuffs almost of a white color, in slightly inclined or almost horizontal beds, have partially filled up deep valleys previously excavated through the older and inclined basaltic rocks (dipping at an angle of 10° to the north), under which the leaf-bed and lignite before mentioned, fig. 653, p. 513, lie buried. During the convulsions which accompanied the outpouring of every newer series of lavas, the older rocks may have been more or less disturbed and tilted, without destroying the general form of the old dome-shaped mountain supposed by us to have been the result of repeated eruptions from the central vents.

The locality just referred to of Porto da Cruz exemplifies, not only the long intervals of time which separated the outflowing of distinct sets of lavas, but also the precedence of the basaltic to the trachytic outpourings. So also on the southern slope of Madeira, I observed between the Jardim and Pico Bodes, situated in a direct line about six miles north-west of Funchal, a well-marked series of trachytic rocks of considerable thickness occupying the highest geological position. They consist of white and gray trachytes, occurring at points varying from 2500 to 3500 feet above the sea. Their position may be understood by supposing them to constitute the uppermost beds represented at *h* in the section, fig. 653, p. 513, and on the slope above *h*. The doctrine, therefore, that in each series of volcanic eruptions the trachytic lavas flow out first, and after them the basaltic kinds (see p. 522), is by no means borne out in