

position of rocks on many definite points, and his researches at once gained recognition. Italian geologists applied themselves with fresh zeal to the study of their volcanic rocks, working more by the practical methods of Dolomieu. Soon they discovered the weaknesses in Dolomieu's writings, where that keen observer had ventured to speculate on the causes which might determine the particular setting and orientation of mineral material characteristic of the transitional varieties of igneous rocks.

The learned Lazzaro Spallanzani (1729-99), Professor of Natural History in Pavia, was the first who applied experimental methods to the elucidation of volcanic rock-structure. He set up series of experiments in his laboratory in order to find out whether gaseous vapour would escape when lava was melted, and what was the chemical nature of such vapours. The result showed that little gas escaped, but the powdered lava partially sublimated, and was partially converted into a vesicular rock-mass.

Spallanzani then tested Dolomieu's idea that the crystalline structure of volcanic rocks was produced under the influence of a moderate degree of volcanic heat acting during a long period. Different kinds of lava were exposed to definite temperatures for forty-five days, some even for ninety days. The result of Spallanzani's experiment appeared negative, since a moderate heat acting for a long time produced precisely the same effects as a more intense heat acting for a shorter period.

Spallanzani also investigated whether, in accordance with the hypothesis of Dolomieu, the presence of sulphur would hasten the fluidity of the lava, and whether the melted material in this case would solidify as a crystalline, rough-grained, or vitreous rock. The result was again negative. The powdered specimens of lava mixed with sulphur demanded the same time to become fluid as the specimens with which no sulphur had been mixed, and on solidifying produced the same glassy rock. Spallanzani therefore opposed Dolomieu's theory, that a combustible substance was present in flowing lava, pointing out (1) that no flames had ever been seen on the surfaces of lava streams; (2) that all lavas were easily brought back to a fluid condition; whereas if Dolomieu were right in supposing they became solid after all the combustible material had been consumed, then in the absence of the latter it should be much more difficult to melt the lavas.