

The minerals which constitute alike the granitic and volcanic rocks consist, almost exclusively, of seven elements; namely, silica, alumina, magnesia, lime, soda, potash, and iron (see Table, p. 475); and these may sometimes exist in about the same proportions in a porous lava, a compact trap, or a crystalline granite. It may perhaps be found, on further examination—for on this subject we have yet much to learn—that the presence of these elements in certain proportions is more favorable than in others to their assuming a crystalline or true granitic structure; but it is also ascertained by experiment, that the same materials may, under different circumstances, form very different rocks. The same lava, for example, may be glassy, or scoriaceous, or stony, or porphyritic, according to the more or less rapid rate at which it cools; and some trachytes and syenitic-greenstones may doubtless form granite and syenite, if the crystallization take place slowly.

It has also been suggested that the peculiar nature and structure of granite may be due to its retaining in it that water which is seen to escape from lavas when they cool slowly, and consolidate in the atmosphere. Boutigny's experiments have shown that melted matter, at a white heat, requires to have its temperature lowered before it can vapourize water; and such discoveries, if they fail to explain the manner in which granites have been formed, serve at least to remind us of the entire distinctness of the conditions under which plutonic and volcanic rocks must be produced.\*

It would be easy to multiply examples and authorities to prove the gradation of the granitic into the trap rocks. On the western side of the fiord of Christiania, in Norway, there is a large district of trap, chiefly greenstone-porphry, and syenitic-greenstone, resting on fossiliferous strata. To this, on its southern limit, succeeds a region equally extensive of syenite, the passage from the volcanic to the plutonic rock being so gradual that it is impossible to draw a line of demarcation between them.

“The ordinary granite of Aberdeenshire,” says Dr. MacCulloch, “is the usual ternary compound of quartz, felspar, and mica; but sometimes hornblende is substituted for the mica. But in many places a variety occurs which is composed simply of felspar and hornblende; and in examining more minutely this duplicate compound, it is observed in some places to assume a fine grain, and at length to become undistinguishable from the greenstones of the trap family. It also passes in the same uninterrupted manner into a basalt, and at length into a soft claystone, with a schistose tendency on exposure, in no respect differing from those of the trap islands of the western coast. The same author mentions, that in Shetland, a granite composed of hornblende, mica, felspar, and quartz, graduates in an equally perfect manner into basalt.†

In Hungary, there are varieties of trachyte, which, geologically speak

\* E. de Beaumont, Bulletin, vol. iv. 2d ser. pp. 1318 and 1320.

† Syst. of Geol. vol. i. pp. 157, 158.