schists in Anglesea was approximately in the planes of bedding; and Professor Ramsay, in 1841, observed the same in regard to the gneiss and mica-schist of Arran. The last-cited geologist says, in reference to Anglesea, that the metamorphism probably took place when the Lower Silurian volcanos were in activity, and therefore long before the cleavage of the Welsh rocks; for the cleavage of the latter affects in common the Lower Silurian and the Cambrian strata. In the same memoir he adds, when referring to Mr. Darwin's theory of foliation, "that if the rocks be uncleaved when metamorphism occurs, the foliation planes will be apt to coincide with those of bedding; but if intense cleavage has preceded, then we may expect that the planes of foliation will lie in the planes of cleavage."*

From what I have myself seen in the Grampians, both in Forfarshire and Perthshire, I have always concluded that MacCulloch was correct in the opinion that gneiss and mica-schist may be considered as stratified rocks, and that certain beds of pure quartz, one or two feet thick, which run for miles in the strike of their foliation, as well as the intercalation of masses of limestone, and of chloritic, actinolitic, and hornblende schists, all indicate the planes of original stratification. At the same time, I fully admit that the alternate layers of quartz, or of mica and quartz, of felspar, or of mica and felspar, or of carbonate of lime, are more distinct, in certain metamorphic rocks, than the ingredients composing alternate layers in most sedimentary deposits, so that similar particles must be supposed to have exerted a molecular attraction for each other, and to have congregated together in layers more distinct in mineral composition than before they were crystallized.

We have seen how much the original planes of stratification may be interfered with or even obliterated by concretionary action in deposits still retaining their fossils, as in the case of the magnesian limestone (see p. 37). Hence we must expect to be frequently baffled when we attempt to decide whether the foliation does or does not accord with that arrangement which gravitation, combined with current-action, imparted to a deposit from water. Moreover, when we look for stratification in crystalline rocks, we must be on our guard not to expect too much regularity. The occurrence of wedge-shaped masses, such as belong to coarse sand and pebbles,—diagonal lamination (see p. 16),—ripple-mark,—unconformable stratification (p. 61),—the fantastic folds produced by lateral pressure,—faults of various width,—intrusive dikes of trap,—organic bodies of diversified shapes,—and other causes of unevenness in the planes of deposition, both on the small and on the large scale, will interfere with parallelism. If complex and enigmatical appearances did not present themselves, it would be a serious objection to the metamorphic theory.

In the accompanying diagram I have represented carefully the lami-

* Geol. Quart. Journ. 1853, vol. ix. p. 172.