

dip at right angles to the axis of elevation, and are parallel to it in their strike. No argument, therefore, can be drawn in favor of a common origin from uniformity of strike in the slaty and foliated rocks; for we require, in addition, coincidence of dip; and such is the variability of the dip both of the slates and folia as to render this kind of proof very difficult to obtain.

That the foliation of the crystalline schists in Norway accords very generally with the planes of original stratification is a conclusion long since espoused by Keilhau.\* Numerous observations made by Mr. David Forbes in the same country (the best probably in Europe for studying such phenomena on a grand scale) confirm Keilhau's opinion; for the dip of the Silurian and fossiliferous strata where they pass into the metamorphic agrees with the foliation of the contiguous gneiss, mica-schist, and crystalline limestone. So also in Scotland Mr. D. Forbes has pointed out a striking case where the foliation is identical with the lines of stratification in rocks well seen near Crianlrich on the road to Tyndrum, about 8 miles from Inverarnon, in Perthshire. There is in that locality a blue limestone foliated by the intercalation of small plates of white mica, so that the rock is often scarcely distinguishable in aspect from gneiss or mica-schist. The stratification is shown by the large beds and colored bands of limestone all dipping, like the foila, at an angle of 32 degrees N. E. †

In stratified formations of every age we see layers of siliceous sand with or without mica, alternating with clay, with fragments of shells or corals, or with seams of vegetable matter, and we should expect the mutual attraction of like particles to favor the crystallization of the quartz, or mica, or felspar, or carbonate of lime, along the planes of original deposition, rather than in planes placed at angles of 20 or 40 degrees to those of stratification.

In Patagonia, a series of thin sedimentary layers of tuff were observed by Mr. Darwin to have become porphyritic, first where least altered, by a process of aggregation, small patches of clay appearing to be shortened into almond-shaped concretions, which in those places where they were more changed had become crystals of felspar, having their longer axes parallel to each other. In other associated strata, grains of quartz had in like manner aggregated into nodules of crystalline quartz. ‡

May we not, then, presume that in rocks where no cleavage has intervened, foliation and the planes of stratification will usually coincide, as in all cases where cleavage happens (as in the writing-slates of the Niesen on the Lake of Thun in Switzerland, containing furoids) to agree with the original planes of sedimentary deposition? Mr. Darwin conceives that "foliation may be the extreme result of the process of which

\* Norske Mag. Naturvidsk. vol. i. p. 71.

† Memoir read before the Geol. Soc., London, Jan. 31, 1855.

‡ South America, p. 149.