

mass. Such stripes are found to be parallel to the true planes of stratification, wherever these are manifested by ripple-mark, or by beds containing peculiar organic remains. Some of the contorted strata are of a coarse mechanical structure, alternating with fine-grained crystalline chloritic slates, in which case the same slaty cleavage extends through the coarser and finer beds, though it is brought out in greater perfection in proportion as the materials of the rock are fine and homogeneous. It is only when these are very coarse that the cleavage planes entirely vanish. These planes are usually inclined at a very considerable angle to the planes of the strata. In the Welsh hills, for example, the average angle is as much as from 30° to 40° . Sometimes the cleavage planes dip towards the same point of the compass as those of stratification, but more frequently to opposite points. It may be stated as a general rule, that when beds of coarser materials alternate with those composed of finer particles, the slaty cleavage is either entirely confined to the fine-grained rock, or is very imperfectly exhibited in that of coarser texture. This rule holds, whether the cleavage is parallel to the planes of stratification or not.*

In regard to joints, they are natural fissures which often traverse rocks in straight and well-determined lines. They afford to the quarryman, as Sir R. Murchison observes, when speaking of the phenomena, as exhibited in Shropshire and the neighboring counties, the greatest aid in the extraction of blocks of stone; and, if a sufficient number cross each other, the whole mass of rock is split into symmetrical blocks. The faces of the joints are for the most part smoother and more regular than the surfaces of true strata. The joints are straight-cut chinks, often slightly open, often passing, not only through layers of successive deposition, but also through balls of limestone or other matter which have been formed by concretionary action, since the original accumulation of the strata. Such joints, therefore, must often have resulted from one of the last changes superinduced upon sedimentary deposits.†

In the annexed diagram (fig. 707), the flat surfaces of rock *a, b, c*, represent exposed faces of joints, to which the walls of other joints, *j j*, are parallel; *s s* are the lines of stratification; *n n* are lines of slaty cleavage, which intersect the rock at a considerable angle to the planes of stratification.

In the Swiss and Savoy Alps, as Mr. Bakewell has remarked, enormous masses of limestone are cut through so regularly by nearly vertical partings, and these joints are often so much more conspicuous than the seams of stratification, that an inexperienced observer will almost inevitably confound them, and suppose the strata to be perpendicular in places where, in fact, they are almost horizontal.‡

Now such joints are supposed to be analogous to the partings which

* Geol. Trans. 2d series, vol. iii. p. 461.

† Silurian System, p. 246.

‡ Introduction to Geology, chap. iv.