

superposition of two or more simple and obviously allowable modes of nodal division, which have the same time of vibration. He assumes, for this purpose, certain "primary figures," containing only *parallel* nodal lines; and by combining these, first in twos, and then in fours, he obtains most of Chladni's observed figures, and accounts for their transitions and deviations from regularity.

The principle of the superposition of vibrations is so solidly established as a mechanical truth, that we may consider an acoustical problem as satisfactorily disposed of, when it is reduced to that principle, as well as when it is solved by analytical mechanics: but at the same time we may recollect, that the right application and limitation of this law involves no small difficulty; and in this case, as in all advances in physical science, we cannot but wish to have the new ground which has been gained, gone over by some other person in some other manner; and thus secured to us as a permanent possession.

Savart's Laws.—In what has preceded, the vibrations of bodies have been referred to certain general classes, the separation of which was suggested by observation; for example, the *transverse, longitudinal, and rotatory*,¹³ vibrations of rods. The transverse vibrations, in which the rod goes backwards and forwards across the line of its length, were the only ones noticed by the earlier acousticians: the others were principally brought into notice by Chladni. As we have already seen in the preceding pages, this classification serves to express important laws; as, for instance, a law obtained by M. Poisson which gives the relation of the notes produced by the transverse and longitudinal vibrations of a rod. But this distinction was employed by M. Felix Savart to express laws of a more general kind; and then, as often happens in the progress of science, by pursuing these laws to a higher point of generality, the distinction again seemed to vanish. A very few words will explain these steps.

It was long ago known that vibrations may be communicated by contact. The distinction of transverse and longitudinal vibrations being established, Savart found that if one rod touched another perpendicularly, the longitudinal vibrations of the first occasion transverse vibrations in the second, and *vice versâ*. This is the more remarkable, since the two sets of vibrations are not equal in rapidity, and therefore cannot sympathize in any obvious manner.¹⁴ Savart found himself

¹³ Vibrations tournantes.

¹⁴ *An. Chim.* 1819, tom. xiv. p. 138.