

faces, and to compare it with experiment." Only one memoir was sent in as a candidate for the prize; and this was not crowned, though honorable mention was made of it.⁵ The formulæ of James Bernoulli were, according to M. Poisson's statement, defective, in consequence of his not taking into account the normal force which acts at the exterior boundary of the plate.⁶ The author of the anonymous memoir corrected this error, and calculated the note corresponding to various figures of the nodal lines; and he found an agreement with experiment sufficient to justify his theory. He had not, however, proved his fundamental equation, which M. Poisson demonstrated in a Memoir, read in 1814.⁷ At a more recent period also, MM. Poisson and Cauchy (as well as a lady, Mlle. Sophie Germain) have applied to this problem the artifices of the most improved analysis. M. Poisson⁸ determined the relation of the notes given by the longitudinal and the transverse vibrations of a rod; and solved the problem of vibrating circular plates when the nodal lines are concentric circles. In both these cases, the numerical agreement of his results with experience, seemed to confirm the justice of his fundamental views.⁹ He proceeds upon the hypothesis, that elastic bodies are composed of separate particles held together by the attractive forces which they exert upon each other, and distended by the repulsive force of heat. M. Cauchy¹⁰ has also calculated the transverse, longitudinal, and rotatory vibrations of elastic rods, and has obtained results agreeing closely with experiment through a considerable list of comparisons. The combined authority of two profound analysts, as MM. Poisson and Cauchy are, leads us to believe that, for the simpler cases of the vibrations of elastic bodies, Mathematics has executed her task; but most of the more complex cases remain as yet unsubdued.

The two brothers, Ernest and William Weber, made many curious observations on undulations, which are contained in their *Wellenlehre*, (Doctrine of Waves,) published at Leipsig in 1825. They were led to suppose, (as Young had suggested at an earlier period,) that Chladni's figures of nodal lines in plates were to be accounted for by the superposition of undulations.¹¹ Mr. Wheatstone¹² has undertaken to account for Chladni's figures of vibrating *square* plates by this

⁵ Poisson's *Mém. in Ac. Sc.* 1812, p. 169. ⁶ *Ib.* p. 220.

⁷ *Ib.* 1812, p. 2.

⁸ *Ib.* t. viii. 1829.

⁹ *An. Chim.* tom. xxxvi. 1827, p. 90. ¹⁰ *Exercices de Mathématique*, iii. and iv.

¹¹ *Wellenlehre*, p. 474.

¹² *Phil. Trans.* 1833, p. 593.