

of a force by the product of the force (itself measured by the velocity of a moving mass) and the velocity or space per unit of time through which it pushes or pulls a moving body, and Leibniz<sup>1</sup> had suggested the term *vis viva* to distinguish it from the *vis mortua*, the force or pressure itself. But the first clear and consistent fixing of the terminology which has since been universally adopted is to be found—not in the ‘*Mécanique analytique*’ of Lagrange (that classical work on theoretical mechanics), but in the ‘*Mécanique industrielle*’ of Poncelet (1829).<sup>2</sup> He introduced the term “mechanical

<sup>1</sup> Leibniz’s occupation with dynamics began with his publication of two theses in 1672, which he dedicated respectively to the Academy of Sciences in Paris and to the Royal Society. In distinction from the writings of Huygens and Newton, where precise definitions take the place of metaphysical discussions, Leibniz’s tracts—except in the comparatively rare cases where he confines himself to mathematical formulæ—are vitiated, like those of Descartes, by philosophical speculations. Thus, though eminently suggestive, they contributed little to the clearing up of ideas. Influenced by Huygens and by Newton, he opposed in 1686 the ideas of Descartes on the measure of force, and has the merit of having introduced the term *vis viva* in 1695, and of having started the celebrated discussion on the measure of force which was carried on during fifty-seven years on the Continent, and only settled by D’Alembert in his ‘*Traité de Dynamique*’ (1743) by stricter definitions. An excellent account of the questions involved, and of the gradual clearing up of ideas, will be found in Prof. Mach’s historical treatise on dynamics referred to

above. See the English translation by M’Cormack, p. 272, &c. It is there shown that one of the great defects of Descartes’ and Leibniz’s dynamical writings was the want of a clear definition of mass or inertia; also that this conception follows more simply from Newton’s definition of force than from Huygens’ conception of work (*ibid.*, p. 251).

<sup>2</sup> By the side of, and sometimes in opposition to the purely analytical school headed by Lagrange, Laplace, and later by Cauchy, there grew up in Paris the school of practical mathematicians which taught the application of theory to practice, to problems of artillery, engineering, and architecture. They created modern geometry, and to a great extent modern mechanics. Monge, Coulomb, the elder Carnot, Poncelet, Coriolis, were their leaders: Navier, Lamé, Chasles, de Saint Venant, followed, and combined their more synthetic methods with the analytical methods of the former school. Through Monge, Carnot, Navier, and Poncelet, geometry and dynamics were led into those channels which have since been so successfully followed in all applied work. To them