

sufficiently cleared up in Mohr's short *aperçu*, which does not attempt to distinguish between the two different meanings of the word force, nor in the earlier papers of Mayer, who, however, in later writings shows a clear appreciation of the difficulty. In Helmholtz's memoirs the desired clearness was only attained by mathematical reasoning, which in his age and country was accessible to but few naturalists. The second and probably the fundamental obstacle in the way of a just recognition of the new truth lay in the fatal use of the term "force" in two distinct meanings. Popularly the difficulty has only been removed by the creation of a new vocabulary, and dates from the introduction of the term "work" by Clausius in 1850, and of the term "energy" by William Thomson, who adopted it from Young in the year 1852. The confusion which had been kept up by employing the word "force" to mean not only pressure or dead force (in the Newtonian sense) but also acting force (*vis viva* in the Leibnizian sense), and with this confusion the whole meaning of the great controversies which raged for many years between the Cartesians and Leibnizians on the correct measure of force, was then removed, and a grammatical and logical founda-

15.
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from Mayer's published correspondence that some remarks of Liebig himself, which appeared early in 1842, induced him to send him his first paper in order "not to lose the right of priority" (letter to Griesinger, 5th-6th December 1842, in 'Schriften und Briefe,' ed. Weyrauch, p. 190). Mayer there says: "Liebig wrote to me, *inter alia*: 'As to what force, cause, and effect are, there exist in general

such confused notions that an easily understood explanation must be considered to be of real value.' One would accordingly think that he himself considers himself quite above this general confusion; that this is not so, I could see sufficiently from his 'phenomena of motion in the animal organism' (Liebig, 'Die organische Chemie, &c.,' 1842, p. 183, &c.)"