tion secured on which a new generation could enter at once into the possession of correcter dynamical and physical views. It is now being recognised more and more that the word "force" applies only to a mathematical abstraction, whereas the word "energy" or "power to perform work" applies to a real quantity; and there are not wanting suggestions that the former should be altogether banished from scientific text-books, and that the latter denotes not merely a property of matter, but that it is after matter the only real thing or substance in the material world.[1]

This radical change in the fundamental notions which underlie all physical reasoning was not brought about, however, till the vaguer views expounded by Mayer in Germany, and the exact measurements of Joule in England, had been united by the independent labours of Thomson and Clausius, whose earliest researches (also carried on independently of each other) had been suggested by the

[1] The late Prof. P. G. Tait has on various occasions expressed himself in this sense. See his lecture on "Force," delivered before the British Association, Glasgow, in 1876, and reprinted in 'Recent Advances,' 3rd ed., also the closing paragraphs of his article "Mechanics," in the 9th ed. of the 'Ency. Brit.,' reprinted as 'Dynamics,' 1895, where he says (p. 356): "The only other known thing in the physical universe, which is conserved in the same sense as matter is conserved, is energy. Hence we naturally consider energy as the other objective reality in the physical universe, and look to it for information as to the true nature of what we call force;" and (p. 361): "In all methods and systems which involve the idea of force, there is the leaven of artificiality. The true foundations of the subject, based entirely on experiments of the most extensive kind, are to be found in the inertia of matter, and the conservation and transformation of energy. With the help of kinematical ideas, it is easy to base the whole science of dynamics on these principles; and there is no necessity for the introduction of the word 'force,' nor of the sense-suggested ideas on which it was originally based." We must, however, in that case extend the conception of matter to embrace also the ether (see Tait, 'Properties of Matter,' p. 5, 2nd ed.)