

complexity and intricacy. A similar¹ attitude has in the course of our century frequently been taken up with regard to the problem of life, but it has always been abandoned again.² We are still told that "in

¹ See, for instance, what Huxley, who, in his earlier writings, might be termed a vitalist (cf. his address "On the Educational Value of the Natural History Sciences," 1854, and his own criticism thereof in the preface, dd. 1870, in 'Lay Sermons and Addresses'), says in his article "Biology," 1875, in the 'Ency. Brit.,' vol. iii. p. 681: "A mass of living protoplasm is simply a molecular machine of great complexity, the total results of the working of which, or its vital phenomena, depend—on the one hand, upon its construction, and on the other, upon the energy supplied to it; and to speak of 'vitality' as anything but the name of a series of operations, is as if one should talk of the 'horology' of a clock." Similarly Claude Bernard, in his 'Leçons sur les phénomènes de la vie,' &c., vol. i. p. 379, says: "En un mot, le phénomène vital est pré-établi dans sa forme, non dans son apparition. . . . La nature est intentionnelle dans son but, mais aveugle dans l'exécution." Both Huxley's comparison of an organism with a clock and the quotation from Claude Bernard suggest a parallel between the dictum of Archimedes: "δός μοι ποῦ στῶ καὶ τὸν κόσμον κινήσω," and a possible one of a biologist: "Give me an organism, and I will explain its action mechanically." In another place Claude Bernard says (*loc. cit.*, ii. p. 524): "L'élément ultime du phénomène est physique; l'arrangement est vital."

² Examples of this could be multiplied indefinitely. I take one from an entirely different

field. Prof. Kerner von Marilaun, the celebrated botanist, says ('The Natural History of Plants,' transl. by Dr Oliver, 1894, vol. i. p. 52): "In former times a special force was assumed—the force of life. More recently, when many phenomena of plant life had been successfully reduced to simple chemical and mechanical processes, this vital force was derided and effaced from the list of natural agencies. But by what name shall we now designate that force in nature which is liable to perish whilst the protoplasm suffers no physical alteration, and in the absence of any extrinsic cause; and which yet, so long as it is not extinct, causes the protoplasm to move, to inclose itself, to assimilate certain kinds of fresh matter coming within the sphere of its activity and to reject others, and which, when in full action, makes the protoplasm adapt its movements under external stimulation to existing conditions in the manner which is most expedient? This force in nature is not electricity nor magnetism; it is not identical with any other natural force, for it manifests a series of characteristic effects which differ from those of all other forms of energy. Therefore I do not hesitate again to designate as vital force this natural agency, not to be identified with any other, whose immediate instrument is the protoplasm, and whose peculiar effect we call life." Another example is that of Prof. Virchow, to whom we are indebted for the great revolution which the application of the novel conceptions of the cellular theory has worked in the