

that this end or purpose was attained by purely mechanical processes, that no new force, called vital force, need be assumed to exist, that it was the adequate and sole object of science to disclose the mechanism by which the various ends of life were attained. The very idea of life, the vitalistic element or factor, was chased away beyond the region of the knowable, and remained merely an idea in the realm of thought, as it was for Descartes and Leibniz, and as it has remained, up to recent times, for von Baer and for Claude Bernard, and for all those who do not accept the Darwinian explanation. For Lotze, Du Bois-Reymond, and Claude Bernard¹

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Lotze and
Claude
Bernard.

of final causes ; in one word, of all pre-Darwinian Darwinians" (vol. ii. p. 299).

¹ Du Bois-Reymond ('Reden,' vol. ii. p. 557) claims that the greater part of the progress in modern physiology belongs to Germany, in spite of the great talent and originality of Claude Bernard. He thus describes the different position of the three countries : "One branch of physiology especially emanated from Germany—general physics of muscle and nerves. Whereas in England experimental physiology lay fallow, while it moved in France in vivisection and zoochemistry, being held down in both countries by vitalism, German science was the first to advance to the investigation of the surviving organs, especially of the frog, looking upon them as apparatus built up by nature, extremely complicated, yet conceivably only machines." This was spoken in 1880. Since that time a certain change has come over physiological reasoning, notably even in the very centre of the physico-chemical school at Berlin. In 1899 Prof. O. Hertwig warns us of the other extreme,

opposed to the older vitalism, "which would lead us to a one-sided and equally inadequate conception of the vital process . . . which would see in it merely a chemico-physical and mechanical problem, and would recognise the genuine science of nature only so far as it is possible to reduce phenomena to motions, . . . and to subject them to mathematical calculation" ('Die Lehre vom Organismus,' an Address, Jena, p. 8). How far Du Bois-Reymond in later years modified his earlier notions, we can to some extent see from his published addresses. We know that the French school, with Claude Bernard as its most illustrious representative, never fell into the mistake of looking at the living organism as a physico-chemical machine, and we may be inclined to attribute this to a large extent to those experiments on the living organism which were first instituted by Magendie, which, under the hands of Claude Bernard, led to the discovery of the action of the pancreatic juice, of the glycogenic function of the liver, of vaso-motor nerves, and of the effects of poisons :