

the organism a self-stoking and a self-repairing engine, both notable qualities, but there is an even deeper contrast, which has been stated by Dr. Joly in a remarkable paper entitled "The Abundance of Life" (*Proc. Roy. Dublin Soc.*, 1890): "While the transfer of energy into any inanimate material system is attended by effects retardative to the transfer and conducive to dissipation, the transfer of energy into any animate material system is attended by effects conducive to the transfer and retardative of dissipation". Following probably from this we have the great contrast, which admits of no denial, that however perfect the inanimate engine may be in its work and longevity, it never gives rise to other engines, while it is characteristic of the organism that it is reproductive.

Over and over again in the history of biology the doctrine of a special vital force has arisen, held sway for a time, and then disappeared. It arises "Vital Force." as a reaction from the false simplicity of premature solutions, or as a despairing retreat in the face of baffling problems, or as the result of misunderstanding the real aim of science.

The doctrine is an old one, for even if we ignore the speculations of the ancients, it must date at least from Paracelsus and Van Helmont. As it has naturally taken very different forms in different generations, the word "vitalism", so often used, has little definite meaning. There is a sense in which no modern physiologist is a vitalist, since none rejects physico-chemical interpretations as the early French vitalists did; there is a sense in which all modern physiologists are vitalists, since none pretends to know the secret of that particular synthesis which even the simplest of organisms illustrates.

The phrase "vital force" may be used as a general expression for the energies resident in living matter, and may serve to suggest that we do not at present understand them, or how they are related in the unity of the organism. But the phrase was originally used to denote a "hyper-mechanical force", a mystical power, resident in living creatures, and quite different