

becomes molecularly more complex and more unstable. On the other hand, the continually recuperated protoplasm becomes active as a source of energy, and breaks down in a descending series of disruptive chemical changes ending in waste products.

Since physiology attained to precision of statement it has been recognized that there is in life a twofold process of waste and repair, of activity and recuperation, of disruption and construction.

Anabolism
and Kata-
bolism.

One of the first to make this general idea more precise was De Blainville, who described vitality "as a twofold internal movement of composition and decomposition". At a later date, Claude Bernard, who may be called the pioneer of the "protoplasmic movement", distinguished "disassimilating combustion and assimilating synthesis". Of recent years various researches and speculations, especially those of Hering and of Gaskell, have led to yet more precise statements in regard to metabolism, perhaps more precise than the known facts warrant.

Generalizing from his studies on colour sensation, Hering was led to regard all life as an alternation of two kinds of activity, the one tending to storage, construction, or *assimilation* of material, the other tending to explosion, disruption, or *dissimilation*.

"Metabolism", he says, "is, physiologically speaking, the essential distinction between living and dead matter. It signifies the chemical processes in living substance, by which, on the one hand, certain products are excreted as foreign bodies, and either accumulate *in situ*, or pass out into the circulating fluids; while, on the other, there is a simultaneous intake of nutritive matters to form new constituents. This last function is known as *assimilation*; the first may be termed *dissimilation*."

"In distinguishing these functions, we must not fall into the error of regarding them as two intrinsically separate, parallel processes, and the living matter itself as a quiescent mass, used up on one side and replaced on the other. . . . Assimilation and dissimilation must rather be conceived as two closely interwoven processes, which constitute the metabolism (unknown