

idea. Empedocles (495-435), whom Osborn calls "the father of the evolution idea", pictured the gradual origin of diverse forms—first plants and then animals—through the chance play of the combining force of love and the separating force of hate upon the four elements—fire, water, earth, and air. The first forms, being monstrous failures, were eliminated and replaced by more successful though still fortuitous products of Nature's spontaneity. Here we find a glimmering of the idea of the survival of the fittest or natural selection. Democritus (450 B.C.?), famous as an early materialist and perhaps the first comparative anatomist, recognized the general occurrence of fitness, even of single structures and organs, but he does not seem to have had any theory of its origin. He advanced some views in regard to heredity, which are usually spoken of as suggestive of pangenesis. Anaxagoras (500-428), on the other hand, was the founder of teleology, in so far as he began to invoke the aid of intelligent design to separate out and arrange the germs of life which existed from all time in the air or ether.

Even when the pre-Aristotelian philosophers condescended to statements with some direct relation to facts, it is difficult for us at this distance of time to understand how much they really meant. But there is little of this difficulty in regard to Aristotle, who combined in equal excellence the qualities of philosopher and naturalist, and, far ahead of his age, made the transition from guess-work to induction. He held the idea of a gradual progression in nature from the inorganic to the organic, and from one grade of life to another. As to the factors in this progression, he does not seem to have worked out the problem concretely; he refused the suggestion that adaptive structures could be the result of the elimination of the unfit, and believed that "nature produces those things which, being continually moved by a certain principle contained in themselves, arrive at a certain end". He expounded the doctrine of a "perfecting principle" or "physical formal cause" which struggled with the "physical material cause" or matter itself, and worked out a continuous and progressive