

# EVOLUTION, GENETICS AND RECAPITULATION

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## ONTOGENY AND PHYLOGENY

**T**WO facts are of central importance in Biology. *One:* Every living being starts its existence as a single cell, the fertilized egg or zygote. By a series of changes involving division and differentiation, it becomes the adult organism. This is ONTOGENY. *Two:* the species, during the course of its evolution, traces a series of stages in its history beginning with the single-celled animal. This is PHYLOGENY. The striking parallelism between the two,—the history of the individual and the history of the species,—was noticed earlier by several biologists but it was given to Ernst Heinrich Haeckel (1834–1919) to make a comparison and propound a law. The Biogenetic Law or the Theory of Recapitulation states simply and in the fewest of words, 'Ontogeny recapitulates Phylogeny'. Expressed in simple language, 'the embryo in its development retraces its evolutionary path or climbs its family tree from the one-celled ancestor up to the present. The adult stages of ancestral forms are repeated but they are now to be found in the earlier stages of ontogeny'. The embryo of the bird and the mammal show gill slits and these according to Haeckel represent the *adult* fish ancestors in their phylogeny. The zygote was compared to the single celled protozoan ancestor, the blastula to Volvox, the gastrula to Hydra and so on.

Thus was built by Haeckel an edifice of 19th century biology incorporating the remarkable and often incomprehensible phenomena of individual development with the immense data furnished by palaeontology, anatomy and taxonomy as evidences for organic evolution. Charles Darwin's epoch-making book on the Origin of Species had just appeared and the embryologist in Haeckel put the facts of ontogeny into the framework of phylogeny of Darwin.

It was an astounding statement. That the embryos of higher animals record in their development the characters of the *adults* of lower animals and that evolutionary changes are added terminally at the end of development were not only new; they were revolutionary. In Haeckel's own words, "Ontogeny is the short and rapid recapitulation of phylogeny . . . During its own rapid development an individual repeats the most important changes in form evolved by its ancestors during their long and slow palaeontological development" (*Generelle Morphologie der Organismen*,

1866). It was natural and understandable that it evoked a great deal of discussion and criticism.

## HAECKEL AND RECAPITULATION

Haeckel's personal influence was so widespread that his theory found its way into areas far removed from biology. 'Ontogeny recapitulates Phylogeny' came to be an oft-quoted phrase in anthropology, sociology, psycho-analysis, primary education and child development. That the child was closer to the animal and the savage than the adult became acceptable; it became acceptable too that the adults of the lower races of man were like the children of the whites. Haeckel himself believed this and was perhaps one of the earliest apostles of racial purity and supremacy of the white races, which came to assume such hideous manifestations two generations later in Germany. Aggressive and versatile if not profound, domineering and brilliant, Haeckel became a powerful force in the scientific and social scene of 19th century Germany, vanquishing his opponents as much by his ruthlessness as by his evangelic fervour. K. E. Von Baer (1792–1876) stood practically alone to refute Haeckel and argued that the developmental stages of higher organisms display the characters of the embryos of lower organisms (not of the adults) and produced massive evidence against the recapitulation theory. But this was to little avail. Haeckel's enthusiasm and personality prevailed and though his scientific colleagues rejected his theory, the appeal to the general public was so striking that its influence prevailed for a long time. The issue turned into an emotional one and Haeckel became a scientist cast adrift on a sea of metaphysics. Even during his lifetime Haeckel's faith in science waned and as he grew older it gave way to a romantic philosophy. His credibility lost, he was reduced to fulminating against religion, yet unyielding in his belief that his concepts and ideas would finally prevail.

## GENETICS AND RECAPITULATION

While it was possible for Haeckel to browbeat and shout down his opponents during his lifetime, as facts of genetics accumulated, as Mendel's findings became known, Haeckel's original assumptions lost much of their validity. Experimental embryology which arrived on the scene at the same time helped drive away recapitulation from the supreme position which the descriptive embryologist in Haeckel had