

evo-devo.ga

Description

Evolutionary developmental biology (informally, **evo-devo**) is a field of [biological research](#) that compares the [developmental processes](#) of different [organisms](#) to [infer](#) the [ancestral relationships](#) between them and how developmental processes [evolved](#).

The field grew from 19th-century beginnings, where [embryology](#) faced a mystery: [zoologists](#) did not know how [embryonic development](#) was controlled at the [molecular level](#). [Charles Darwin](#) noted that having similar embryos implied common ancestry, but little progress was made until the 1970s. Then, [recombinant DNA](#) technology at last brought embryology together with [molecular genetics](#). A key early discovery was of [homeotic genes](#) that regulate development in a wide range of [eukaryotes](#).

The field is characterised by some key concepts, which took [evolutionary biologists](#) by surprise. One is [deep homology](#), the finding that dissimilar organs such as the eyes of [insects](#), [vertebrates](#) and [cephalopod](#) molluscs, long thought to have evolved separately, are controlled by similar genes such as [pax-6](#), from the [evo-devo gene toolkit](#). These genes are ancient, being [highly conserved](#) among [phyla](#); they generate the patterns in time and space which shape the embryo, and ultimately form the [body plan](#) of the organism. Another is that species do not differ much in their structural genes, such as those coding for [enzymes](#); what does differ is the way that [gene expression is regulated](#) by the toolkit genes. These genes are reused, unchanged, many times in different parts of the embryo and at different stages of development, forming a complex cascade of control, switching other regulatory genes as well as structural genes on and off in a precise pattern. This multiple [pleiotropic](#) reuse explains why these genes are highly conserved, as any change would have many adverse consequences which [natural selection](#) would oppose.

New [morphological](#) features and ultimately new species are produced by variations in the toolkit, either when genes are expressed in a new pattern, or when toolkit genes acquire additional functions. Another possibility is the [Neo-Lamarckian](#) theory that [epigenetic changes](#) are later [consolidated at gene level](#), something that may have been important early in the history of multicellular life.

Category

1. External Domains

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