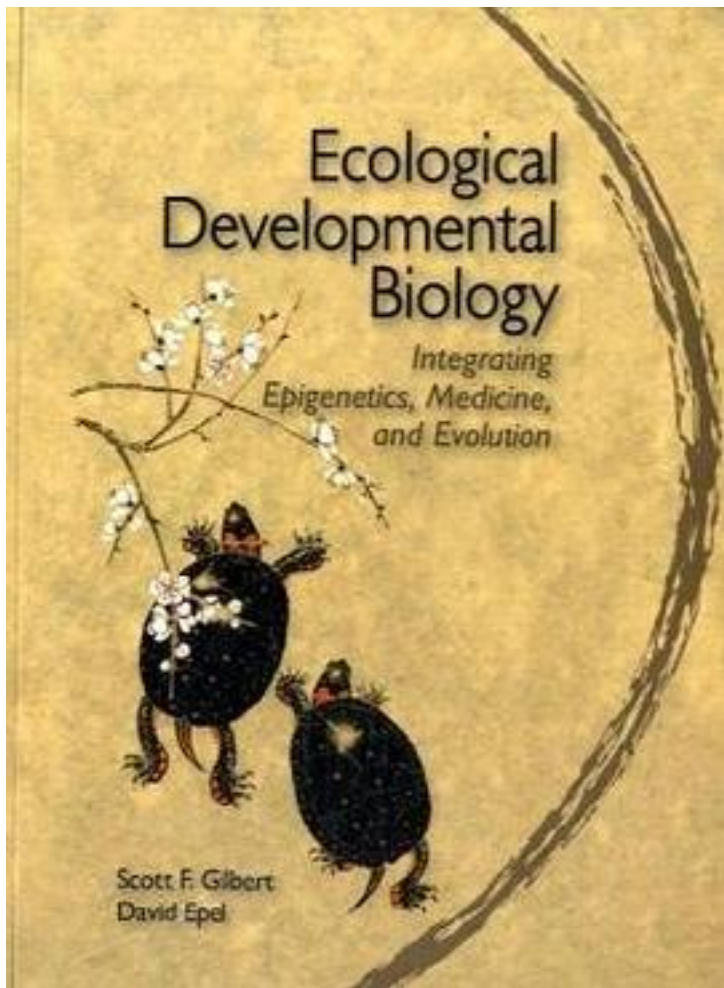


Ecological Developmental Biology



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When the molecular processes of epigenetics meet the ecological processes of phenotypic plasticity, the result is a revolutionary new field: ecological developmental

biology, or “eco-devo.” This new science studies development in the “real world” of predators, pathogens, competitors, symbionts, toxic compounds, temperature changes, and nutritional differences. These environmental agents can result in changes to an individual’s phenotype, often implemented when signals from the environment elicit epigenetic changes in gene expression. Ecological developmental biology is a truly integrative biology, detailing the interactions between developing organisms and their environmental contexts.

Ecological developmental biology also provides a systems approach to the study of pathology, integrating the studies of diabetes, cancers, obesity, and the aging syndrome into the framework of an ecologically sensitive developmental biology. It looks at examples where the environment provides expected cues for normal development and where the organism develops improperly without such cues. Data from research on teratology, endocrine disruptors, and microbial symbioses, when integrated into a developmental context, may have enormous implications for human health as well as the overall health of Earth’s ecosystems.

The study of epigenetics—changes in gene expression that are not the result of changes in a gene’s DNA sequence—has recently provided startling insights not only into mechanisms of development, but also into the mechanisms and processes of evolution. The notion that epialleles (changes in chromosome structure that alter gene expression) can be induced by environmental agents and transmitted across generations has altered our notions of evolution, as have new experiments documenting the genetic fixation of environmentally induced changes in development. The widespread use of symbiosis in development provides new targets for natural selection. Ecological developmental biology integrates these new ideas into an extended evolutionary synthesis that retains and enriches the notion of evolution by natural selection.

作者介绍:

Scott F. Gilbert, the Howard A. Schneiderman Professor of Biology at Swarthmore College, teaches developmental biology, developmental genetics, and the history of biology. After receiving his B.A. from Wesleyan University, he pursued his graduate and postdoctoral research at The Johns Hopkins University and the University of Wisconsin. Dr. Gilbert is the recipient of several awards, including the first Viktor Hamburger Award for excellence in developmental biology education, the 2004 Alexander Kowalevsky Prize for evolutionary developmental biology, an honorary degree from the University of Helsinki, and the Medal of François I from the Collège de France. He is a Fellow of the American Association for the Advancement of Science, and a corresponding member of the St. Petersburg Society of Naturalists. His research is sponsored by the National Science Foundation and involves the developmental genetic mechanisms by which the turtle forms its shell.

David Epel, the Jane and Marshall Steel Jr. Professor of Biological Sciences at Stanford University’s Hopkins Marine Station, did his undergraduate studies at Wayne University and then graduate and postdoctoral studies at the University of California, Berkeley and the University of Pennsylvania. Dr. Epel has been a Guggenheim Fellow, is a Fellow of the American Association for the Advancement of Science, the California Academy of Sciences, and an Overseas Fellow of Churchill College and Life Fellow of Clare Hall at the University of Cambridge. His honors include the Cox Medal for Fostering Undergraduate Research at Stanford and the Ed Ricketts Memorial Award for Lifetime Achievement in the Marine Sciences. Epel’s research focuses on the

activation of the egg at fertilization, the unique physiology of the embryo, and developing web sites and curricula highlighting early development of the sea urchin embryo to capture the imagination and interest of high school students.

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