

AMERICAN Scientist

BOOK REVIEW

Development in the Real World

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ECOLOGICAL DEVELOPMENTAL BIOLOGY: Integrating Epigenetics, Medicine, and Evolution. Scott F. Gilbert and David Epel. xvi + 480 pp. Sinauer Associates, Inc., 2009. \$49.95 paper.

What constitutes a new field in science? Must it be the consequence of a new synthesis? Does it need to take research in a new direction based on new ideas or new techniques? Or is it something that we recognize after the fact as a paradigm change? If we take these to be the criteria, then ecological developmental biology certainly qualifies as a new field, for it fulfills them all.

Anyone wanting to learn more about “eco devo” would do well to read Scott F. Gilbert and David Epel’s recent magnum opus, *Ecological Developmental Biology: Integrating Epigenetics, Medicine, and Evolution*. The same applies for those who may have been wondering what the currently emphasized “new biology” is all about. The new paradigm for biology in the 21st century is integration—of the various subfields of biology, and of biology with other fields, including physics, chemistry, geology, the social sciences and the humanities—and the goal is to understand the complexity of living systems and their dynamic nature. Several scientists interested in integration have been writing discourses on why it is important and how it can be facilitated. But Gilbert and Epel have chosen to leapfrog that discursive step to produce a compelling portrait of the new biology in action.

The authors have two goals for the book: to offer a “fresh and challenging way of looking at biology,” so that a different set of questions can be asked, and to show how ecological developmental biology is needed to diagnose and potentially help cure many of the problems of our planet. They emphasize four “revolutions” that are currently under way in biology: Inheritance has been shown to involve the transmission of gene expression patterns as well as gene nucleotide sequences; developmental and ecological explanations for human diseases are being found; phenotypic plasticity is being recognized as a “driving force” in the development and organization of biodiversity; and there is a new focus on analyzing relationships within networks of interaction. The book demonstrates that ecological developmental biology is significant in all four of these trends. Gilbert and Epel hope that by showing how to use the many facets of development to integrate disparate disciplines, the book will stimulate new research.

Of course, development in nature can differ in important ways from development in a controlled laboratory environment. Research on development in *Drosophila* and in mouse models, despite having been enormously productive, has not lent itself to a synthetic approach, because it takes place in laboratories, where the environment is considered constant and consequently unimportant. Integrating reductionistic laboratory research with experimental and observational research done in the field can be enlightening, and the book supplies a wealth of examples showing that many scientists have been doing



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