

Gilbert's Seventh Hits All the Right Notes: A Synthesis for Everyone

DEVELOPMENTAL BIOLOGY, SEVENTH EDITION

by S.F. Gilbert

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"Biology, like any other science, does not deal with facts, but with evidence," states Scott Gilbert in the 7th incarnation of his textbook *Developmental Biology*. And the evidence is in that he consistently achieves outstanding results. As with previous editions, Gilbert proves that *Developmental Biology* is up-to-date, informative, highly readable, and comprehensive in its scope, yet remains useful as an undergraduate textbook.

A DISTINCTIVE APPROACH

Developmental Biology stands out from the field of developmental biology texts. First, Gilbert's volume adheres tightly to his principle that science is a process that deals with evidence. From the beginning, he defines and applies the rules of evidence; he describes morphologic observations and background information followed by the experimental evidence for the mechanisms, models, and theories currently proposed for developmental events.

Another feature that sets *Developmental Biology* apart from other texts is its comprehensive scope. This means that the text can be a supplement for people already familiar

with the field or a resource for biologists whose primary area of interest may be elsewhere. The currency, clarity, and breadth of *Developmental Biology* make it an excellent resource, either as a reference or a textbook.

In addition to its strengths in presenting the experimental basis for developmental biology, *Developmental Biology* provides the instructor with flexibility. After covering basic principles, the comprehensive coverage of the book permits the instructor to pick and choose topics. Because most instructors have a favorite organism, choice of topics should be straightforward. This is made easier still because most of the chapters can stand alone; likewise, even partial chapters can be used to illustrate a point. A solid background in genetics and cell biology is required to understand development. Therefore, it is probably better to use Gilbert's text with upper-level undergraduates, who will be better prepared. Indeed, for the upper-level student, the chapter about basic principles provides a new context within which to place their previous studies in genetics and cellular biology. Finally, because it is experimental in focus, this text can act as a portal from fact-based class work to process-oriented investigative science, as well as act as a gateway into student research projects.

CHANGES IN THE NEW EDITION

What are the differences between the 6th and 7th editions? Although the underlying organization has remained the same, all of the chapters have been brought up to date with new references and supporting material. A few chapters stand out due to major revisions. Because most textbooks cannot expand indefinitely, some content has also been reduced or removed.

Part I deals primarily with principles, concepts, and tools. Although *Entwicklungsmechanik* ruled the field for years, current emphasis is on genetic and epigenetic control of cell behavior and cell fate, leading to pattern formation and morphogenesis. Thus, the reader is given a summary overview of genetic and cell biological analysis of development. This section received the least revision, as the basic principles and concepts have changed little. Additional updates include clear explanations of current investigative techniques such as gene targeting, conditional mutagenesis or "floxed" genes, microarrays, and antisense analysis including morpholino and RNA interference technology.

Part II deals with early events such as fertilization, cleavage, and axis formation in various embryos. There is additional information about the terminal system during axis specification in *Drosophila*. Discussion of specification of blastomeres in inver-

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tebrates is bolstered by new material on the role of β -catenin in sea urchins, Macho-1 in ascidians, and the MAP kinase pathway in molluscs. The vertebrate chapters contain more information about convergent extension mechanisms, the role of Wnts and their inhibitors in antero-posterior patterning events, and the players setting up left-right asymmetry. This section also provides an in-depth treatment of zebrafish as a model organism, including a description of screening tools for forward genetic analysis.

Part III describes subsequent events in the differentiation of the germ layers. Each of these chapters has new material, as the quantity of information about the specifics of differentiation and patterning events has exploded in the past few years. Most have been expanded, reorganized, or rewritten; among these are the chapters that include heart formation, axonal targeting, and regeneration. Perhaps most noteworthy, the chapter on the tetrapod limb has been completely rewritten. In a fair and balanced treatment, it presents recent experimental data on digit specification and proximodistal compartments in the context of both new and old models. Similarly, new ideas are explained about how patterning along the anterior-posterior axis is controlled, especially in the autopod.

Part IV extends the scope of traditional developmental biology classes and will probably capture the interest and imagination of students because of its relevance to current events. A new chapter on "Medical Implications of Developmental Biology" addresses issues that make the headlines. This chapter provides a synthesis of many new breakthroughs; it is useful not just for developmental biology classes but also for general biology classes. If Sinauer Associates, Inc., would make the "Medical Implications of Developmental Biology" chapter freely available on their Web site, it would be a helpful service to the community, and the publisher may attract additional text adoptions. Within this chapter are clear explanations of basic techniques and concepts such as in vitro fertilization,

identification of genetic errors, and environmental effects on development. This chapter also provides a forum for discussion of ethical issues that result from our knowledge of and ability to manipulate both genes and embryos.

The next chapter, "Environmental Regulation of Animal Development," addresses many of the natural and man-made environmental influences on development. The inclusion of a chapter on plant development in this section likewise extends the traditional scope of many developmental biology texts. New information on leaf patterning includes adaxial (stem side) and abaxial patterning genes, along with more information on leaf morphogenesis. This chapter may serve to illustrate the differences between plants and animals more than their similarities. Finally, there is a chapter on "Developmental Mechanisms of Evolutionary Change," a synthesis that seeks "to explain the origin of both species and higher taxa." In this chapter, some of the evolutionary evidence from comparative genomics and functional analysis is presented. All in all, this final section presents a novel synthesis as it gathers together topics that had been dispersed in previous editions. It provides entry to territory unexplored by most other developmental textbooks or courses.

ADDITIONAL RESOURCES

The 7th edition has many new illustrations. The drawings and diagrams are more colorful than in past editions. Prominent among these are the many beautiful photographs of embryos, especially color photographs of whole-mount in situ and immunostained embryos. Here too the photographic panoply of phenotypes that illustrate the "raw data" of development speaks volumes. These examples not only capture students' interest but also illustrate why someone would want to make the study of developmental biology their life's work.

On the negative side, one resource the text lacks is a separate glossary, although bold face type in the index indicates where definitions can be found. Perhaps a glossary

could enhance the 8th edition or the Web site.

The text has its own Web site at <http://www.devbio.com> that is publicly accessible. Here, Gilbert has deposited supplemental material, including readings for students who want to delve more deeply into specific topics and material for bioethics discussions.

*Vade Mecum*² by Tyler and Kozlowski, is the 2nd edition of a CD-ROM supplement that can be packaged with the text. It contains beautiful and well-explained time-lapse videos of the major animal models used in developmental biology laboratories. Furthermore, *Vade Mecum*² now incorporates the laboratory manual *Developmental Biology: A Guide for Experimental Study*.

In summary, there is ample evidence that it was time for the 7th edition of *Developmental Biology*. The field of development is moving quickly, so that new experimental evidence either supports our understanding or forces us to revise our thinking. For everyone teaching developmental biology, it is challenging to keep abreast of all of the changes. A current and comprehensive text makes the job easier. Gilbert's *Developmental Biology* meets this need. It is noteworthy that Gilbert's approach is to avoid the dogmatic stance; it really is about the evidence, with the result that his textbook has great flexibility for classroom use. This approach also permits the instructor to teach science as it really is: a work in progress.

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