Preface

Essentials of Genetics is designed for courses requiring a text that is shorter and more basic than its more comprehensive companion, *Concepts of Genetics*. While coverage is still thorough and of high quality, *Essentials* is written to be more accessible to students with less background in biology and chemistry. While it will serve well courses offered to biology majors early in their undergraduate careers, it will also be useful in courses populated by a mixture of majors who are pursuing careers in agriculture, forestry, wildlife management, chemistry, psychology, etc. Because the text is shorter than many other available books, *Essentials of Genetics* will be more manageable in courses of both one-quarter and one-semester length.

Goals

Although *Essentials of Genetics* is almost 300 pages shorter than its companion volume, our goals are the same for both books. Specifically, we have sought to

- Emphasize concepts rather than excess detail
- Write clearly and directly to the students of genetics in order to provide straightforward explanations of complex, analytical topics
- Establish a careful organization within and between chapters
- Maintain constant emphasis on scientific analysis as the means to illustrate how we know what we know
- Propagate the rich history of genetics that so beautifully illustrates how information is acquired and extended within a discipline as it develops and grows
- Design inviting, pedagogically sound full-color figures supplemented by equally useful photographs to support the textual material

These goals serve as the cornerstones of this text. Providing such a pedagogic foundation allows *Essentials of Genetics* to accommodate courses with many different organizational approaches and lecture formats. Chapters are written to be as independent of one another as possible, allowing instructors to utilize them in various sequences. We believe that by combining these various approaches, we have created a text that provides optimal support for students as they study genetics.

Features of the Third Edition

- Length—a more manageable, streamlined text of 515 pages apportioned into 22 chapters.
- Revised Organization—an improved chapter sequence designed to provide a smooth flow of topics from start to finish, including a cohesive sequence of chapters centering on the genetic role of DNA, its structure, replication, expression, and regulation.
- New Chapters—the Recombinant DNA chapter of the second edition has been replaced by two new chapters: *DNA Biotechnology-Techniques and Analysis* and *DNA Biotechnology-Applications and Ethics* in order to provide thorough, modern coverage of this contemporary topic
- Redesign of the Entire Art Program—to further improve its pedagogic value.
- New Photographs—many new images that supplement the beautiful art program, often linked directly to a topic illustrated in a figure.
- Inclusion of Emerging Topics—extensive coverage of cutting edge subjects, including the genetic involvement in cancer, the genetic basis of immunology, and the genetic control of development and behavior.
- Modernization of Topics—to remain current in areas that are at the forefront of genetic studies, coverage of human genetics has been updated throughout the text, particularly where the Human Genome Project has impacted on our knowledge of our own species. Additionally, more extensive information has been provided on the more specific topics including cell cycle regulation, genomic imprinting, genetic anticipation, gene therapy, diagnosis of human genetic disorders, trinucleotide repeat mutations, and RNA editing.
- New "Genetics, Technology, and Society" Essays—to introduce relevant and sometimes controversial topics where advances in the technology of genetics interfaces with society. Among others, topics such as the creation of edible vaccines, the use of DNA analysis to establish the fate of Tsar Nicholas II and his family, the link between prions and Mad Cow disease, the impact of radiation produced at Chernobyl, the use of antisense RNAs as therapeutic agents, and telomeres and aging are presented.
- Emphasis on Problem Solving—by including both the "Insights and Solutions" feature as an aid to obtaining solutions to problems and the extensive "Problems and Discussion Questions" section in each chapter.

Emphasis on Concepts

As in its companion volume, *Essentials of Genetics* continues to emphasize the conceptual framework of this

discipline. The concepts derived from each major topic represent those ideas and information that students take with them once the course is completed. To aid the student in identifying the conceptual aspects of a major topic, each chapter begins with a section called "Chapter Concepts," which in a few sentences captures the essence of the most important ideas about to be presented. Then, each chapter ends with a Chapter Summary, which enumerates the five to ten key points that have been established. These two sections help to ensure that the text emphasizes concepts rather than detail. Reinforcing examples and carefully designed figures have been selected to support this approach.

Insights and Solutions

Genetics, more than any other discipline within biology, lends itself to problem solving and analytical thinking. At the end of each chapter, we have included the popular and successful section "Insights and Solutions," first developed in *Concepts of Genetics*. In this section, we stress:

Problem solving
Quantitative analysis
Analytical thinking
Experimental rationale

Problems or questions are posed, and detailed solutions or answers are provided. This section is designed to prime the students as they move on to the "Problems and Discussion Questions" section concluding each chapter.

Problems and Discussion Questions

Following the "Insight and Solutions" section in each chapter, an extensive collection of problems and discussion questions are presented. These represent various levels of difficulty, with the most challenging appearing at the end of each section. In this section, we have attempted to optimize the opportunities for student growth in the important area of problem solving and analytical thinking skills. Brief answers to half the problems are in Appendix A. For those faculty wishing to expose their students to detailed answers to all problems and questions, the Student's Handbook is available (see supplements section).

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