

Preface

Students' curiosity about genetics is refreshed by almost daily reports in the media of new discoveries related to genetic differences in drug responses, genetic risk factors for disease, and genetic evidence for human origins and history. They are also intrigued by ethical controversies related to genetics: Should genetic manipulation be used on patients for the treatment of disease? Should human fetuses be used in research? Should human beings be cloned? What are the biological and ethical implications of gene editing? And there are social controversies: Should there be laws governing genetic privacy? Who should have access to genetic testing records, and for what purpose? What is the proper role of direct-to-consumer genotyping services?

The teacher of genetics, in turn, faces myriad challenges:

- Sustaining students' enthusiasm about this topic
- Motivating their desire to understand the principles of genetics in a comprehensive and rigorous way
- Guiding students in gaining an understanding that genetics is not only a set of principles but also an experimental approach to solving a wide range of biological problems
- Helping students learn to think about genetic problems and about the wider social and ethical issues arising from genetics and genomics

Genetics: Analysis of Genes and Genomes, Ninth Edition, addresses these challenges while emphasizing the beauty, logical clarity, and unity of the subject. Our pedagogical approach is to treat transmission genetics, molecular genetics, and evolutionary genetics as fully integrated subjects. This integration appeals to most modern geneticists, who recognize that the distinctions between the subfields are artificial. The chapters in this text have been arranged into five sections: an overall introduction to genes and genetic analysis, transmission genetics, the organization and replication of DNA, gene expression and regulation, and evolutionary genetics. Recognizing that these topics can be organized in many

ways, we have sought to make it possible for individual instructors to customize the order in which they are presented.

Our aim is to provide a clear, comprehensive, rigorous, and balanced introduction to genetics and genomics at the college level. We believe that a good course should maintain the right balance between two important aspects of genetics: (1) genetics as a body of knowledge pertaining to genetic transmission, function, and mutation; and (2) genetics as an experimental approach, or a kit of "tools," for the study of biological processes such as development or behavior. Any student claiming a knowledge of genetics must achieve the following milestones:

- Understand the basic processes of gene transmission, mutation, expression, and regulation
- Be familiar with the principal experimental methods that geneticists and molecular biologists use in their studies, and recognize the advantages and limitations of these approaches
- Think like a geneticist at the elementary level of being able to formulate genetic hypotheses, work out their consequences, and test the results against observed data
- State genetic principles in his or her own words and recognize the key terms of genetics in context
- Solve problems of several types, including single-concept exercises that require application of definitions or the basic principles of genetics, problems in genetic analysis in which several concepts must be applied in logical order, and problems in quantitative analysis that call for some numerical calculation
- Gain some sense of the social and historical context in which genetics and genomics has developed and is continuing to develop
- Acquire a basic familiarity with the genetic resources and information that are available through the Internet