Preface

Best practice in modern science teaching makes use of explicit **learning objectives** and **science competencies,** which lay out as clearly as possible what students should know, understand, and be able to do. Learning objectives and science competencies help guide students to identify key concepts and use them at a variety of learning levels including comprehension, application, analysis, and synthesis. Each chapter of ***Genetics: Analysis of Genes and Genomes, Eighth Edition***, begins with a list of its learning objectives and science competencies. These serve the student as an initial orientation when studying the chapter for the first time and as a guide when reviewing the material afterward.

Genetics and genomics are ideal subjects for this approach because many students are already interested and engaged. Their curiosity is refreshed by almost daily reports in the media of new discoveries on genetic differences in drug responses, genetic risk factors for disease, and genetic evidence for human origins and history. There are also ethical controversies. Should genetic manipulation be used on patients for the treatment of disease? Should human fetuses be used in research? Should human beings be cloned? And there are social controversies. Should there be laws governing genetic privacy? Who should have access to genetic testing records, and for what purpose?

For the teacher of genetics, the challenges are

- To sustain the students' enthusiasm;
- To motivate a desire to understand the principles of genetics in a comprehensive and rigorous way;
- To guide 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; and
- To help 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, Eighth Edition, addresses these challenges while showing 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 appeals to most modern geneticists, who recognize that the distinctions between the subfields are artificial. The chapters have been arranged to match the organization of the overwhelming majority of college courses in genetics, including our own.

Our aim has been 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. The first aspect is that genetics is a body of knowledge pertaining to genetic transmission, function, and mutation; the second is that genetics is an experimental approach, or a kit of "tools," for the study of biological processes such as development or behavior. The rationale of the book is that any student claiming a knowledge of genetics must

- 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; and
- Acquire a basic familiarity with the genetic resources and information that are available through the Internet.