

Preface

The living world is incredibly diverse: there are more than two million species, from lowly bacteria to orchids, sequoias, iguanas, and humans. The stupendous diversity conceals remarkable unity, for all organisms use similar nucleic acids as carriers of hereditary information, perform vital functions by means of enzymes made up of the same twenty amino acids, use the same genetic code, and have identically organized membranes. The diversity as well as the unity of life are the result of the evolutionary process. There is unity because all organisms are genetically continuous, derived from the same ancestors. The differences reflect adaptation to different conditions of life, different places, and different history. The aphorism uttered by the eminent geneticist Theodosius Dobzhansky is correct: "Nothing in biology makes sense except in the light of evolution."

Hereditary continuity and change underlie the evolutionary process. *Population and Evolutionary Genetics: A Primer* introduces the concepts and theories that account for the evolutionary process at the genetic level. These should be of interest to all biologists; not only to students of the process of evolution itself, but also to ecologists, physiologists, anthropologists, and paleontologists.

The *Primer* is an elementary treatment of population and evolutionary genetics. The required concepts of general genetics are reviewed in Chapter 1. The mathematics have been kept to a minimum and can be understood with knowledge of high school algebra. Yet, the *Primer* covers not only the classical principles of population genetics, but proceeds into the exciting new field of molecular evolution. Indeed, during the last decade the most significant advances in the understanding of evolution have come about through the study of DNA and proteins—the information-laden macromolecules of life.

Chapters 2 and 7 deal with molecular evolution; they can be understood without previous knowledge of biochemistry.

The *Primer* may serve as text for elementary courses in population genetics, but it can be useful as supplementary reading in other courses, such as evolution, genetics, ecology, paleontology, population biology, anthropology, and behavioral biology. The style is clear and all fundamental principles are illustrated with examples. The text is, thus, comprehensible even when the material has not been covered in lecture.

Special Features

- The book is generously illustrated to enhance the clarity of the text.
- Examples and empirical data are used to illustrate and support all major concepts.
- About a dozen special topics of various kinds are set apart as "boxes," which can be skipped without loss of comprehension of the text.
- The principles of quantitative inheritance are included in Chapter 6.
- The problems at the end of the chapters are an integral part of the book; some contain new information considered subsidiary or too detailed to be included in the text proper. The answers to the problems are given at the end of the book.
- Students who have not taken a course in statistics will find in the appendix the concepts and methods needed to understand the text and solve the problems.
- A glossary is provided as an aid in reviewing both new and familiar concepts.
- The bibliography lists basic references that document the material covered in the text; the credit lines for figures and tables are additional sources of information.

Acknowledgments

This book is indebted in a most fundamental way to all scientists whose brilliant efforts have produced the body of theory and empirical information that make up the exciting fields of population and

evolutionary genetics. Special thanks are due to those who gave permission to reproduce illustrations and data, and to those who reviewed the text (see list below). The reviewers' comments have greatly contributed to enhance clarity and reduce errors.

I thank my collaborators who assisted in the preparation of the text, with typing, proofreading, and indexing: Lorraine Barr, David Friedman, Candy Miller, and Elizabeth Toftner. Bonnie Garmus has been an effective and always cheerful editor. Jim Behnke, biology editor of Benjamin/Cummings, is not only a distinguished exemplar of professionalism in the publishing industry, but also a cherished friend. The contributions of Fred Raab, as manuscript editor, and Georg Klatt, as illustrator, to *Modern Genetics* persist in the present book; I appreciatively acknowledge their dedication and skill.

Readers familiar with *Modern Genetics* by F. J. Ayala and J. A. Kiger, will recognize that most of the text and illustrations of this *Primer* are reproduced from that book. Chapters 2 to 5 of the *Primer* correspond almost exactly to Chapters 18 to 22 of *Modern Genetics*, and Chapter 6 incorporates about two-thirds of Chapter 15. Chapter 1 has been newly prepared, but it uses materials from diverse chapters of the earlier book.

I owe special thanks to John Kiger, co-author of *Modern Genetics*, for allowing me to use the lion's share of my contribution from our collaborative enterprise in the *Primer*. I value our friendship and have the highest admiration for his uncompromisingly rigorous approach to the teaching of genetics.

Francisco J. Ayala
Davis, California

List of Reviewers

James P. Collins, Arizona State University
David C. Culver, Northwestern University
Yun-Tzu-Kiang, University of New Hampshire
Roger Milkman, University of Iowa
Jeffrey B. Mitton, University of Colorado
Henry E. Schaffer, North Carolina State University