
PREFACE

I have been teaching population genetics for 30 years, and during that time the importance and centrality of this field to modern biology have increased dramatically. Population genetics has always played a central role in evolutionary biology as it deals with the mechanisms by which evolution occurs within populations and species, the ultimate basis of all evolutionary change. However, as molecular genetics matured into genomics, population genetics was transformed from a discipline receiving new techniques from molecular genetics into a discipline providing the basic analytical methods for many aspects of genomics. Moreover, an increasing number of students are interested in the problems of species extinction and of environmental degradation and change. Population genetics offers many basic tools for conservation biology as well. As a result, the audience for population genetics has increased substantially, and I have witnessed a sixfold increase in the enrollment in my population genetics course over the past several years. This book is written with this expanded audience in mind. Many examples are given from conservation biology, human genetics, and genetic epidemiology, yet the focus of this book remains on the basic microevolutionary mechanisms and how they interact to create evolutionary change. This book is intended to provide a solid basis in population genetics both for those students primarily interested in evolutionary biology and genetics as well as for those students primarily interested in applying the tools of population genetics, particularly in the areas of conservation biology, human genetics, and genomics. Without a solid foundation in population genetics, the analytical tools emerging from population genetics will frequently be misapplied and incorrect interpretations can be made. This book is designed to provide that foundation both for future population and evolutionary geneticists and for those who will be applying population genetic concepts and techniques to other areas.

One theme throughout this book is that many important biological phenomena emerge from the interactions of two or more factors. As a consequence, evolution must be viewed with a multidimensional perspective, and it is insufficient to examine each evolutionary force one by one. Two highly influential mentors strengthened this theme in my work: Charles Sing and Hampton Carson. Charlie was my Ph.D. advisor and continues to be a mentor, collaborator, and friend. Charlie always stressed the importance of interactions in biology and genetics, and he was and is concerned with the "big picture" questions. I cannot thank Charlie enough for his continuing intellectual challenges and for his friendship.

Hamp Carson also stressed the importance of interacting forces in evolution and genetics. Hamp was both my undergraduate research mentor and my postdoctoral advisor, as well as a long-time collaborator and friend. Hamp died at the age of 91 as this book was nearing completion. He lived a full and highly productive life, and I dedicate this book in his memory to honor his life and accomplishments.

Many of my graduate students, both current and former, contributed significantly to this book. Indeed, the impetus for writing this book came largely from two former graduate students, Delbert Hutchison and Keri Shingleton. When Delbert and Keri were at Washington University as graduate students, they also served as teaching assistants in my population genetics course. My lectures did not follow any of the existing textbooks, so first Delbert, and then Keri, wrote out detailed lecture notes to help the students. These notes also formed the backbone of this book, and both Delbert and Keri strongly urged me to take their notes and transform them into a book. This is the book that resulted from that transformation.

Many of my graduate students read drafts of the chapters and offered many suggestions that were incorporated into the book. I thank the following graduate students for their valuable input: Corey Anderson, Jennifer Brisson, Nicholas Griffin, Jon Hess, Keoni Kauwe, Rosemarie Koch, Melissa Kramer, Taylor Maxwell, Jennifer Neuwald, James Robertson, and Jared Strasburg. In addition, many of my former graduate students and colleagues read drafts of this book and often used these drafts in teaching their own courses in population genetics. They also provided me with excellent feedback, both from themselves and from their students, so I wish to thank Reinaldo Alves de Brito, Keith Crandall, Delbert Hutchison, J. Spencer Johnston, and Eric Routman. I also want to thank three anonymous reviewers for their comments and suggestions on the first six chapters of this book. Finally, I used drafts of this book as my text in my population genetics class at Washington University. Many of the students in this class, both graduate and undergraduate, provided me with valuable feedback, and I thank them for their help.

Over the years, I have witnessed a sixfold increase in the enrollment in my population genetics course over the past several years. This book is written with the expanded audience in mind. Many examples are given from conservation biology, human genetics, and ecology, yet the focus of this book remains on the basic principles of population genetics. I hope this book will be useful to those students primarily interested in evolutionary biology and genetics as well as to those students primarily interested in applying the tools of population genetics to the study of conservation biology, human genetics, and genomics. Without a solid foundation in population genetics, the analysis of data from population genetics will frequently be misapplied and incorrect interpretations can be made. This book is designed to provide that foundation both for future population and evolutionary geneticists and for those who will be applying population genetic concepts and techniques to other areas.

One theme throughout this book is that many important biological phenomena emerge from the interactions of two or more factors. As a consequence, evolution must be viewed with a multidimensional perspective, and it is insufficient to examine each evolutionary force on its own. Two highly influential mentors strengthened this theme in my work: Charles Seng and Hampton Carson. Charles was my Ph.D. advisor and continues to be a mentor, collaborator, and friend. Charlie always stressed the importance of interactions in biology and genetics, and he was and is concerned with the "big picture" questions. I cannot thank Charlie enough for his continuing intellectual challenges and for his friendship. Hampton also stressed the importance of interacting forces in evolution and genetics. Hampton was both my undergraduate research mentor and my postdoctoral advisor, as well as a long-time collaborator and friend. Hampton died at the age of 91 as this book was nearing completion. He lived a full and highly productive life, and I dedicate this book in his memory to honor his life and accomplishments.