Preface

This book is a intended mainly for biologists. It assumes that the reader is familiar with the basic facts of biology, including population and evolutionary biology, as for example can be obtained by pursuing an undergraduate degree in the subject. It also assumes that the reader is motivated to understand variation in the biological world. The aim of the book is to bring to the reader the beginnings of a mathematical understanding of coalescent theory, which is a collection of stochastic models used to generate predictions about patterns of genetic variation and to make inferences from samples of genetic data. After a brief introductory chapter, the book dives right into the mathematics at a level which is hoped to facilitate learning. However, a certain amount of prior mathematical training is necessary. In addition to the usual college-level general mathematics courses, including calculus, some exposure to probability theory and statistics is highly recommended. Readers who find the material in Section 2.1.1 completely unfamiliar will struggle. However, anyone who one masters the material in this book will be able to read papers in the primary literature with some confidence, and also be in a position to carry out some independent research using coalescent theory.

It is also hoped that the book will be of interest to mathematicians who wish to see how one branch of applied probability theory plays out in a biological setting. The material in chapter 1 will provide some biological background, but readers may wish to consult an introductory textbook on genetics. It is hoped that this book can foster communication between mathematics and biology, and between mathematicians and biologists.

A number of have made this book far better than it would have been had I been left to myself. Rick Durrett, Marc Feldman, Joe Felsenstein, Dick Hudson, Ben Kerr, and Claudia Neuhauser reveiwed portions of the manuscript. A number of useful informal comments came from graduate students and post-docs who read earlier versions of the book: Guillaume Achaz, Flavia Fuchs de Jesus, Alex Lancaster, John Novembre, Owen Solberg, and Taesung Kim. All errors and shortcomings that remain are my own. This writing of this book was supported by a Presidential Early Career Award for Scientists and Engineers (NSF grant DEB-013760), and would not have been possible without the generous support of the Radcliffe Institute for Advanced Study.

John Wakeley

Cambridge, Massachussets

November 22, 2004