
Preface

Evolution's tempo and mode shapes our understanding of life's fundamental processes and systems. From early discussions between Charles Darwin and Alfred Wallace about the pace of species change to present-day concerns about the transmission of drug-resistant superbugs, biologists have tried to characterize the evolutionary dynamics of genetic systems. A range of theories on rates of evolution—from static to gradual to punctuated to quantum—have mostly been drawn by comparing morphological changes over geological timescales as described in the fossil record. However, new paleontological, experimental, molecular, and genomic investigations have injected a tremendous amount of new data, fresh perspectives, and excitement, offering valuable insights on the rates of evolutionary change, particularly in those fast evolving genetic systems.

This book attempts to capture these recent exciting developments by bringing together information from morphological, molecular, cellular, developmental, and genetic investigations of both natural and experimental populations across a diversity of life forms. An emerging theme among the

27 chapters is that while the rate of evolution can vary significantly, rapid changes are commonly observed. Furthermore, they play extremely important roles in adaptation, speciation, and the generation and maintenance of a diversity of biological traits and properties.

The aim of this book is to not only provide case studies that exemplify rapid evolution but to also showcase the diversity of rapidly evolving genes and genetic systems. Together, these chapters shed light on the rapid rate of evolution at the genetic, genomic, and phenotypic levels that span a diversity of timescales: from a few days in laboratory experimental populations to tens of millions of years on geological timescales. While rates of evolutionary change have been treated in various books and chapters in the post-Modern Synthesis era, to the best of our knowledge this is the first book of its kind in terms of its comprehensive coverage, breadth of genetic mechanisms, and relevant evolutionary processes and case histories. We believe that this book is timely and we hope it will continue to evolve as more and more data and theory gather.

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