

PREFACE

Available in four editions, the first in 1990, the fourth in 2008, *Strickberger's Evolution* has consistently remained abreast of the latest discoveries and approaches to the study of biological evolution and the science of evolutionary biology. The fourth edition incorporated the then fast developing fields of evolutionary developmental biology, paleobiology, and evolutionary ecology. In addition, insights from sequencing entire genomes and the increasing application of bioinformatic tools, cladistic analyses, and systems approaches to the study of organisms made their appearance. This, the fifth edition, continues the tradition of incorporating the latest discoveries concerning evolution. Additionally, this edition has all illustrations and figures in four colors, substantially enhancing the visual learning aspect of the book.

Many strands of evolutionary thought are old and have endured since 1858 when Charles Darwin was writing *On the Origin of Species*. Essential to our understanding of evolution is that groups of organisms are bound together by their common inheritance; that the past has been long enough for inherited changes to accumulate; and perhaps most essential of all, that discoverable biological processes and natural relationships among organisms explain the reality of evolution. Although each of these aspects had been studied and discussed at various times in human history, only after the mid-nineteenth century when Charles Darwin developed his theory of evolution by natural selection was biological evolution recognized as the science of life.

The central aim of the science of evolutionary biology is to explain the origins and diversity of life. The properties of different organisms—the organization and function of their component parts—are explained within the context of their organismal histories, which include adaptations to specific lifestyles at particular times. When historical conditions are repeated, and different organisms are subjected to similar selective evolutionary forces, some common features can be predicted; geographically widely separated populations and species, such as fish adapted to cave conditions, consistently show rudimentary eyes, enhanced development of chemosensory organs, and loss of pigment, among other common attributes. Other evolutionary changes are contingent on past history and environments, for example, the evolution of flight among reptiles and not among frogs or most mammals.

In this text we provide the evidence upon which general principles can be based and explore those aspects of organisms and biological processes that appear to be specific to lineages or stages of evolution. To this end, there is a logical arrangement of the subject matter, although the structure of the book allows you to begin with Part 8 or to read individual parts as units independent of the other parts:

- beginning with the history of evolutionary ideas, species and their relationships, and patterns of evolutionary change (Part 1);
- moving to the origins of the universe, Earth, rocks, continents, oceans and atmospheres (Part 2);
- before discussing the origin, molecules, cells, organisms and natural selection (Part 3).
- Part 4 considers how 19th century naturalists Charles Darwin and Alfred Russel Wallace came to almost the same theory of evolution by natural selection under the influence of social economic writings of Thomas Malthus; how Gregor Mendel's experiments provided basic principles of inheritance that were unknown to Darwin or to Wallace; and how later studies showed how environments and genes interact in inheritance (heredity).

- Operation of natural selection and how genotypes (which are inherited) and phenotypes (which are not) interact are the topics of Part 5.
- Natural selection is only effective if biological variation is present. Sources of variation in individuals and populations are the topics of Part 6.
- Interactions between individuals and populations and between both and the environment, as reflected in competition, predation, coevolution, and extinction, maintain species and are important components of speciation, the topics of Part 7.
- The book ends with how cultural, social, and biological evolution interact in our own populations, the impact humans have had on the evolution of other species, and how culture, evolution, and religion interact and coexist (Part 8).

Summaries are provided at the beginning of each chapter. We suggest that you read the summary both before and after you read each chapter—before to see whether what is coming is familiar or not; after to be sure you have captured the essence of the topic(s) of the chapter. Boxes within chapters are used to draw attention to particular topics. Important terms and concepts are highlighted in **bold** with summary text highlighted in blue.

Most chapters end with an End Box or Boxes (23 in all), each of which begins with a synopsis of the contents. Some End Boxes cover material that was distributed among several chapters in the fourth edition: Fossils as Evidence of Past Life (End Box 3.1 in Chapter 3) is an example. Other End Boxes are large and relevant to the content of more than one chapter. End Box 17.1 Animals Arise (4300 words, five figures) is an example. This End Box discusses the organisms present in the Precambrian and Early Cambrian, examines how stem taxa are distinguished from crown taxa, how limits on morphological variation are studied, and how “molecular clocks” are used to calibrate rates and times of evolution. Because knowledge of gene regulation obtained from living organisms tell us much about how animals arose and evolved, this End Box has been placed at the end of the chapter on gene regulation and the origin of variation.

Much more information and analysis is available on all topics discussed than we could possibly have included in the book. Many introductory textbooks provide no access to the literature upon which the science is based. We think this is a mistake for two major reasons:

- (1) One is intrinsic to the nature of the subject matter. Evolution is a science, and as such, you as the reader of this scientific textbook should not take our representations and interpretations of scientific research for granted. Rejection or acceptance of a scientific hypothesis is based on whether data gathered to test the hypothesis refute it or not. As one example, the sequence of hominin, primate-like fossils extending from the far past to the present supports the hypothesis that humans have a primate origin (Chapter 25).
- (2) The second reason is that whether this book is used for an introductory or a more advanced class—and it is, in our view, suitable for either—the primary literature cited provides an ideal basis for tutorials, discussions, essays and/or presentations.

As you should be able to check the primary literature for yourself, we have cited enough of that primary literature to enable you to enter it with ease. General references are highlighted in yellow in the text (e.g., Bowler, 2003) and grouped together at the end of each chapter. References to specific studies are provided in full as footnotes.

ORGANIZATION OF MATERIAL IN THE FIFTH AND FOURTH EDITIONS

Organization of some of the material in the fifth edition differs from the fourth. Specifically:

- Information on species and species concepts, found in chapters 2, 8, and 11 in the fourth edition is consolidated as Chapter 2 in this edition.