

Preface

The year 2009 marks the bicentennial anniversary of the birth of Charles Darwin and the sesquicentennial anniversary of the publication of *On the Origin of Species*. It is pleasing to release the second edition of *Evolution* in this year, when the accomplishments and future of evolutionary biology are being celebrated by symposia and by scientific and popular books and articles throughout the world. Evolution has clearly established itself as the most important principle in biology, the single scientific theory that unites the phenomena of life at every level from macromolecule to ecosystem.

During the last such celebratory year, 1959, the theoretical foundations of evolution, the joining of Darwin's insights to modern genetics, had been established, but the "molecular revolution" of biology had only just started, and as yet had had little impact on evolutionary research. Since 1959, evolutionary science has been transformed by the knowledge and techniques of molecular biology, as well as by advances in theory and in computation, and every subject area in evolution has seen immense and rapid advance. Phylogenetic relationships among organisms are understood with greater confidence and on a far greater scale; the roles of natural selection and genetic drift in the evolution of genes and phenotypes are increasingly clarified. The evolution of whole classes of organismal features, such as behavior, life histories, adaptations of species to one another, and DNA sequences, had hardly been addressed 50 years ago, but are well understood today. Our knowledge of human evolution has been transformed.

Evolutionary research today continues to illuminate these subjects, and is now exploring such frontiers as the evolution of genomes, metabolomes, complex systems such as cells and brains, and the developmental processes that translate DNA sequences into the physical structures of organisms. The diverse applications of evolutionary biology to human affairs, ranging from medicine to environmental change, have attracted increased attention and research. Scientists working in molecular, genomic, cell, and developmental biology increasingly recognize that the interpretive framework, the principles, and the analytical methods of evolutionary biology are critically important for their fields.

For these reasons, I suggest, the principles of evolution should be a foundation of the scientific education of everyone—future biologist, doctor, farmer, citizen—especially as opposition to evolution, and to the principles of sound science, spreads. I hope this book will help, however slightly, to advance the unification of biology and the understanding of science.

As in the first edition, the book begins with phylogeny and evolutionary history, continues with the many facets of evolutionary process, and returns to macroevolution, approached as a synthesis of evolutionary process and pattern. Human evolution is treated throughout the text rather than as a separate topic, an approach that reveals the social and personal relevance of the various topics in evolutionary science and points to the commonality of humans with the rest of the biological world. The final chapter, as before, treats the increasingly indispensable topics of the evidence for evolution, the nature of science, and the failings of creationism, ending on a positive note with a brief survey of some of the social applications of evolutionary biology. The most conspicuous difference between this and the previous edition is the reorganization of material on life histories, sex and sexual selection, and cooperation into three rather than two chapters, but every chapter has been updated and in some cases differs substantially from the first edition.

It is increasingly difficult to keep abreast of progress in any one field of evolutionary studies, and nearly impossible to follow—or to understand fully—all of them. So I am once again immensely grateful to Scott Edwards (Harvard University) and John True (Stony Brook University) for agreeing to continue in this venture, by contributing revised chapters on the rapidly moving subjects of genome evolution and evolutionary developmental biology.

I am grateful to Michael Foote, Bruce Lyon and Donald Prothero for indispensable review and advice on several chapters, and to Rodrigo Cogni for help with obtaining figures. Steve Dudgeon, Doug Erwin, John Relethford, Joel Sachs, and Mark Wilson provided invaluable feedback on the first edition. Among the many colleagues who provided information or answered questions as I worked on the new edition are Richard Bambach, L. Jardón Barbolla, Michael Bell, Daniel Bolnick, Carlos Bustamante, Jerry Coyne, Joel Cracraft, Daniel Dykhuizen, Walter Eanes, Catherine Graham, Joseph Graves, David Jablonski, Andrew Knoll, David Krause, Jeffrey Levinton, Maureen O'Leary, Massimo Pigliucci, David Pfennig, Joshua Rest, A. Vásquez-Lobo, and John Wiens. Scott Edwards also thanks Allan Drummond, Kevin Peterson, and Andrew Shedlock for their comments on Chapter 20.

I have learned from many others, besides those listed, during the preparation of this edition, and I apologize to those whom I have inadvertently omitted. Of course it cannot be assumed that my colleagues agree with all my interpretations or emphases, and any faults or errors are mine alone. I am very fortunate to enjoy the continued intellectual stimulation and support of the faculty and graduate students of one of the best Departments of Ecology and Evolution in the world, for which I am most grateful.

Every page of this book bears witness in its design, esthetic values, and accuracy to the extraordinary dedication and competence of the Sinauer team, including Elizabeth Pierson, David McIntyre, Jefferson Johnson, Chris Small, Carol Wigg, and, of course, Andy Sinauer. To all, my warmest thanks.

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