Miller Harley's *Zoology 6e*
Preface

As authors, we are honored to play a key role in the instruction of future generations of zoologists, ecologists, wildlife managers, and other life scientists. We undertook the revision for the sixth edition with this privilege, and the responsibility for content integrity, in mind.

The preparation of the sixth edition of *Zoology* involved careful evaluation of the previous editions and the features that contributed to the understanding of zoology as an exciting and dynamic scientific field. Our goal in preparing the sixth edition of *Zoology*, as in previous editions, was to prepare an introductory general zoology textbook that we believe is manageable in size and adaptable to a variety of course formats. We have retained the friendly, informative writing style that has attracted instructors and students to previous editions.

The shorter format of the fifth edition was well received by users as being less expensive and easily adapted to a one-semester course format. The sixth edition retains that format. The shorter format does mean that some general biological topics were eliminated from the book. These chapters are, however, still available, along with numerous other resources, in an electronic format on the book website and are free to adopters of the book. (Chapters found online only are indicated in the Table of Contents by an asterisk.)

Content and Organization

We have maintained from the inception of this text that evolutionary and ecological perspectives captivate students and are fundamental to understanding the unifying principles of zoology. These perspectives are incorporated into *Zoology* in a number of ways. For example, animal structure and function is considered in the context of environment, the animal phyla are described with their roles in ecosystems in mind, and the "Wildlife Alerts" that first appeared in the fourth edition, and were expanded in the fifth edition, have been retained. These boxed readings depict the plight of selected animal species or broader ecosystem issues relating to preserving animal species.

We believe that the sixth edition of *Zoology* presents evolution as an exciting and dynamic field of study—a field of study that is vital for understanding all of biology. In addition the continuing and expanding pseudoscientific attacks on biology make it urgent that evolutionary concepts be presented clearly and convincingly throughout the biology curricula. We have attempted to do just that. A special font highlights important evolutionary concepts. Animal survey chapters begin with an "Evolutionary Perspective" and end with "Further Phylogenetic Considerations." These sections describe evolutionary relationships within each phylum and evolutionary connections to animals of previous and following chapters. Cladograms continue to be used to depict taxonomic relationships. Evolutionary connections and animal adaptations are stressed in the structure and function section.

To further explain and support evolutionary concepts, this new edition has a second set of themed boxed readings (in addition to "Wildlife Alerts") entitled

"Evolutionary Insights." These boxes provide detailed examples of principles covered in a chapter and provide insight into how evolutionary biology works. For example, Chapter 4 includes a reading on big-cat biogeography that illustrates how a variety of sources of evidence are used to paint a picture of the history of one group of animals. Chapter 5 has a reading on speciation of Darwin's finches that illustrates how and why speciation occurs. Other readings describe ideas regarding animal origins and the debates that occur among taxonomists who try to sort out evolutionary relationships within animal groups.

Zoology is organized into three parts. Part One covers the common life processes, including cell and tissue structure and function, the genetic basis of evolution, and the evolutionary and ecological principles that unify all life.

Part Two is the survey of protists and animals, emphasizing evolutionary and ecological relationships, aspects of animal organization that unite major animal phyla, and animal adaptations. All of the chapters in Part Two have been updated. The presentation of taxonomic principles in Chapter 7, and the taxonomic relationships in Chapters 8-22, have been carefully revised and incorporate some of the flavor of the exciting changes occurring in the field of taxonomy. You will see some of these changes listed under "New to the Sixth Edition". Cladograms have been updated and, as in previous editions, full-color artwork**,** photographs, and lists of phylum characteristics are used to highlight each phylum.

Part Three covers animal form and function using a comparative approach. This approach includes descriptions and full-color artwork that depict evolutionary changes in the structure and function of selected organ systems. Part Three includes an appropriate balance between invertebrate and vertebrate descriptions.

New to the Sixth Edition

Major additions to the sixth edition focus on evolutionary principles and taxonomy. Evolutionary concepts must be presented clearly and convincingly in biology courses. We believe that changes we have made will help instructors accomplish that goal by providing more evidence of evolution, more examples to illustrate evolutionary principles, and more detail on evolutionary mechanisms. Recent, fast-paced changes in animal taxonomy require constant reevaluation of the presentation of evolutionary relationships between animal taxa. Because the taxonomy of many animal groups is unsettled, we have tried to take a conservative, yet up-to-date, position on taxonomic revisions. The following are major additions to this edition.

- "Evolutionary Insights" boxes appear in selected chapters. These readings present students with further information and examples of how evolutionary biology works.
- Chapter 4 is reorganized and presents new information on the distinction between microevolution and macroevolution. The coverage of the evidence of macroevolution includes an expanded discussion of paleontology, a reorganized and expanded discussion of homology, an analogy from the perspectives of both comparative anatomy and molecular biology, and a new presentation of evidence from developmental biology. A new section on phylogeny and common descent caps this chapter.

- Chapter 5 begins with an expanded presentation of populations and gene pools. The sections on sources of variation and gene flow are enhanced with more information and new examples.
- Chapter 9 presents new information on the evolutionary relationships of the Porifera, Cnidaria, and Ctenophora.
- Chapter 13 provides an updated taxonomy of the Annelida, including the presentation of the oligochaetes and leeches as members of a single class Clitellata.
- Chapters 14 and 15 include an extensive update on arthropod taxonomy. Arthropods are presented as a monophyletic group, and recent thinking regarding crustacean ancestry for the phylum is discussed. There is expanded coverage of the hemocoel and insect nutrition and digestion.
- Chordate taxonomy in chapters 17-22 has been updated. Chapter 18 includes expanded discussion of the evolution of jaws and paired appendages and the fish-to-amphibian transition. Chapter 19 introduces more coverage of the early evolution of the Stegocephalia and Tetrapoda. Chapter 21 has expanded coverage of bird evolution.

Supplementary Materials

Supplementary materials are available to assist instructors with their presentations, course management, and to augment student learning. The usefulness of these supplements is now greatly enhanced with the availability of online, digital, and printed resources. A "Digital Content Manager" is available as a CD-ROM. It contains PowerPoint slides of most line art and photographs from the textbook, which can be used in customizing classroom presentations.

Online Learning Center

As with the previous edition, chapters on cell chemistry, energy and enzymes, embryology, and animal behavior—along with numerous boxed readings and pedagogical elements—have been moved to the Online Learning Center. This content-rich website is located at www.mhhe.com/zoology. Both instructors and students can take advantage of numerous teaching and learning aids within this book's Online Learning Center.

Instructor Resources:

- Instructor's Manual
- Instructor Resource Guide
- Link to Digital Zoology

Student and Instructor Resources:

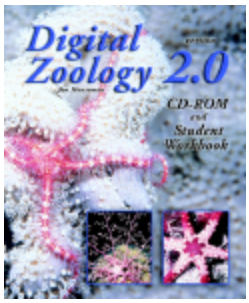
- Interactive Cladistics Exercises
- Chapters on:
    - Chapter 30: The Chemical Basis of Animal Life
    - Chapter 31: Energy and Enzymes: Life's Driving and Controlling Forces
    - Chapter 32: How Animals Harvest Energy Stored in Nutrients
    - Chapter 33: Embryology

    - Chapter 34: Animal Behavior
- Quizzing
- Flashcards
- Suggested Readings
- Boxed Readings
- Animation Exercises
- Zoology Lab Correlations
- Zoology Essential Study Partner (ESP)

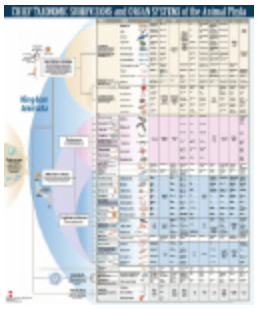
Other Resources

The following items may accompany *Zoology*. Please consult your McGraw-Hill representative for policies, prices, and availability.

- An **Instructor's Manual**, prepared by Susan L. Keen, is available for instructors within the Online Learning Center. It provides items such as a lecture outline, lecture enrichments, research discussion topics, teaching suggestions, and/or suggested readings for each chapter.
- A ***Zoology* Test Item CD-ROM** is also available for instructors. This contains approximately 50 multiple-choice questions and the instructor's manual for each chapter.
- **General Zoology Study Guide**, prepared by Jane Aloi and Gina Erickson, contains subject-by-subject summaries, questions, and learning activities.
- A set of 100 full-color acetate transparencies is available to supplement classroom lectures.
- **General Zoology Laboratory Manual**, Fifth Edition, by Stephen A. Miller, is an excellent corollary to the text and incorporates many learning aids. It includes illustrations and photographs, plus activities on scientific method, cladistics, ecological and evolutionary principles, and animal structure and function. A Laboratory Resource Guide, available within the Online Learning Center, provides information about materials and procedures, and answers to worksheet questions that accompany the lab exercises.
- **Digital Zoology CD-ROM** is an exciting interactive product designed to help you make the most of your zoology classes and laboratory sessions. This program contains interactive cladograms, laboratory modules, video, interactive quizzes, hundreds of photographs, a full glossary, and much detailed information about the diversity and evolution of the animals that we find on the planet. To find out the latest news on this ever-expanding product, log on to www.digitalzoology.com and find out how to incorporate this valuable resource into your course.



- **Study Aid/Poster: Chief Taxonomic Subdivisions & Organ Systems of the Animal Phyla -** This 30’ x 36" poster is a great reference/study tool for students.



- Available through the Zoology Online Learning Center or on a free CD-ROM, the **Zoology Essential Study Partner** is a complete, interactive study tool offering animations and learning activities to help students understand complex zoology concepts. This valuable resource also includes self-quizzing to help students review each topic.
- PageOut® is the solution for professors who need to build a course website. The following features are now available to professors:
    - The PageOut Library offers instant access to fully loaded course websites with no work required on the instructor’s part.
    - Courses can now be password protected.
    - Professors can now upload, store, and manage up to 10MB of data.
    - Professors can copy their course and share it with colleagues or use it as a foundation for next semester. Short on time? Let us do the work. Our McGraw-Hill service team is ready to build your PageOut website, and provide content and any necessary training. Learn more about PageOut and other McGraw-Hill digital solutions at www.mhhe.com/solutions.

Acknowledgements

We wish to thank the reviewers who provided detailed analysis of the text during development. In the midst of their busy teaching and research schedules, they took time to read our manuscript and offer constructive advice that greatly improved this sixth edition.

Reviewers

Barbara J. Abraham, *Hampton University*; **Marc C. Albrecht**, *University of Nebraska at Kearney*; **Donald I. Anadu** , *South Carolina State University*; **Joe Arruda**, *Pittsburg State University*; **Amir M. Assadi-Rad**, *San Joaquin Delta College.*

Kris Burnell, *Santa Barbara City College.*

Vincent A. Cobb, *Northeastern State University*; **Marjorie M. Collier**, *Louisiana State University at Alexandria*.

D. Charles Dailey, *Sierra College*; **Lewis Deaton**, *University of Louisiana at Lafayette*; **Elizabeth A. Desy**, *Southwest State University*; **Charles D. Dieter**, *South Dakota State University.*

Phillip Eichman, *University of Rio Grande*; **David J. Eisenhour**, *Morehead State University.*

Bruce E. Felgenhauer, *University of Louisiana at Lafayette.*

Jim Goetze , *Laredo Community College*; **Glenn A. Gorelick**, *Citrus College*; **Edward J. Greding, Jr.**, *Del Mar College*; **Ann Grens**, *Indiana University - South Bend.*

Leon E. Hallacher, *University of Hawai at Hiloi*; **Jenna Jo Hellack**, *University of Central Oklahoma*; **J. L. Henriksen**, *Bellevue University*; **Gary W. Hunt**, *Tulsa Community College.*

Arthur B. Jantz, *Western Oklahoma State College*.

Ritin Khan, *Armstrong Atlantic State University*; **Scott L. Kight**, *Montclair State University*; **Shelley A. Kirkpatrick**, *Saint Francis University*; **Robert A. Krebs**, *Cleveland State University*; **Mary Jane Krotzer**, *Stillman College*.

Kevin Lyon, *Jones County Junior College.*

Kelly M. Mack, *University of Maryland Eastern Shore*; **Neal F. McCord**, *Stephen F. Austin State University*; **Bonnie McCormick**, *University of the Incarnate Word*; **Michael B. McDarby**, *Fulton-Montgomery Community College*; **Emily C. McDuffee**, *Freed-Hardeman University*; **William R. Miller**, *Chestnut Hill College*; **Devonna Sue Morra**,
Saint Francis University.

Charles M. Page, *El Camino College*; **Louis L. Pech**, *Carroll College*; **Polly K. Phillips**, *Miami-Dade Community College*; **Karen E. Plucinski**, *Defiance College*; **Michelle A. Priest**, *College of the Canyons*.

William M. Saidel, *Rutgers University - Camden*; **Allen Sanborn**, *Barry University*; **Neil Schanker**, *College of the Siskiyous*; **Doug Schexnayder**, *Copiah-Lincoln County College*; **Fred Schindler**, *Indian Hills Community College*; **Shari Snitovsky**, *Skyline College*; **Ken Spitze** , *University of Miami.*

Annie M. Talley, *Asheville-Buncombe Technical College*; **Michael E. Toliver**, *Eureka College*; **Richard E. Trout**, *Oklahoma City Community College*.

Elise M. Van Ginkel, *Madison Area Technical College*.

Scott E. Walter, *University of Wisconsin - Richland*; **Danny B. Wann**, *Carl Albert State College*; **MaryJo A. Witz**, *Monroe Community College*; **Jeffery S. Wooters** , *Pensacola Junior College.*

Robert W. Yost, *Indiana University/Purdue University at Indianapolis.*

David D. Zeigler, *University of North Carolina at Pembroke*; **Brenda Zink**, *Northeastern Junior College.*

The publication of a text requires the efforts of many people. We are grateful for the work of our colleagues at McGraw-Hill who have shown extraordinary patience, skill, and commitment to this textbook. Marge Kemp has helped shaped *Zoology* from its earliest planning stages. Although she has moved up to other responsibilities within McGraw-Hill, her wisdom and skill is still evident in this sixth edition. Donna Nemmers, Senior Developmental Editor, has worked with this textbook through the last two revisions. We are grateful for her skill in coordinating many of the tasks involved with publishing previous editions of *Zoology*. Our Developmental Editor, Fran Schreiber, helped make the production of the sixth edition remarkably smooth. Fran kept us on schedule and the production moving in the plethora of directions that are nearly unimaginable to us. Jayne Klein served as project manager for this edition. We appreciate her efficiency and organization.

Finally, but most importantly, we wish to extend appreciation to our families for their patience and encouragement. Janice A. Miller lived with this text through many months of planning and writing. She died suddenly two months before the first edition was released. Our wives, Carol A. Miller and Donna Dailey have been supportive throughout the revision process. We appreciate the sacrifices that our families have made during with writing and revision of this text. We dedicate this book to the memory of Jan and to our families.

Stephen A. Miller
John P. Harley