

PREFACE

Laboratory Studies in *Integrated Principles of Zoology* offers students hands-on experience in learning about the diversity of life. It provides students the opportunity to become acquainted with the principal groups of animals and to recognize the unique anatomical features that characterize each group as well as the patterns that link animal groups to each other. Although this manual was written to accompany a particular textbook, *Integrated Principles of Zoology*, it can easily be adapted to use with its shorter sister text, *Biology of Animals*, or with any other introductory zoology text and with a variety of course plans. Every effort has been made to provide clear instructions and enough background material to create interest and an understanding of the subject matter. Many illustrations complement the written word.

New to the Tenth Edition

- Project exercises are placed with certain chapters in units entitled "Experimenting in Zoology." Two new project exercises use molecular techniques to explore questions that are important to our understanding of zoology and evolution. Some of these exercises can be completed within a single laboratory period; others are followed for a longer period. In all project exercises the student follows experimental procedures, records and analyzes

quantitative data, and draws conclusions from the results. Many instructors will want their students to gain additional experience by writing a laboratory report in which the student states the objectives, methods followed, results obtained, and conclusions that can be drawn from the results. The Experimenting in Zoology exercises are: Effect of Temperature on the Locomotor Activity of *Stentor* (Exercise 6); Genetic Polymorphism in *Tetrahymena* (Exercise 6); Regeneration in *Planaria* (Exercise 9); Behavior of the Medicinal Leech, *Hirudo medicinalis* (Exercise 12); The Phototactic Behavior of *Daphnia* (Exercise 14); Aggression in Paradise Fish, *Macropodus opercularis* (Exercise 18); Analysis of the Multiple Hemoglobin System in *Carassius auratus*, the Common Goldfish (Exercise 18).

- Also new to this edition is a supplement to Exercise 5, "Taxonomic classification and phylogenetic trees," which is found on this manual's website: <http://www.mhhe.com/zoology>. This interactive exercise, prepared by Louise Wootton of Georgian Court College, leads the student through the construction of a dichotomous key and the construction of cladograms.
- We have made the exercises more interactive with questions placed throughout the text, and with spaces provided for

students to write down their responses and observations. This "active learning" approach involves students in the exercise and encourages them to think about the information as they read. Some questions may require students to consult their textbook for the answers. In some exercises we have placed questions in the figure legends, to be answered in the spaces provided when the student consults the figure. Examples of this interactive approach are found in Exercises 3 and 17 through 22.

- In several exercises we rewrote or expanded the "Where Found" sections to provide more interesting information on the biology of the organism or group. These enhanced introductions are found in Exercise 8B (*Aurelia*), Exercise 9B (*Clonorchis*), Exercise 10A (*Ascaris* and pinworms), Exercise 11A (bivalves), Exercise 13A (horseshoe crab), Exercise 16 (sea stars, brittle stars, sea urchins, sea cucumbers), and Exercise 17A (tunicates).
- A complete new set of full-color illustrations drawn from frog specimens was prepared for Exercise 19. Many existing illustrations throughout the manual were converted to full color.

As with the previous edition we have included the derivation of specialized biological terms and genera where first introduced. This

is an important assist to students in becoming familiar with the Latin and Greek roots from which technical terms are built. We repeatedly emphasize that the species is a binomial by spelling the complete species binomial in the classification breakdown for each representative species in the exercises.

Directions for preparing the exercises in this manual are found in Appendix A. For each exercise we have listed the materials required, directions for preparing solutions, suggestions for maintaining and working with living materials, suggestions for demonstrations, and a listing of appropriate references, most of which are annotated. This information is convenient to the instructor as well as to students who may later wish to consult or implement an exercise.

Exercises present in previous editions of the manual, but removed from the present edition, will be found at our zoology website <http://www.mhhe.com/zoology> and are available to any instructor who wishes to use them. These include an exercise on cell function (Exercise 3 in the ninth edition) and nine exercises on physiology and genetics (Exercises 24–27 in the eighth edition).

There are many aids for the student in this laboratory manual. Throughout the exercises, working instructions are clearly set off from the descriptive material. Classifications, where appropriate, are included with the text, together with a “pie” diagram showing the relative sizes of the classes in a phylum. Function is explained along with anatomy. Topic headings

help the student mentally organize the material. Metric tables and definitions are placed on the inside front and back covers for convenient use. Much of the artwork was designed to assist the student with difficult dissections.

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Although we make every effort to bring to you an error-free manual, errors of many kinds inevitably find their way into a book of this scope and complexity. We will be grateful to readers who have comments or suggestions concerning content to send their remarks to Donna Nemmers, Developmental Editor, McGraw-Hill Publishers, 2460 Kerper Boulevard, Dubuque, IA 52001. Donna may also be contacted by e-mail: donna_nemmers@mcgraw-hill.com, or through this textbook’s website: <http://www.mhhe.com/zoology>.