

Preface

To the Student

To get the most out of each laboratory session, you should read the text pages listed under Student Preparation for the topic to be covered. We also urge you to review each topic to be covered prior to coming to the lab. Even a cursory reading will be beneficial. Then, at the beginning of the laboratory period, read the instructions again, carefully and completely. Once you begin to do an experiment or examine material, do not hesitate to ask questions if you are having difficulties. (If something is troubling you, it is likely that others are puzzled too.) This is especially important early in the term. If you do not understand something or cannot find an object with the microscope, for example, get help immediately. Do not go on to another laboratory period without having seen and identified everything covered in the previous one. If you get off to a good start, you will find yourself looking forward to your botany laboratories. By the end of the course, the world about you will have assumed broader and more meaningful dimensions.

This manual was written to be used in conjunction with your textbook, *Biology of Plants*, Eighth Edition. You will probably find it useful to bring your copy of the textbook with you to each laboratory session. To help you gain a deeper understanding of the topic being studied in the laboratory, we often refer to illustrations and other material in the textbook. Figures in the textbook are referred to as "text Figure X," and the page on which they appear is provided; figures in this manual are referred to as "manual Figure X."

To the Instructor

This laboratory manual is based upon a course in General Botany offered by the first author for 41 years. In the same course, the second author has participated as laboratory supervisor and preparator. The third author has more than 20 years experience in biology laboratory teaching, and currently teaches general botany, general biology, and environmental biology. In writing this manual, we have worked to acquaint the student with recent advances in botany, while maintaining a strong emphasis on the basic facts and principles necessary for a sound foundation in the plant sciences. The manual complements *Biology of Plants*, Eighth Edition, by Ray F. Evert and Susan E. Eichhorn.

The material in the manual is organized according to topics and is not divided into laboratory periods of set duration. Certain topics (for example, The Microscope) require relatively little time, whereas others (for example, the topics on fungi and on protists) require two or three laboratory periods of 2 and 3 hours each. Some of the physiology topics are best conducted by groups of two or more students, and some may consist entirely of demonstration experiments.

Diagrams and drawings are infrequently called for in the manual, although drawing is an excellent teaching and learning technique. The number of drawings required greatly influences the amount of time necessary to cover a topic, so we feel this requirement is best decided by each instructor. Being flexible in this regard permits instructors to emphasize the techniques that *they* have found most effective.

Most of the topics are self-contained and can be presented in a sequence different from that used here. Not all of the information presented in the manual need be covered; other information can be inserted as is necessary or useful. Every attempt has been made to eliminate any plant materials, prepared slides, or equipment that are not readily available to botanists at most colleges and universities.

This edition of the lab manual continues to emphasize hypothesis testing as a fundamental process of science. Scientific inquiry is introduced in Topic 2, and students practice developing hypotheses, designing tests of their hypotheses, and interpreting the results in numerous

activities thereafter. Communication of results via laboratory reports is supported with Appendix A (How to Write a Lab Report). Simple statistical tests are employed where appropriate to aid in analysis of experimental results; this approach is supported with Appendix B (Basic Statistics for the Botany Lab).

A separate *Preparation Guide* offers some supplemental exercises and suggestions of materials and equipment to be used, a list of sources from which materials can be obtained, and other helpful hints for the preparator. It also suggests the amount of time needed to complete parts of each topic, as well as ways of reducing that time for shorter laboratory periods.

Acknowledgments

We have been aided in our efforts to prepare a laboratory manual that is both instructive and motivating by many comments from students and instructors who have used earlier drafts of many of these laboratory exercises. We are grateful for their suggestions. Also, we are pleased to acknowledge a great deal of help and advice from our colleagues at the University of Wisconsin-Madison and the University of Wisconsin Colleges. We extend our thanks to Margaret Comaskey for her copyediting and Jodi Isman for her assistance during the production stage of this edition. Special thanks are extended to Sheridan Sellers for making up the pages of this manual and to Kandis Elliot for her expert rendering of the illustrations into electronic form.

March 2012