

PREFACE

With the fourteenth edition, *Genetics Laboratory Investigations* is well into its seventh decade serving the needs of genetics instructors and students. Beginning in 1952, the first four editions were authored by Eldon Gardner of Utah State University. Thomas Mertens assumed the major responsibility for preparing the next three editions. Robert Hammersmith joined the writing team for the eighth edition; following Dr. Gardner's death, Mertens and Hammersmith prepared editions nine through thirteen, and now the fourteenth. This long history of service to the genetics education community was recognized in 1998 by the Text and Academic Authors Association with the presentation of the McGuffey Award.

Much of the success of the book can be accounted for by the user-friendly design meant to meet the needs of both faculty and students, and having been developed by those actively involved in the teaching of introductory general genetics at the undergraduate level. We are firmly convinced that a student's laboratory experience in genetics is an essential part of the learning process and vitally important to fostering student interest in, and understanding of, the discipline. Toward this end, a number of "open-ended" investigations have been included in this manual—the most obvious being Investigation 13, "Open-Ended Experiments Using *Drosophila*: Locating a Mutant Gene in its Chromosome." With appropriate adaptation, however, instructors can use the open-ended approach in any of the investigations in which students collect original data.

New to this Edition

We have tried to live up to the legacy of the manual in this new edition. As in previous editions, we have included investigations to accommodate courses taught in a variety of academic settings and to be cost-effective, especially for investigations involving molecular genetics. Many investigations provide two or more alternative ways of achieving the instructional objectives. Each investigation has been reviewed and updated for newer data and clarity, as have the references at the end of each investigation. The fourteenth edition of the manual represents one of the most extensive revisions undertaken by the authors, and involves the conversion of most of the black and white photographs and diagrams to full color photographic plates and illustrations. This conversion has allowed us to now include many new photographs detailing differences in mutants of *Drosophila*, maize, barley and other organisms that previously could not have been adequately done with black and white illustrations.

- Over 85 new color photographs have been incorporated into 55 new or replacement figures, including new photographs of *Drosophila* and maize in Investigations 1, 8, 11, 13, and 19.
- Investigation 1 has been extensively rewritten to expand ideas for mono- and dihybrid crosses, with photographs of body, wing, bristle and eye-color mutants of *Drosophila* and various aleurone and starch characteristics in maize. The section on epistasis has also been expanded and detail photographs of maize aleurone epistasis provided, so that students can count kernels in the photographs if actual epistatic ears are not available.
- New problem sets and problem examples for Investigations 2, 3, 22, and 23 have been added, with some problem sets drawing on data collected from maize ears featured in photographs in Investigation 1.
- Investigations 4, 5, and 6 have new color photographic plates of chromosomes in mitosis and meiosis with a totally new plate on whitefish mitosis and ascaris meiosis.

- New human chromosome spreads for student karyotyping have been added to Investigation 10.
- New photographs of tight linkage in maize and linkage in barley are found in Investigation 11, augmenting discussion of recombination and analysis of a problem set on the interpretation of F_2 hybrid linkage data. Color figures of FISH (fluorescence in situ hybridization) have also been placed in Investigation 11.
- Investigations 12, 14, 17, 20, 21, 22, and 24 have new color figures as well.
- We have undertaken a major revision of Investigation 26, "NCBI and Genomic Data Mining," to accommodate changes in these federal data bases and it includes four new figures.
- A new Instructor's Manual provides answers to most questions in each investigation, helpful hints for setting up experiments in certain investigations, and when needed, sources of instructional materials beyond those suggested in the book itself.

To all who have assisted us over the years, we give our thanks. Credit for illustrations and tables in the present edition are given with appropriate investigations according to the wishes of the authors or publishers from whom permissions have been granted. Investigations 12 (Genetics of *Sordaria*), 22 (Human Fingerprint Ridge Counts), and 24 (Genetic Drift) were originally published in *The American Biology Teacher* as was the portion of Investigation 6 dealing with meiosis in *Tradescantia*. We acknowledge with special appreciation new photos of human chromosome spreads (Investigation 10 and 11) and the back cover photograph provided by Dr. Daniel Van Dyke and his colleagues at the Mayo Clinic. We thank the Biological Sciences Curriculum Study (Investigation 22), and Helena Laboratories (Investigation 25) for illustrations they provided. The section of Investigation 25 that deals with electrophoresis of hemoglobin was reviewed by Helena Laboratories of Beaumont, Texas, and is used with their permission. Investigation 16 is based in part on material supplied by the Perkin Elmer Corporation and by Carolina Biological Supply Company, and thanks are due to both firms for their assistance. Kits for conducting this investigation may also be purchased from Carolina Biological. We wish to thank our editor Michael Gillespie and assistant editor, Chloé Veylit, and their staff for their support and efforts in the production of this manual. Finally, we wish to thank the instructors and students who have used the thirteenth edition of this manual. It is their commitment to the manual that has justified the production of the fourteenth edition. We hope that the updates and additions found in the new edition will continue to make the manual a useful instructional tool.

T. R. M. & R. L. H.



in memoriam

Thomas Mertens

1930–2014

Dr. Mertens was a Professor of Biology and Distinguished Professor of Biology Education at Ball State University for over thirty-five years. Among his many accomplishments, he served as president of the National Association of Biology Teachers where he helped guide a strong emphasis on using an "open-ended" approach for teaching genetics, and for which he received their Ohaus Award. In 1988, he received the McGuffey Award from the Textbook and Academic Authors Association for work on this book. Dr. Mertens was the author or co-author of over 200 publications, including this text. He will be greatly missed by his family, colleagues and co-author.