Preface

For more than a century, genetics-based discovery research in the vinegar fly *Drosophila melanogaster* has provided many of the first descriptions of functional principles in multiple areas of biology, including neuroscience. Indeed, the focus of many *Drosophila* researchers has been on using flies to discover molecular and cellular mechanisms that underlie neural functions and direct behaviors.

In this second edition of Drosophila *Neurobiology: A Laboratory Manual*, we have curated a collection of articles that highlight new areas that have emerged since the first edition of the *Manual* was published in 2010, together with updates on frequently employed "classic" techniques. The collection is broken into three main modules: development, physiology, and behavior, and major areas of focus are single-cell genomics, central brain patch-clamp physiology, and neural circuit mapping. The selected reviews and protocols cover a broad range of techniques, such as neuromuscular junction electrophysiology, Ca^{2+} imaging, and behavioral analysis. New do-it-yourself (DIY) methods, such as 3D printing for constructing behavioral apparatuses, have increased the accessibility to the equipment that is required to measure and quantify fly behavior, and some of the chapters in this collection include these methods and plans. It is our hope that this updated edition of the *Manual* allows established *Drosophila* neurobiologists to expand their repertoire of approaches, and also encourages those who might work on other animal models to adopt—and perhaps adapt—"*Drosophila* techniques" to address their research questions.

The Cold Spring Harbor Laboratory (CSHL) course "*Drosophila* Neurobiology: Genes, Circuits, and Behavior," for which we have all been instructors, provided the foundation for the first edition of this manual and is also the inspiration for much of this current collection. As such, this collection would not be possible without the dedication of the many faculty and their laboratory members from across the world that have lectured, instructed, and run laboratories each summer for years on end as part of this course, many of whom are authors of the chapters included here. We are also grateful to Dr. Marc Freeman, who was an editor of the successful first edition of this book. We hope that the power of *Drosophila* as a model for neuroscience investigation, and the collaborative and supportive nature of the *Drosophila* research community, which has played a key role in the course and the articles described here, are conveyed in the structure and contents of this collection.

The "*Drosophila* Neurobiology: Genes, Circuits, and Behavior" course has relied on generous support from many companies over the years, and would not happen without the dedication of many staff in the Meeting & Courses office and facilities at CSHL. Dr. David Stewart (Executive Director, Meetings and Courses, CSHL) has been a stalwart supporter of not only the course but also of the biannual *Drosophila* neurobiology meeting and this manual. In addition, this book would not exist without the contribution of many people at CSHL Press. We thank Dr. John Inglis (Executive Director, CSHL Press) for his support of this second edition of the *Manual* and his contributions to the course. We are particularly indebted to the fantastic CSHL press editorial team, Dr. Christin Munkittrick, Dr. Alejandro Montenegro-Montero, Dr. Maria Smit, Denise Weiss, Kathleen Bubbeo, Cynthia Blaut, Barbara Acosta, and Danett Gil, who gently cajoled each of us to keep the project moving and were truly instrumental in the organization, detailed editing, and eventual completion of this book.

We believe *Drosophila* neurobiology is in a golden age, with great progress being made in many areas. Although we hope this current collection of experimental protocols will be useful for some time, we have no doubt that new technologies and conceptual advances will emerge that shift the

focus and approaches employed in the field in the years to come. It is the rapidity of progress, detail of mechanistic insight, and ever-changing scientific process, combined with a field full of talented and largely collaborative people, that makes us optimistic that the future of *Drosophila* neurobiology research is bright.

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