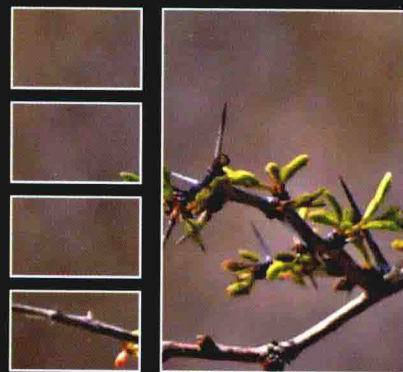
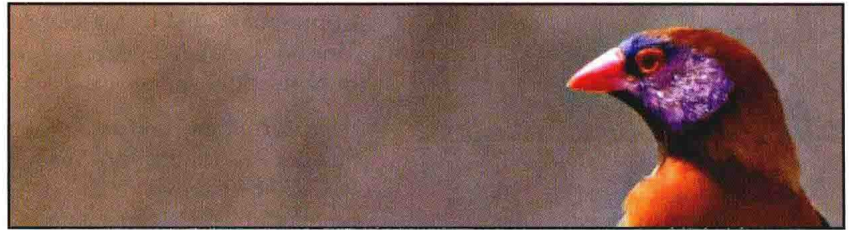


An Introduction to
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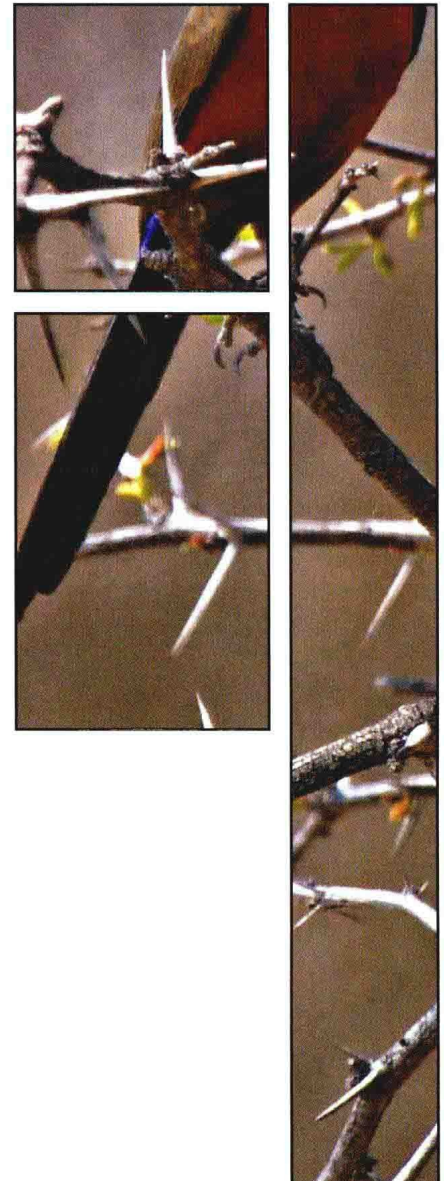
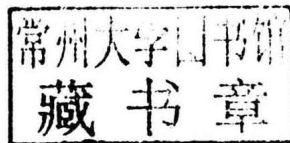
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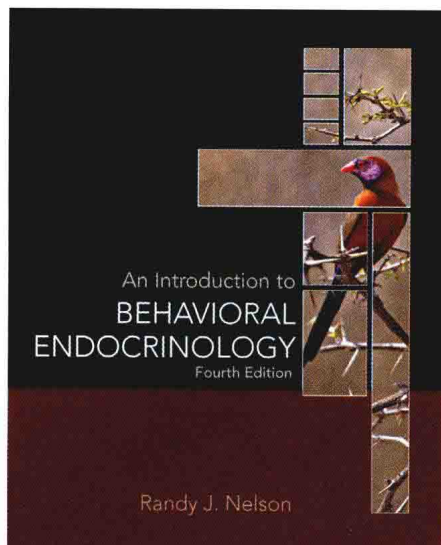
An Introduction to
**BEHAVIORAL
ENDOCRINOLOGY**
Fourth Edition



Randy J. Nelson
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The Cover

The cover photo is a male violet-eared waxbill (*Uraeginthus granatina*), a brilliantly colored territorial finch that lives in male–female pairs. Violet-eared waxbills are native to West and South Africa. These birds have been used to identify the neuropeptides involved in social behaviors and social grouping. For example, mesotocin (an avian homologue of oxytocin) receptors are more prevalent in the dorsal lateral septum among flocking species than among violet-eared waxbills, a species that tends to avoid large groups. Understanding the receptor distribution of hormones in the nervous system is critical to understanding how hormones affect behavior.

An Introduction to Behavioral Endocrinology, Fourth Edition

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Behavioral Endocrinology

For Courtney, Morgan, and Justin...again.

Preface

It is the last day of May 2011 and it is a time for reflection. How has the field of behavioral endocrinology changed since I published the first edition of this book in 1995? As I submit the final parts of my fourth edition manuscript to the publisher, I think of how the genomic revolution has influenced this field. This edition has required updating in how genomics has influenced the approaches used in the study of behavioral endocrinology. No matter how well the genetics, molecular signaling pathways, or endocrine interactions are characterized, it is important to understand the antecedents of behavior. What is the role of the behavior in the context of how individuals have evolved to survive and reproduce in specific environmental and temporal niches?

The field of behavioral endocrinology is a truly interdisciplinary effort. It involves the study of phenomena ranging from genetic, molecular, and cellular levels of analysis to the study of individual and social behaviors. I had several goals when I began writing the fourth edition of this textbook, one of which was to continue to present information about the interactions between hormones and behavior from diverse perspectives. I also want to provide students with more-detailed information about the scientists who laid the foundation for our modern studies of behavioral endocrinology. I have tried to present current hypotheses and theories in the context of their historical origins. Naturally, after six years, the book needed some general updating to remain useful, and I have endeavored to update all chapters to reflect current studies and information. Some areas, such as body mass regulation and circadian rhythm research, are moving forward with rapid advances announced weekly.

One criticism that I have received in the past, especially from my colleagues teaching in Psychology departments, is that I have too much comparative work in the text. This is a criticism that I continue to happily ignore. The comparative perspective is what gives behavioral endocrinology great strength, and has revealed some of the most fascinating discoveries in our field using nontraditional animal models. I present this broad comparative approach in this edition. It is my hope that presenting adaptive function along with molecular and physiological mechanisms will yield greater understanding than presenting either approach alone.

I appreciate that many behavioral endocrinology students will be psychology majors. Thus, I have tried to keep the conceptual issues clear, and provide only sufficient details and examples that support the concepts. New to this edition is an outline and discussion of the main points for each chapter

to help guide students through the text. My assumption is that psychology students will have taken a course in biopsychology or neuroscience by the time they encounter this textbook, but again, I have tried to keep discussions of endocrine physiology and biochemistry to a minimum level necessary to understand the hormone–behavior interactions being discussed. Because students are likely to be familiar with the behavior of common animals such as dogs and rabbits, I have continued to use these animals as examples to help explain many concepts in this text. New to this edition is a student website that contains some wonderful videos and animations, which I hope help illustrate some of the behavioral and physiological concepts discussed in the text. Also new to this edition is the addition of color graphics that I hope will help clarify principles.

Several topics had to be omitted or curtailed in the text. I assume that professors will use additional readings to make up for any deficiencies. Some topics covered in the text are controversial and will likely stimulate class discussions. At the end of each chapter are some questions for discussion that I hope will be potential starting points for such exchanges. A short, updated list of suggested readings is also provided at the end of each chapter where students can find reasonably current and more detailed information on the material in each chapter.

This is a very exciting time to be studying this field, either as a student or as a researcher in behavioral endocrinology. I hope that I have captured for the reader at least a fraction of the excitement of this field that I have enjoyed. ■

Randy J. Nelson

May 2011

Acknowledgments

Completion of a textbook requires input from students, colleagues, editors, artists, production editors, photo editors, composers, and friends. There are so many people to thank who provided remarkable assistance to me as I worked on this edition. I remain profoundly grateful to the reviewers and colleagues who provided feedback and assistance that shaped the first three editions. These individuals include: Elizabeth Adkins-Regan, Gregory Ball, Jacques Balthazart, Tim Bartness, George Bentley, Dan Bernard, Staci Bilbo, Eric Bitman, Elliott Blass, Jeff Blaustein, Joan Blom, Robert Bridges, Sue Carter, Joe Casto, Silvana Chiavegatto, Nicky Clayton, Lique Coolen, Tara Craft, David Crews, James Dabbs, Greg Demas, Courtney DeVries, Don Dewsbury, Debbie Drazen, Lori Flanagan-Cato, Alison Fleming, Nancy Forger, Karyn Frick, Stephen Gammie, Erica Glasper, Paul Gold, Bruce Goldman, Elizabeth Gould, David Gubernick, Tom Hahn, Joyce Hairston, Andrew Hotchkiss, Elaine Hull, Sabra Klein, Rosemary Knapp, Lance Kriegsfeld, Michael Leon, Joe Lonstein, Vicky Luine, Margaret McCarthy, Martha McClintock, Jim McGaugh, Lynn Martin, Chris Moffatt, Celia Moore, Michael Moore, Gretchen Neigh, Kathie Olsen, David Olton, Deb Olster, Vladimir Pravosudov, Brian Prendergast, Leah Pyter, Emilie Rissman, Mike Romero, Jay Rosenblatt, Ed Roy, Ben Sachs, Randall Sakai, Jen Sartor, Jill Schneider, Barbara Sherwin, David Shide, Rae Silver, Cheryl Sisk, Chuck Snowdon, Judith Stern, Brian Trainor, Anjali Trasy, George Wade, John Wingfield, Amy Wisniewski, Ruth Wood, Pauline Yahr, Kelly Young, Zachary Weil, and Irving Zucker.

I am especially grateful for assistance during the preparation of this fourth edition by many colleagues, who provided helpful, insightful, direct, critical, and immensely kind comments including Elizabeth Adkins-Regan, Noah Ashley, Greg Ball, Jacques Balthazart, Andy Bass, Tracy Bedrosian, Jeff Blaustein, Frances Champagne, Nicky Clayton, David Crews, Jill Daniel, Greg Demas, Courtney DeVries, Gary Dohanich, Alison Fleming, Laura Fonken, Karyn Frick, Stephen Gammie, Jim Goodson, Achikam Haim, Eric Herzog, Kim Huhman, Ellen Ketterson, Kelly Klump, Lance Kriegsfeld, Al Lewy, Joe Lonstein, Vicky Luine, Bob Mason, Ignacio Moore, John Morris, Karl Obrietan, Michael Romero, Heather Rupp, Randall Sakai, Jill Schneider, Brian Trainor, Sari van Anders, Amy Wisniewski, James Walton, Zachary Weil, Gary Wenk, John Wingfield, and Irving Zucker. I attempted to incorporate virtually all of these reviewers' suggestions for changes into this new edition. Occasionally, because of stubbornness, laziness, or other negative traits on my part, I failed to address my friends' and colleagues' suggestions. Any and all remaining errors, sources of confusion, or other shortcomings in this new edition remain my sole responsibility.

I also thank Tracy Bedrosian, Laura Fonken, Greg Demas, Courtney DeVries, Lance Kriegsfeld, Brian Trainor, James Walton, and Zachary Weil for helping to track down various materials for the revised book manuscript. I remain especially grateful to my many colleagues who kindly provided reprint or preprint copies of their papers, as well as my colleagues and friends who generously provided permission to use their graphic or photographic material in the book or website. Special thanks to Jim Goodson for suggesting the use of the beautiful violet-eared waxbill for the cover image. I am profoundly grateful to individuals who provided extensive reviews and helpful updated text including Jill Daniel, Greg Demas, Gary Dohanich, Jim Goodson, Ellen Ketterson, Jill Schneider, and Zachary Weil who also provided much help in reading and re-reading proofs. Of course, I remain singularly grateful to my colleague, collaborator, and wife, Courtney DeVries, who has been supportive during the preparation of all four editions and remains critical only while reading chapter manuscripts, and uncritical at all other times.

I also thank the very hard-working folks at Sinauer Associates. Although only my name appears on the cover, this book is the result of helpful and talented people. I remain grateful for the friendship and guidance provided to me during the first two editions by Pete Farley, and during production of the third edition by Graig Donini. Graig started with the fourth edition of this book, but was completed with the remarkably kind and talented book editor, Sydney Carroll, who assured me that we were “right on schedule” no matter how many deadlines passed. She also led the effort to change format and add color to the production of this edition.

I am grateful to Chelsea Holabird, the production editor, whose excellent eye for detail has helped improve the book. Others who deserved special thanks at Sinauer include Chris Small, production manager; Joanne Delphia, book designer; Joan Gemme, compositor; Elizabeth Morales, artist; David McIntyre, photo editor; and Laura Green, production editor. I remain grateful for having the same outstanding copy editor for the first three editions, Norma Roche, who taught me about clear writing. A new copy editor, Lou Doucette, kindly stepped in to gently fix-up my prose in this edition. I also thank Jason Dirks, the media editor, for his help in designing and implementing the website. This Fourth Edition of the textbook is much improved because of their unrelenting hard work and uncompromising standards.

Finally, I thank the hundreds of undergraduate students who have taken my course in Behavioral Endocrinology over the past 25 years. They have provided many helpful suggestions on improving the textbook. The study of the interactions among hormones, brain, and behavior is a fascinating field. If I’m able to convey just a small part of the excitement in this discipline to students, then I’ll consider this book a success. ■

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