

PREFACE

In this text, we offer students an accessible approach to the major principles, mechanisms and controversies in the study of animal behavior. Throughout the book, we use Tinbergen's four questions—causation, survival value, ontogeny, and evolution—to frame animal behavior and to lend coherence to a diverse and highly integrative field of scientific inquiry. We see that same inquiry at the heart of the discipline, so we emphasize how to test hypotheses about animal behavior, and we encourage students to think critically about experimental evidence.

We take stands on controversial issues in this book and have clearly expressed our point of view in scientific interpretations. We do not expect faculty members who teach animal behavior courses to agree with all of our interpretations. (Indeed, the two of us have had some lively discussions about some of these topics as the work has progressed!) Instead, we see areas of disagreement as pedagogical tools to help students understand that not all scientific issues are settled. In fact, we have highlighted those unsettled areas, because a textbook is not a compendium of absolute knowledge; it is a snapshot of current scientific understanding. We encourage faculty and students who use this textbook to approach our statements critically, and to ask how further hypothesis testing will improve knowledge and understanding.

Every field has a history, but the history of animal behavior is particularly informative because it teaches us so much about how scientists sort through controversy and learn, collectively, how to think critically. It also tells us why we are only now asking questions that might have been off-limits to earlier workers. We therefore begin this book with a brief overview of that history. Then, because evolution is, famously, that thing without which nothing in biology makes sense, we follow history with a refresher on evolution. In our experience as teachers, we have realized that such a refresher is often desirable.

After this introductory chapter, our approach flows from the physiological and genetic underpinnings of behavior (Chapters 2 and 3) through behavioral concerns of individual animals to the complexities of social behavior (Chapters 13 and 14). Chapters 2 and 3 provide ample foundation for mechanisms-oriented animal behavior courses and offer background for students in courses that do not emphasize mechanisms. Building on mechanisms, we consider behavioral homeostasis (Chapter 4). Learning (Chapter 5) and cognition (Chapter 6) are aspects of animal behavior that link neural processes with the behavior of the animal itself. An understanding of communication (Chapter 7) involves not only the underlying mechanisms, but the behavior of at least two participants. Midway through the book a study of orientation and migration (Chapter 8) builds a bridge from mechanisms to behavioral ecology. Behavioral ecologists will find contemporary coverage of the key elements of behavioral ecology in chapters on foraging (Chapter 9), self-defense (Chapter 10), mating systems (Chapter 11), parenting (Chapter 12), and social behavior (Chapters 13 and 14). Chapter 15 introduces the exciting—and essential—field of conservation behavior.

In our coverage, we recognize two emerging topics in animal behavior, cognition (Chapter 6) and conservation (Chapter 15), with full chapters. Cognition presents engaging and difficult hypotheses that will challenge our students, perhaps more than any other topic in animal



behavior. Given societal debates over our relationships with animals and the ethics of maintaining animals in farms, zoos, and human households, our chapter on cognition provides a timely overview of the scientific evidence in that field. Cognition is one of the Next Big Topics in animal behavior and reveals some dimly lit areas of the discipline; we invite students to step onto the ground floor of an area of study that in the future will likely revolutionize our concept of and relationship with animals.

As for conservation, there is no denying that many species are in peril. Effective animal conservation programs can exist only with a thorough understanding of the behavior of the species that the programs seek to save. In our experience, community, ecosystems, and landscape-level ecologists often give short shrift to the importance of animal behavior in making conservation choices, and in so doing, they run the risk of failure. Effective conservation programs require knowledge of foraging behavior, mating systems, dispersal and migration. Successful release of captive-reared animals—an increasingly important strategy in saving endangered species—requires substantial knowledge of animal learning, ranging from imprinting to learned aspects of foraging and anti-predator behavior. We offer the last chapter of this text as a platform for integrating behavior and conservation, and hope to inspire a generation of students to use behavior as a conservation tool.

The majority of animal behavior students will not go on to careers in animal behavior, but most of them will enjoy the companionship of animals. We have highlighted the behavior of companion animals in special features called "Bringing Animal Behavior Home." This dimension of animal behavior is often important to students but may be overlooked in textbooks intended for animal behavior courses. Teachers of animal behavior courses may opt to cover companion animals, but even if a lecturer does not mention dogs or cats, including them in the text is one more reason for a student to read this book. This material also appeals to pre-veterinary students, who often enroll in animal behavior courses as preparation for their careers.

Because of our emphasis on evolution, we have not strictly excluded humans from our textbook, but neither is human behavior emphasized. Instead, when we do refer to human behavior, it is often in the context of questioning the traditional distinction between non-human animals and humans—a distinction that may be artificial in places, lacking sufficient scientific scrutiny. We explicitly reject an overly simplistic "my-genes-made-me-do-it" approach to behavior in general and human behavior in particular. In asking students to consider the continuum of all living things, we aim to promote critical thinking and a new consideration of traits that we may share with other species as a result of descent from common ancestors.

The laboratory manual that accompanies this text (*Field and Laboratory Exercises in Animal Behavior*) contains proven exercises. We encourage instructors who have not incorporated a laboratory in their course to consider doing so. A successful laboratory experience in animal behavior need not be expensive to present. The laboratory manual puts a strong focus on inquiry-based student participation, developing student strengths in hypothesis testing, and on giving the students hands-on experiences with topics covered in animal behavior courses. The exercises in the manual include a mix of field studies and laboratory studies. The targeted species of the field studies are widespread, and if the species mentioned in the manual does not occur locally, substitutions should be easy. The laboratory studies rely on easily-obtained study animals. The focus is slightly biased to experiments with invertebrate animals; this reduces the burden of obtaining IACUC approval for some of the laboratories. However, the most popular laboratory for our students is a multi-week exploration of *Betta* (Siamese fighting fish) behavior.

This book is an outgrowth of our decades of teaching animal behavior—what we have learned, what we have wished for, where we have found great joy. As we have worked

through this immense undertaking, we have been impressed with the wide-ranging curiosity of our colleagues, friends, and students, and with their willingness to help in so many ways, surpassing our ability to thank them. We are particularly grateful to Ben Pless, Scott Altenbach, Jeff Mitton and Randy Moore, who generously contributed their outstanding photography to this effort, and whose images have proven that the appeal of animal behavior knows no academic boundaries. Thank you to all of our colleagues who took time to read all the chapters and provide us with expert feedback. Your insights and suggestions helped us create a better textbook. We also thank Rebecca von Gillern, whose editorial expertise greatly improved this book.

Michael D. Breed

Janice Moore

December 2010