

Biological Psychology

Fifth Edition

James W. Kalat



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JAMES W. KALAT

North Carolina State University



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Preface

Biological psychology is the most interesting topic in the world. I am sure every professor or textbook author feels that way about his or her own topic. But the others are wrong; this really *is* the most interesting topic. By this statement, I do not mean that memorizing the names of brain parts is more interesting than memorizing geographical terms or dates in history. I mean that biological psychology's ultimate questions are so profound that they should interest virtually everyone.

Actually, I shall back off enough to acknowledge that cosmology is in the running with biological psychology for having the profoundest questions. Cosmology, the study of the origin of the universe, asks how the universe came to be and why it exists at all. Biological psychology asks why, in a universe composed of matter and energy, conscious experience exists.

My primary goal in writing this text has been to engage readers' interest. I have tried to focus on the biological mechanisms that are most relevant to key issues in psychology—topics such as the mind-body problem, the development of language and learning, sexual behavior, alcoholism, psychosomatic illnesses, anxiety, aggressive behavior, recovery from brain damage, depression, and schizophrenia. I hope that by the end of the book readers will no longer be asking, "What does all this brain stuff have to do with real psychology?" I hope they will understand that this brain stuff *is* psychology.

Every chapter in this text has been revised since the previous edition. The organizational changes are as follows:

- The chapter on development has been moved from Chapter 8 to Chapter 5. It now includes a new module on the evolution of the brain. The module on development of vision has been moved to the vision chapter, and the module on abnormalities of development has been deleted, with parts of it moved to other sections of the text.
- The order of the chapters on vision and nonvisual senses has been reversed, so that vision now comes first.
- The chapter on lateralization and language has been moved from Chapter 5 to Chapter 14. It has moved around quite a bit from one edition to the next. Instructors who like to discuss it early in the course will find that they can still do so; it does not presuppose a great deal of background. In fact, I know of at least one professor who assigns this chapter first, as a way of grabbing students' interest at the start of the semester.

All chapters except Chapter 1 are divided into modules, each beginning with its own introduction and finishing with its own summary and questions. This organization makes it easier for instructors to assign part of a chapter per day

instead of assigning a whole chapter per week. An instructor can also omit a given module or ask students to read the modules in an order different from the one I have used.

Instructors adopting this text for classroom use may obtain from the publisher a copy of the Instructor's Manual, written by Thomas Stonebraker of Greenville College. Contained in the manual are approximately two thousand multiple-choice test items, which are also available on diskette for IBM and Macintosh computers. Also available is a set of overhead transparencies. A Study Guide, written by Elaine Hull of SUNY-Buffalo, is available for student purchase. I am grateful for the excellent work of Stonebraker and Hull.

Packaged free with every new copy of the text is a brief *Dictionary of Biological Psychology*. Useful as a reference for students who are writing papers or studying for exams, this dictionary is also available at a nominal price for students purchasing used copies of the text.

Also available for your biological psychology course is Timothy Teyler's software program *The Graphic Brain: Neurophysiology*. This courseware includes three hours of computer-animated presentations of physiological functions that are difficult to convey via print alone. It is sold on a single-user basis for professors who wish to use it for in-class demonstrations and on a site-license basis for student review in a computer lab. Selected modules from the full program are also available for sale in *The Graphic Brain: Student Edition*, which includes specific references to appropriate pages in *Biological Psychology*, Fifth Edition. In this text, you will notice computer icons in the margins; these indicate the relevant modules of *The Graphic Brain: Student Edition*. To purchase a copy of *The Graphic Brain*, contact the Brooks/Cole fulfillment center at 1-800-354-9706. For information or site-license purchases, call Brooks/Cole marketing at 1-800-354-0092.



Let me tell you something about researchers in this field: As a rule, they are amazingly cooperative with textbook authors. A number of my colleagues have sent me comments, ideas, and published materials; others supplied me with photos for use in this text. I thank especially Israel Abramov, Brooklyn College; Jeffrey Alberts, Indiana University; Suzanne Corkin, Massachusetts Institute of Technology; Terence Deacon, MacLean Hospital; Gary H. Duncan, University of Montreal; Bart Hoebel, Princeton University; Dennis M. D. Landis, Case Western Reserve University; John Liebeskind, UCLA; Jacqueline Ludel, Guilford College; Merriel Mandell, United States International University; Morris Moscovitch, Erindale College of the University of Toronto; Jim Murphy, Indiana University-Purdue University at Indianapolis; Roberto Refinetti, College of William and Mary; Duane Rumbaugh and Sue Savage-Rumbaugh, Georgia State University; Carla Shatz, Stanford University; Thomas Scott, University of Delaware; and Byron Ward, Villanova University.

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After preparing the first four editions with Wadsworth Publishing Company, this is the first edition I have written with Wadsworth's sibling company, Brooks/Cole. I have been most fortunate to work with Jim Brace-Thompson, who has been a very helpful and supportive editor. Kirk Bomont of Brooks/Cole and Margaret Pinette and Richard Lange of GTS Graphics have done an excellent job of overseeing the production of this edition; I am grateful to have had

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Thanks to my wife, Ann, and my daughter, Robin, who listened every time I wanted to talk about the latest thing I had read. And thanks to my department head, David Martin, for his support and encouragement.

I welcome correspondence from both students and faculty. Write: James W. Kalat, Department of Psychology, Box 7801, North Carolina State University, Raleigh, NC 27695-7801. Fax: (919) 783-7468. E-mail: kalat@poe.coe.ncsu.edu.

James W. Kalat

THE GLOBAL ISSUES OF BIOLOGICAL PSYCHOLOGY



A biological psychologist tries to explain any behavior, such as the behavior of this mother gorilla toward her baby, not in terms of subjective experiences like "love" but in terms of its physiology, its development, its evolution, and its function. (Photo courtesy of the Cincinnati Zoo.)

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CHAPTER ONE

MAIN IDEAS

1. Biological psychologists seek to explain behavior in terms of its physiology, its development, its evolution, and its function.
2. Mind and brain are closely related, but we do not know the exact nature of their relationship or what mind really is. Both philosophers and scientists would like to know whether minds could exist independently of brains, whether brains could function equally well if they did not give rise to minds, and what aspects of brain activity are responsible for conscious experience.
3. Direct electrical stimulation of the brain can induce behavioral changes and subjective experiences. Studies of electrical stimulation of the brain provide strong evidence that the brain is responsible for mental activity.
4. Many experiments in biological psychology use animal subjects. Some of those experiments inflict pain or distress. The ethics of such experiments has become controversial.

It is often said that Man is unique among animals. It is worth looking at this term "unique" before we discuss our subject proper. The word may in this context have two slightly different meanings. It may mean: Man is strikingly different—he is not identical with any animal. This is of course true. It is true also of all other animals: Each species, even each individual is unique in this sense. But the term is also often used in a more absolute sense: Man is so different, so "essentially" different (whatever that means) that the gap between him and animals cannot possibly be bridged—he is something altogether new. Used in this absolute sense the term is scientifically meaningless. Its use also reveals and may reinforce conceit, and it leads to complacency and defeatism because it assumes that it will be futile even to search for animal roots. It is prejudging the issue.

Niko Tinbergen (1973)