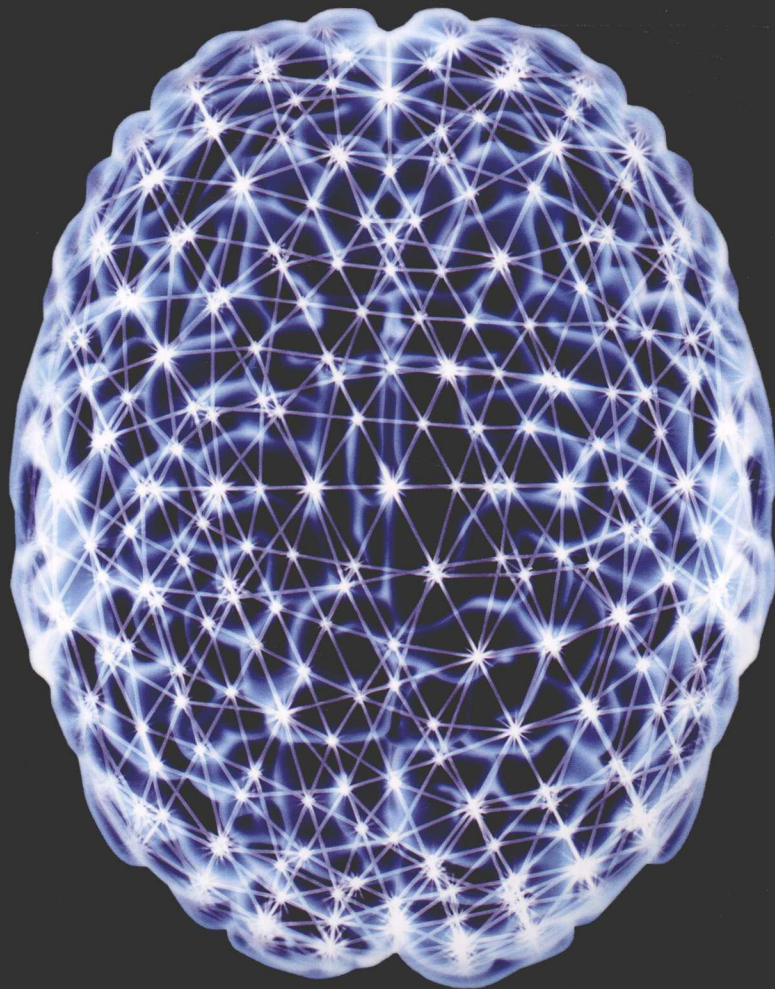


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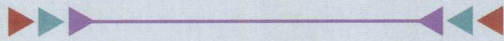
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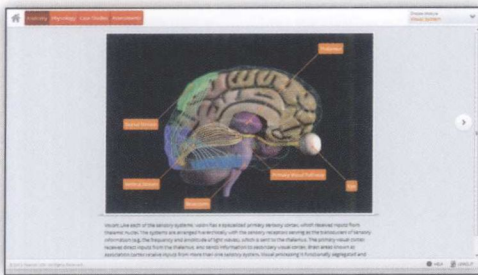
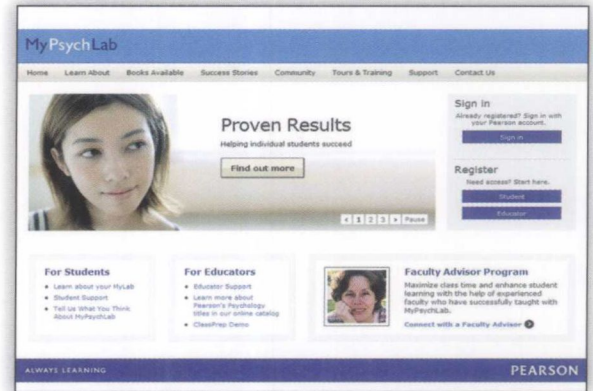
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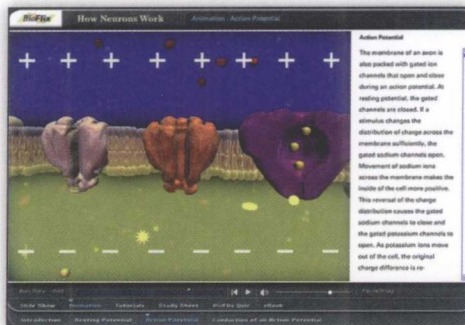
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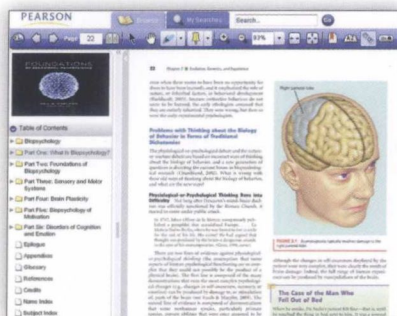
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# PREFACE

---

All my life I have wanted to know how things work. When I was a boy I took apart alarm clocks, radios, my mother's sewing machine, and other interesting gadgets to see what was inside. Much to my parents' relief, I outgrew that habit (or at least got better at putting things back together), but my curiosity is still with me. Since my college days, I have been trying to find out all I can about the workings of the most intricate piece of machinery that we know of: the human brain.

The field of neuroscience research is a very busy and productive one today. A large number of scientists are trying to understand the physiology of behavior, using more and more advanced methods, yielding more and more interesting results. Their findings provide me with much to write about. I admire their dedication and hard work, and I thank them for giving me something to say. Without their efforts I could not have written this book.

I wrote the first edition of this book at the request of my colleagues who teach the course and wanted a briefer version of *Physiology of Behavior* with more emphasis on research related to humans. The first part of this book is concerned with foundations: the history of the field, the structure and functions of neurons, neuroanatomy, psychopharmacology, and methods of research. The second part is concerned with inputs: the sensory systems. The third part deals with what might be called "motivated" behavior: sleep, reproduction, emotion, and ingestion. The fourth part deals with learning and verbal communication. The final part deals with neurological and mental disorders.

## New to This Edition

Of course, all chapters in this book have been revised. My colleagues keep me busy by providing me with interesting research results to describe in my book. The challenge is always to include the interesting new material without letting the length of the book get out of hand.

The following list includes some of the information that is new to this edition:

- Role of prion proteins in normal brain development
- Research on optogenetic methods to restore sight in blinded animals
- Congenital amusia
- Increased auditory input to the visual cortex in blind people
- Musical processing in the brains of newborn infants
- Neural mechanisms of homeostatic, allostatic, and circadian factors in control of sleep
- Role of kisspeptin in onset of puberty
- Role of the ventromedial prefrontal cortex in extinction of conditioned emotional responses
- Role of 5-HT in moral judgments
- Cross-cultural recognition of nonverbal emotional vocalizations
- Identification of osmoreceptors involved in thirst
- Research on genes involved in regulation of body weight
- Role of PKM-zeta in long-term potentiation and learning
- Role of place cells, grid cells, head-direction cells, and border cells in spatial learning
- Research on brain mechanisms of recognition of people's voices
- Research on universal features of written languages
- New section on traumatic brain injury
- Mirror neurons and therapy after stroke
- Research on use of small interfering RNA for treatment of Huntington's disease
- Role of prion-like transmission of misfolded A $\beta$  in Alzheimer's disease
- Trial of gene delivery to the basal ganglia to treat Parkinson's disease



- Role of glial infection in AIDS dementia complex
- Role of DISC1 mutation in schizophrenia and depression
- Effect of season of birth on development of depression
- Effects of oxytocin on social interaction in autistic disorders
- Role of COMT gene in susceptibility to PTSD
- Treatment of PTSD with TMS
- Role of MCH and orexin in the appetite-reducing effects of nicotine
- Role of alleles of the  $\alpha 5$  ACh gene in nicotine addiction
- Research on the use of DBS and TMS in treatment of drug addiction

## Strategies for Learning

This theme of strategies for learning, which runs throughout the book, was created to help apply the research findings of behavioral neuroscience to daily life. For example, in Chapter 1 you will find a section called *Strategies for Learning*; and in Chapter 5, *Methods and Strategies of Research*, you will find that you are not faced with a bewildering list of research methods; instead, you are led through a set of hypothetical investigations organized the way that a research project might proceed. Each step in an investigation illustrates a particular procedure in the context in which it would be applied in an ongoing program.

The following sections in each chapter provide an overview of the chapter as well as a convenient review of the subjects covered.

- **LEARNING OBJECTIVES.** Each chapter begins with a list of Learning Objectives that also serve as the framework for the study guide that accompanies this text.
- **PROLOGUE.** Each chapter opens with a Prologue that contains the description of an episode involving a neurological disorder or an issue in neuroscience.
- **EPILOGUE.** At the end of the chapter, an Epilogue resolves the issues raised in the Prologue, discussing them in terms of what the reader has learned in the chapter, or it introduces a related topic.
- **SECTION SUMMARY.** A Section Summary follows each major section of the book. The summaries not only provide useful reviews, but they also break each chapter into manageable chunks.
- **THOUGHT QUESTIONS.** Most Interim Summaries are followed by Thought Questions. The questions provide students with an opportunity to think about what they have learned in the previous section.
- **KEY TERMS.** Definitions of Key Terms are printed in the margin on the page in the text where the terms are first discussed or on a facing page. For terms that might be difficult to pronounce, a pronunciation guide is included with the definition.
- **KEY CONCEPTS.** Each chapter ends with a Key Concepts section that provides a quick review of the topics discussed in the chapter.

## Pedagogically Sound Art

Jay Alexander, of I-Hua Graphics, prepared the illustrations in this book. Jay and I have been working together on my books for several years. I think the result of our collaboration is a set of clear, attractive, and pedagogically effective illustrations.

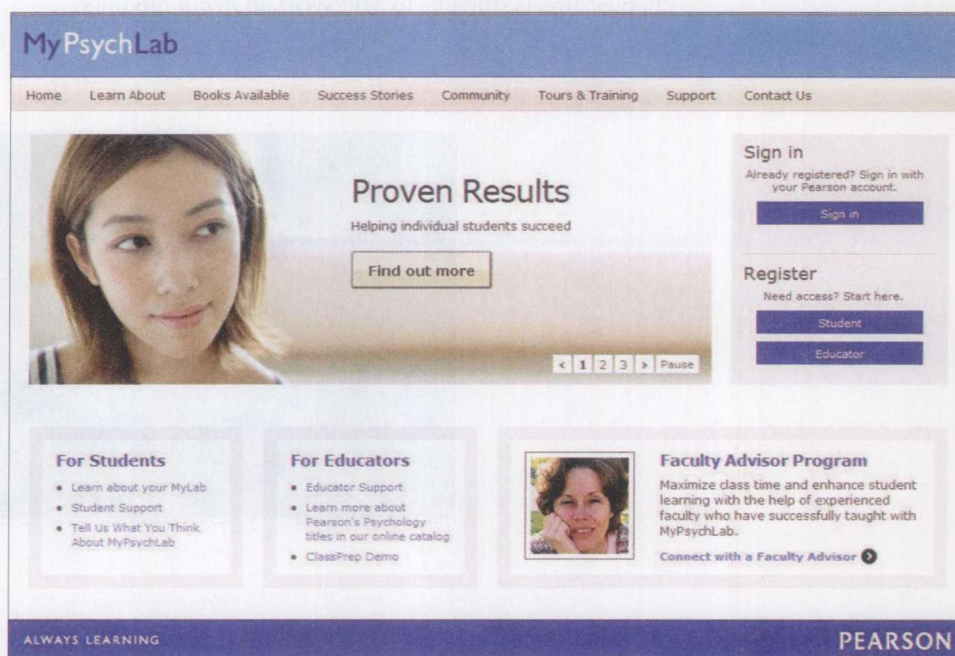
## Resources for Instructors

Several supplements are available for instructors who adopt this book.



- **INSTRUCTOR'S MANUAL** (ISBN 0-205-94035-8) Written by Scott Wersinger, State University of New York at Buffalo, this manual provides a tool for classroom preparation and management. Each chapter includes an Integrated Teaching Outline with teaching objectives, lecture material, demonstrations and activities, handouts, videos, suggested readings, web resources, and information about other supplements. Available online at [www.pearsonhighered.com/irc](http://www.pearsonhighered.com/irc).
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- **POWERPOINT SLIDES** (ISBN 0-205-94034-X) Created by Grant McLaren, Edinboro University of Pennsylvania, this interactive tool facilitates the development of lectures and the encouragement of classroom discussions by pairing key points covered in the chapters with images from the text. For this edition, the slides have been enhanced with even more visual appeal to engage students. Available online at [www.pearsonhighered.com/irc](http://www.pearsonhighered.com/irc).

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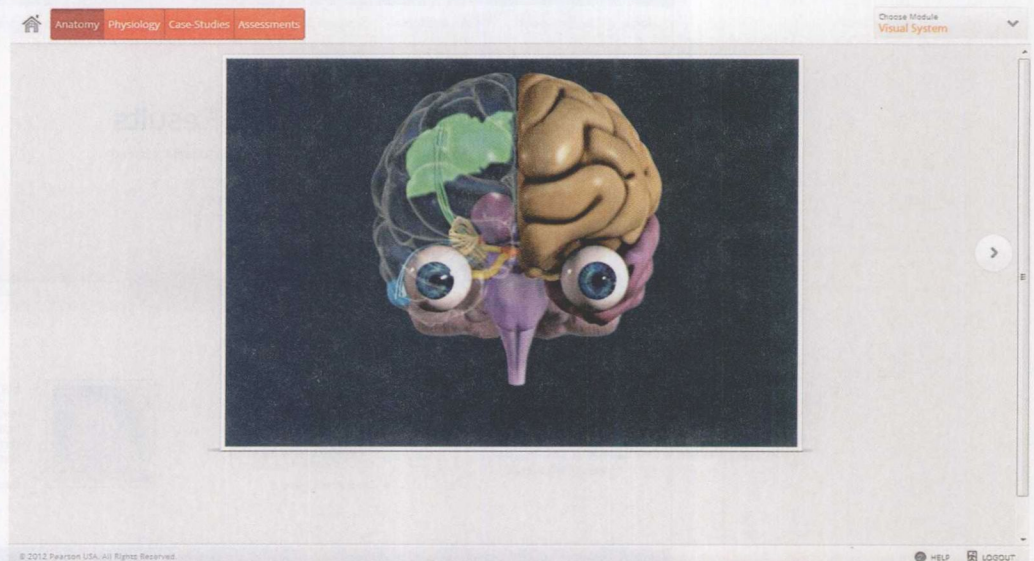
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- **MYPsYCHLAB MARGIN ICONS.** Margin icons guide students from their reading material to relevant videos and simulations.

The new *MyPsychLab Brain* is an interactive virtual brain designed to help students better understand neuroanatomy, physiology, and human behavior. Fifteen new modules bring to life many of the most difficult topics typically covered in the biopsychology course. Every module includes sections that explore relevant anatomy, physiological animations, and engaging case studies that bring behavioral neuroscience to life. At the end of each module, students can take an assessment that will help them measure their understanding. This hands-on experience engages students and helps make course content and terminology relevant. References throughout the text direct students to content in MyPsychLab, and a new feature at the end of each chapter directs students to *MyPsychLab Brain* modules.



## In Conclusion

Trying to keep up with the rapid progress being made in neuroscience research poses a challenge for teachers and textbook writers. If a student simply memorizes what we believe at the time to be facts, he or she is left with knowledge that quickly becomes obsolete. In this book I have tried to provide enough background material and enough knowledge of basic physiological processes that the reader can revise what he or she has learned when research provides us with new information.

I designed this text to be interesting and informative. I have endeavored to provide a solid foundation for further study. Students who will not take subsequent courses in this or related fields should receive the satisfaction of a much better understanding of their own behavior. Also, they will have a greater appreciation for the forthcoming advances in medical practices related to disorders that affect a person's perception, mood, or behavior. I hope that people who read this book carefully will henceforth perceive human behavior in a new light.



## Acknowledgments

Although I must accept the blame for any shortcomings of the book, I want to thank colleagues who helped me with this book by sending reprints of their work, suggesting topics that I should cover, sending photographs that have been reproduced in this book, and pointing out deficiencies in the previous edition. I thank the following reviewers for their comments on this edition:

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## To the Reader

I hope that in reading this book you will come not only to learn more about the brain but also to appreciate it for the marvelous organ it is. The brain is wonderfully complex, and perhaps the most remarkable thing is that we are able to use it in our attempt to understand it.

While working on this book, I imagined myself talking with students, telling them interesting stories about the findings of clinicians and research scientists. Imagining your presence made the task of writing a little less lonely. I hope that the dialogue will continue. Please write to me and tell me what you like and dislike about the book. My e-mail address is [nrc@psych.umass.edu](mailto:nrc@psych.umass.edu). If you write to me, we can make the conversation a two-way exchange.

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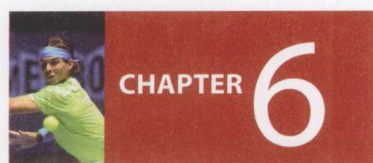
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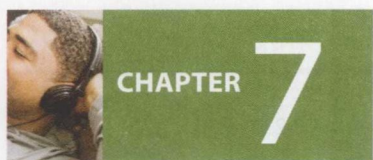
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