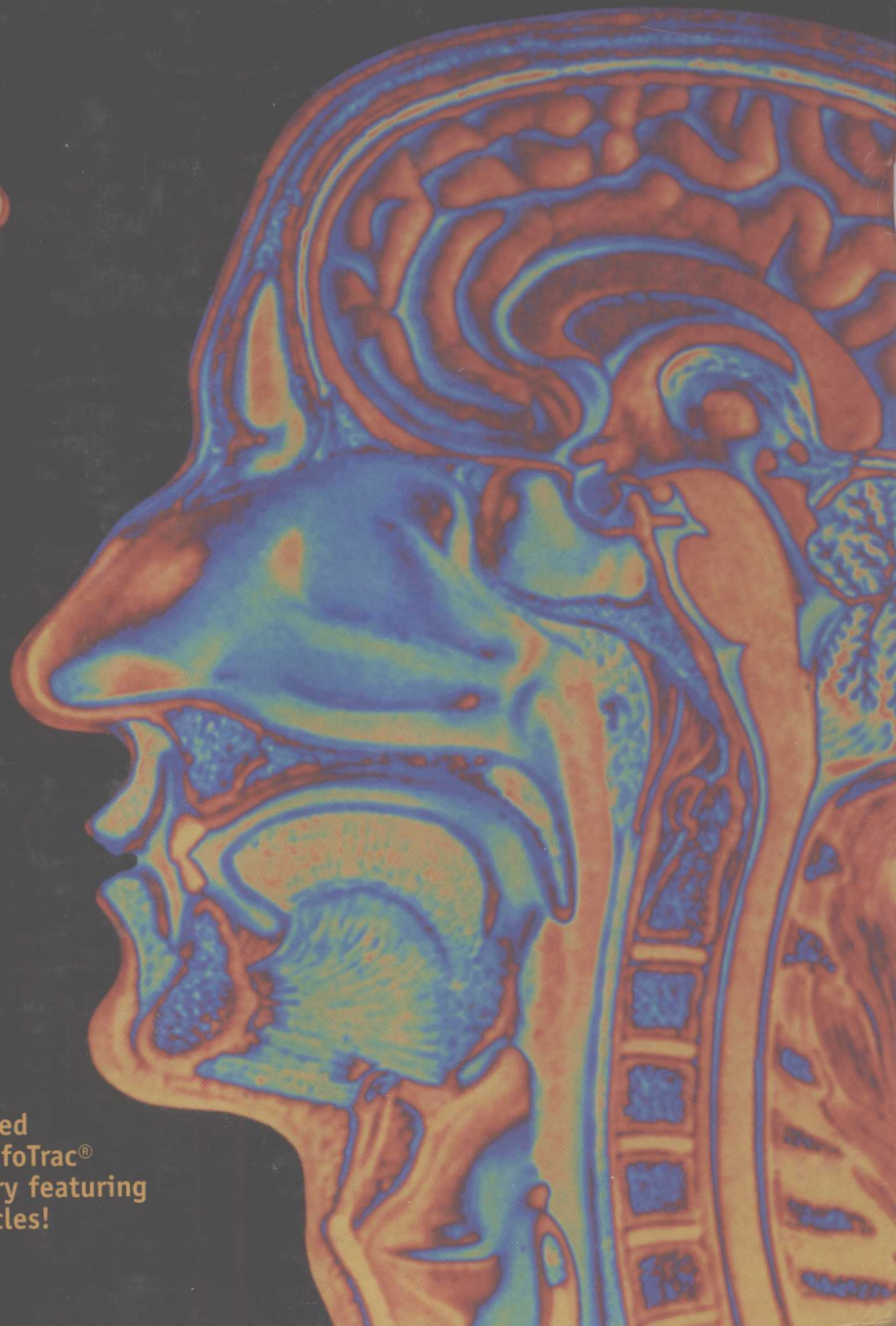
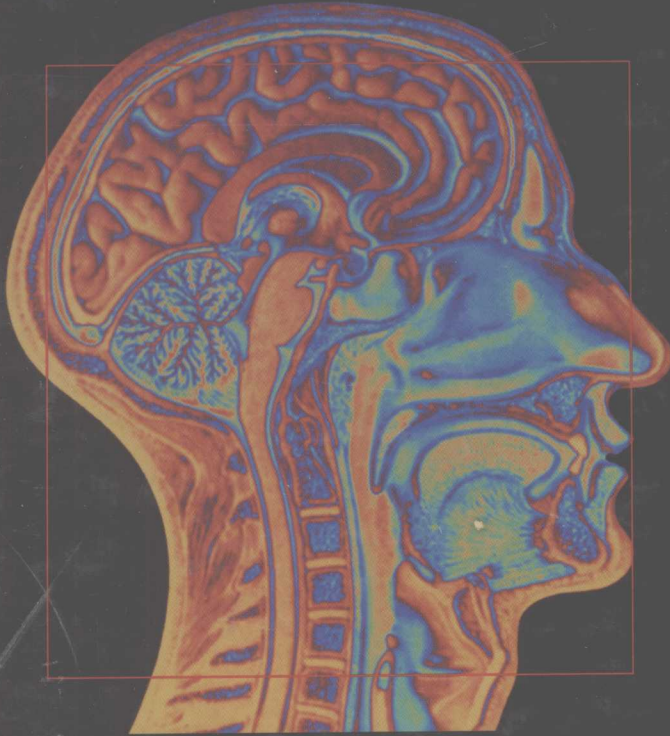


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James W. Kalat



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James W. Kalat

North Carolina State University

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Preface

In the first edition of this text, published 20 years ago, I remarked, “I almost wish I could get parts of this text . . . printed in disappearing ink, programmed to fade within ten years of publication, so that I will not be embarrassed by statements that will look primitive from some future perspective.” Biological psychology progresses rapidly, and many statements become out of date in fewer than 10 years. Perhaps I could get this book stamped, like grocery items, “Best if used by this date . . .” The alternative is to publish frequent new editions.

The most challenging aspect of writing a text is selecting what to include and what to omit. My primary goal in writing this text has been to engage readers’ interest. I have focused on the biological mechanisms relevant to key issues in psychology, such as language, learning, sexual behavior, anxiety, aggression, abnormal behavior, and the mind-body problem. I hope that by the end of the book readers will clearly see what the study of the brain has to do with “real psychology” and that they will be interested in learning more.

Each chapter is divided into modules; each module begins with its own introduction and finishes with its own summary and questions. This organization makes it easy for instructors to assign part of a chapter per day instead of a whole chapter per week. Parts of chapters can also be covered in a different order. (Indeed, of course, whole chapters can be taken in different orders. I know one instructor who likes to start with Chapter 14.)

I assume that the reader has a basic background in psychology and biology and understands such basic terms as classical conditioning, reinforcement, vertebrate, mammal, gene, chromosome, cell, and mitochondrion. Naturally, the stronger the background, the better. I also assume a high-school chemistry course. Those whose memories of chemistry have faded may consult Appendix A for a review.

Changes in This Edition

The changes in this text are my attempt to keep pace with the rapid progress in biological psychology. There are about 500 new references from 1997 through 2000 and countless major and minor changes, including new

or improved illustrations and a redesigned layout. Here are some highlights:

General

- Definitions of key terms are highlighted in blue ink. (They also appear in the combined glossary/index at the back of the text.)
- Previous editions had Review Questions at the end of each module, without answers. This edition has Stop and Check Questions at certain points within the text, with answers at the end of the module.
- Key Terms and Suggestions for Further Reading are now at the end of the chapter instead of the end of the module.
- Web Sites to Explore also are listed at the end of the chapter. A reader can go to the publisher’s Web site for this text and click on these other suggested Web sites, which will be updated periodically.
- The module on methods was deleted from Chapter 4. Each method is presented in a new Methods heading where it first becomes relevant.

Chapter 1

- The new first module presents an overview of the goals and methods of biological psychology and then concentrates on the mind-brain issue (which was the Epilogue to the 6th edition).

Chapter 2

- New information indicates the ability of the adult CNS to generate additional neurons in some areas.

Chapter 3

- The module on drugs has many updates and a reorganized order of presentation.
- Material about alcohol abuse was moved to Chapter 15 (disorders).
- A new module on hormones was added here, replacing the section at the start of Chapter 11.

Chapter 4

- The module on research methods was deleted. Each method is now presented at the time it first becomes relevant in the text.
- The section on contralateral neglect after right parietal lobe damage was significantly updated.
- A substantial new section was added on how the various brain areas work together, including the binding problem, which has emerged as a major new research area closely related to the mind-body problem.

Chapter 5

- The Evolution module was deleted; sections of it were moved to Chapters 1, 4, 5, and 14.
- Most of previous Chapter 15 (“Recovery from Brain Damage”) was moved to become the second module of this chapter.
- Accordingly, the chapter title was changed from “Development and Evolution of the Brain” to “Development and Plasticity of the Brain.”
- The section on pathfinding by axons was shortened and simplified.
- A digression on attention-deficit disorder was substituted for the one on Rett syndrome.
- In the Development of the Brain module, note the added section, Proportional Growth of Brain Areas, taken mostly from the Evolution module of the 6th edition.
- The phantom limb discussion was moved from Chapter 7 (nonvisual senses) to here, with ties to the reorganization of the brain.

Chapter 6

- The material from Digression 6.1 (blind spot and blindsight) was removed from the digression and put into two sections of the main text.
- The section on lateral inhibition was rewritten and reillustrated.
- The description of receptive fields was revised.
- The section on building receptive fields was deleted.
- New sections were added on visual attention and visual consciousness.

Chapter 7

- Additions include a new comment on tinnitus as a probable analogue to phantom pain, a digression on tickle sensation, a short section on pain representation in the brain, a short section on individual differences in taste, and sections about supertasters

and about the effects of losing sensation from part of the tongue.

- New Try-It-Yourself demonstrations illustrate taste adaptation and olfactory adaptation.
- The digression on pheromones was moved into the text proper in combination with the vomeronasal organ.

Chapter 8

- The discussion of myasthenia gravis was moved from the third module to just after the mention of nerve-muscle junction in the first module.
- The second module was reorganized to put the motor mechanisms of the cerebral cortex before the cerebellum and the basal ganglia.
- The Role of the Spinal Cord was consolidated into the discussion of the cerebral cortex.
- The section on Movement Coding in the Primary Motor Cortex was deleted.
- Note the new information on heritability of early-onset but not late-onset Parkinson’s disease.
- The discussion on neural transplantation for relief of Parkinson’s disease was updated.
- Also note the new information on the ability of a presymptomatic test to predict the age of onset of Huntington’s disease.

Chapter 9

- The discussion of brain mechanisms and sleep abnormalities was moved to the second module. The discussion of functions of sleep was moved from the first to the third module and theories of dreaming to the third module. Now the second module is mechanisms of wakefulness and sleep; the third module is theories of why we sleep, have REM sleep, and dream.
- A new section, How Light Resets the SCN, is now separate from evidence that the SCN controls circadian rhythms.
- Theories of REM include an increased emphasis on the role of REM in memory and mention of a new theory that REM’s purpose is just to increase oxygen supply to the corneas.
- Information was added on the role of adenosine and prostaglandins.
- A new theory was added on the biology of dreaming.

Chapter 10

- The explanation was expanded concerning why we evolved the body temperature we did.

- Note the new digression on poikilothermic animals that survive temperatures near -40° .
- The discussion of leptin was updated, as was the role of culture in anorexia nervosa.
- A simple list and explanation were substituted for the overcomplicated Table 10.3.

Chapter 11

- The discussion of hormones in general, previously at the start of this chapter, was moved to Chapter 3, where it is now a new module.
- A new digression was added on premenstrual syndrome.
- The various updates include failure to replicate a link between male homosexuality and the X chromosome.
- The discussion of intersexes was updated.

Chapter 12

- The first module was split into two: one on the nature and functions of emotions; the other on stress and health. Each module was expanded.
- Note the new introduction to the chapter and to the first module, highlighting the relationship between emotions and consciousness.
- The discussions were expanded concerning the function of the emotions and the theories of emotion, such as the James-Lange theory.
- The section Where Is Emotion in the Brain? was deleted.
- The discussion of ulcers (present in editions 1–5 but not in 6) was restored with new information.
- The treatment of stress was expanded and updated. Note especially the expanded discussion of cytokines.
- A new section was added on posttraumatic stress disorder.
- The treatment of genetics and aggressive behavior was modified; the influence attributed to genetics could be from either genetics or prenatal environment.
- Two new Try-It-Yourself demonstrations were added: one on facial expressions and emotion; one on anxiety and the startle reflex.

Chapter 13

- The discussion of emotions and the consolidation of memory was updated.
- A new Try-It-Yourself demonstration was added for working memory.

- The first module was reorganized to put all the material about the hippocampus together.
- Several updates were added about Alzheimer's disease, including possible strategies for treatment or prevention.
- The LTP section has many changes, including new, simpler figures.

Chapter 14

- Phrenology was moved from Chapter 4 to a digression in this chapter.
- The section on evolution of language was reorganized, now addressing two questions: What language-type capacities do nonhumans show? Why/how did humans develop language abilities that other species lack? Two hypotheses are discussed: language as a by-product of overall intelligence and language as a special module. (Neither is fully satisfactory.) The material previously titled Genetic Abnormalities of Language and Intellect is now integrated into this discussion; so is some material previously in Chapter 5's Evolution module.
- A new section was added, Is There a Critical Period for Language Learning?
- A new Try-It-Yourself exercise illustrates the inconsistent spelling rules of English, in contrast to Italian. That difference is relevant to brain scan measures of activity during reading.

Chapter 15

- Because previous Chapter 15, "Recovery from Brain Damage," was consolidated into Chapter 5, the final chapter on psychological abnormalities is now Chapter 15 instead of 16.
- A new short module was added on alcoholism, drawn partly from material previously in Chapter 1.
- An update notes that Borna virus predisposes to psychiatric disorders in general, not necessarily to depression.
- The discussion of depression has a new order of presentation, with genetics first.
- A new Try-It-Yourself demonstration illustrates lateralization and depression.
- New data solidify the argument that treatments for bipolar disorder act by blocking certain second-messenger systems.
- In the module on schizophrenia, new data weaken the conclusion that schizophrenia depends on a strong genetic influence. Much of what we have been attributing to genetics could be due to prenatal or early postnatal environment.

Also, new data have accumulated that pose problems for the dopamine hypothesis of schizophrenia and suggest an alternative glutamate hypothesis.

The Epilogue of the 6th edition became part of Chapter 1 in this edition, so this edition has no Epilogue.

Supplements

Instructors who adopt the book may also obtain from the publisher a copy of the Instructor's Manual, written by Cynthia Crawford. The manual contains chapter outlines, class demonstrations and projects, a list of video resources, additional Web sites InfoTrac key terms, and the author's answers to the Thought Questions. The Instructor's Manual also includes a conversion guide prepared by Linda Lockwood. A separate book lists multiple-choice items written and assembled by Maria Lavooy. Note the special file of questions for a comprehensive final exam. The test items are available on disks for IBM and Macintosh computers. The Study Guide, written by Elaine Hull of SUNY, Buffalo, may be purchased by students. Also available are the multimedia products: BioPsychLink and Active Learner Link.

I am grateful for the excellent work of Crawford, Hull, Lavooy, and Lockwood.

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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, USA. E-mail: james_kalat@ncsu.edu

James W. Kalat

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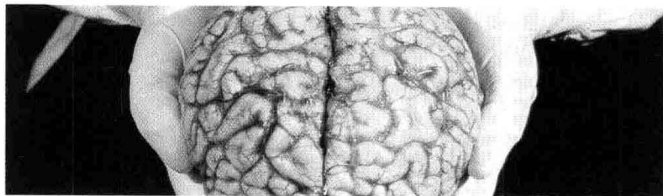
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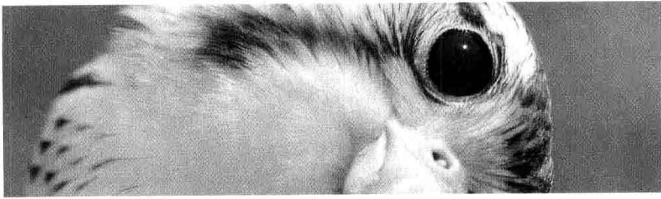
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