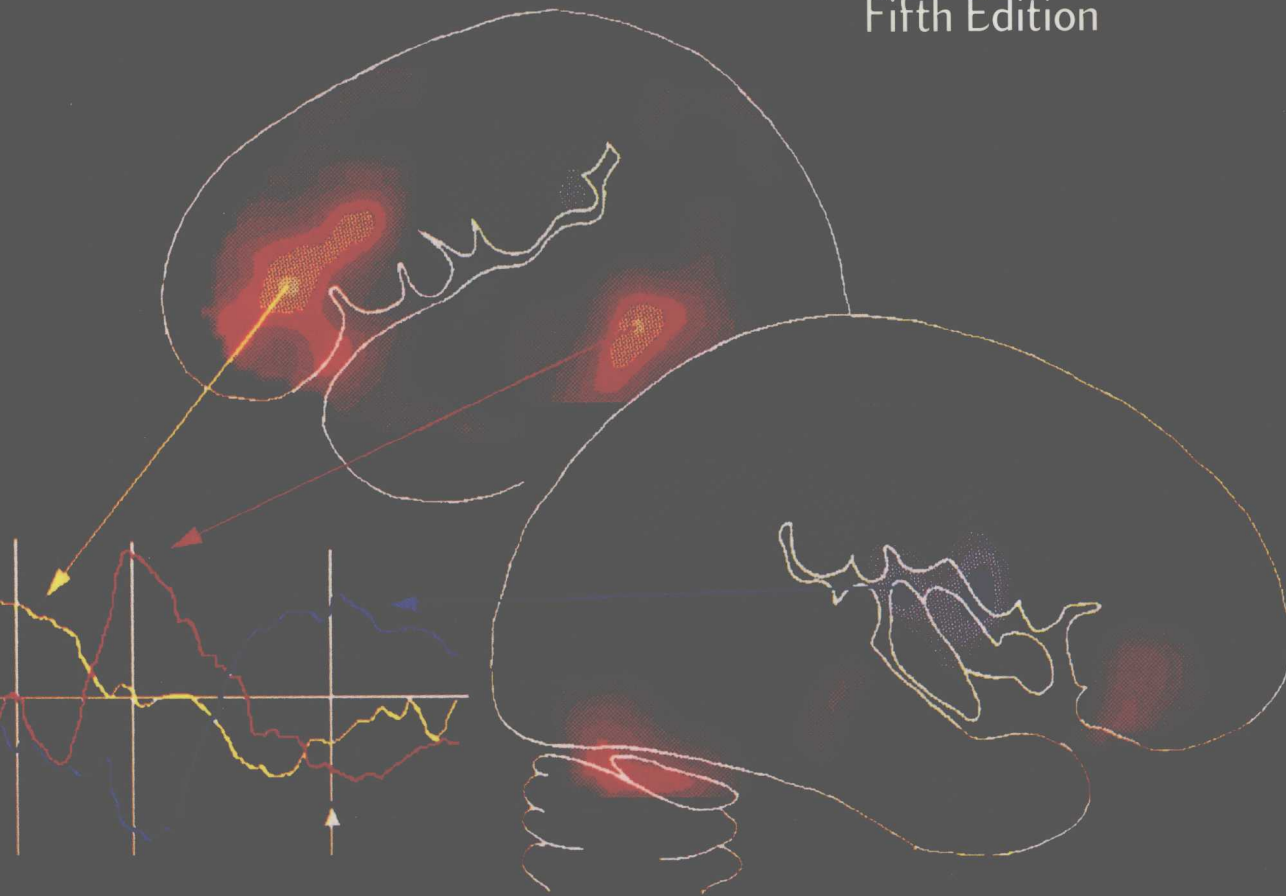
# COGNITION

Fifth Edition



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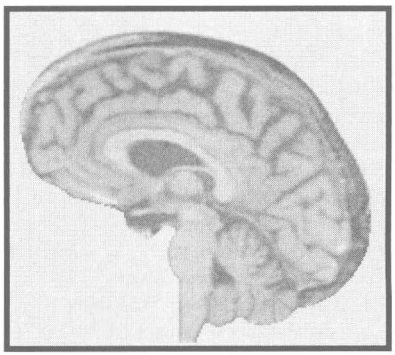

# COGNITION

## Theory and Applications

Fifth Edition

**STEPHEN K. REED**

San Diego State University

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For more information, contact:
**Wadsworth/Thomson Learning**
**10 Davis Drive**
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**International Headquarters**
Thomson Learning
International Division
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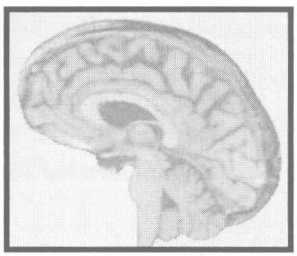


# Preface

## COGNITION IN THE CONTEXT OF EVERYDAY LIFE

The most exciting development in the field of cognitive psychology is not a particular theory or experimental finding but a general trend. Cognitive psychologists have demonstrated an increasing interest in studying complex, real-world tasks and are making significant progress in understanding how people perform on these tasks. I hope that one result of this trend will be that undergraduates discover the direct relevance of cognitive psychology to many of their daily activities.

In this book I have attempted to place a greater emphasis on the application of cognitive psychology than is typically found in an undergraduate text. The study of reading, for example, is discussed in the chapters on pattern recognition, attention, language, and text comprehension. Efficient learning strategies are major topics in the chapters on long-term memory and visual imagery. The chapter on expertise and creativity shows how the study of problem solving is currently being extended to include the kinds of problems students encounter in their courses. The chapter on language discusses how the implications of sentences influence legal testimony and advertising, and the chapter on decision making includes a section on applications to medicine and to emergency situations. In order to help students relate the study of cognition to popular articles they are likely to read, I have included many magazine and newspaper clippings on such contemporary topics as implanting false memories and determining the value of a human life in order to justify life-saving decisions.

## ORGANIZATION OF THE BOOK

The 14 chapters in the book cover a wide range of topics, and instructors should be able to expand on whatever topics interest them. The book is divided into three parts: Information-Processing Stages, Representation and Organization of Knowledge, and Complex Cognitive Skills. Part I consists of an introductory chapter followed by chapters on pattern recognition, attention, short-term working memory, and long-term memory. The

chapters describe what occurs during the different information-processing stages and how the stages interact. Part II contains chapters on memory codes, visual images, categorization, and semantic organization. The first two chapters in this part describe qualitatively different memory codes, and the next two chapters discuss the organization of knowledge in long-term memory. Part III consists of chapters on language, comprehension and memory for text, problem solving, expertise and creativity, and decision making. The discussion of these complex cognitive skills is often related to ideas presented earlier in the book.

The organization of a book on cognition should reflect what we actually know about cognition. Research suggests that a hierarchy is a particularly effective way to organize knowledge (see Chapter 9). Recall is facilitated when information is partitioned into categories, which are further partitioned into smaller categories. Hierarchical organization seems to be particularly effective when the number of partitions varies from two to five. I deliberately selected such a structure for this book in the hope that the material would thereby be more accessible to students.

The fifth edition retains the same organization as the previous editions. One of my objectives in revising the book was to substantially update the material that I had included in the Boxes. In particular, I found that articles in the *APA Monitor* are an excellent source of material that is groundbreaking, very readable, and interesting. Also, I wanted to report on some of the new research that had been done since the publication of the fourth edition. In order not to increase the length of the book, I deleted some information that I thought was less essential.

## NEW MATERIAL

Examples of new material include, in Part I, evidence of the dramatic impact of cognitive theories on the rest of psychology, more information on acoustic codes in rehearsal, enhanced discussion of working memory and its relation to short-term memory, retrieval fluency as an index of learning, use of spaced retrieval to improve learning in Alzheimer's patients, and brain structures that support different explicit and implicit memory tasks. Part II, on the representation and organization of knowledge, now contains additional material on flashbulb memory, the role of imagery in creating false memories, mental animation, rules for categorization, and variables that influence categorization strategies. Additions to Part III, on complex cognitive skills, include new material on adjustment of reading speed to maintain comprehension, the relation of syntactic ambiguity to lexical ambiguity, cognitive structures that support expert reasoning, the role of feedback in tutoring, inadvertent plagiarism, determinants of utility, cross-cultural study of risk assessment, and the advantage of frequency over probability information in decision-making.

## ANCILLARIES

### Study Guide

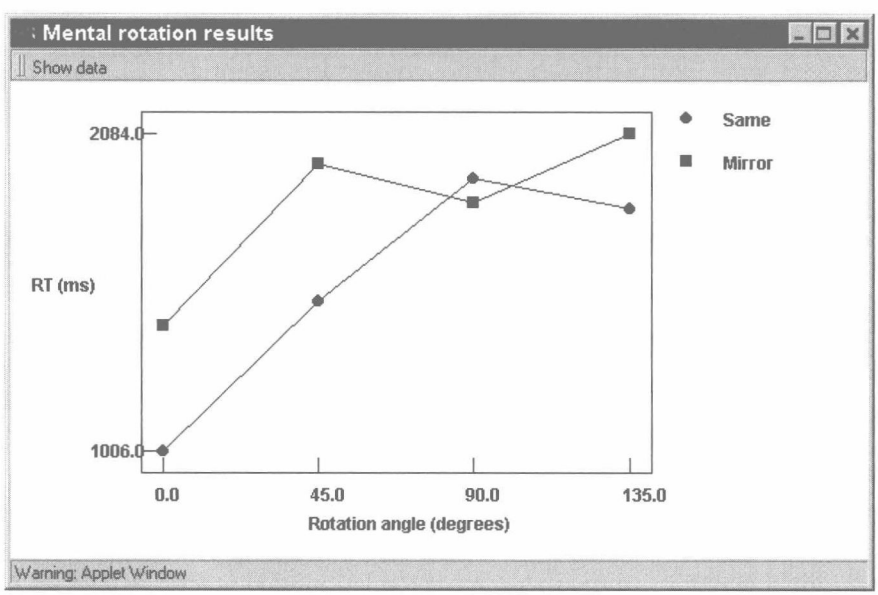
The Study Guide, by Linda Buyer, consists of chapter outlines, key terms, self-assessment exercises (including approximately 10 true/false, 20 multiple choice and 2 essay questions per chapter) and 3–4 complete exercises for students to perform outside of class.

### Instructor's Manual with Test Bank

There are 30 multiple choice items per chapter, prepared with the assistance of Dennis Kerkman. Tom Pusateri contributed 50 detailed demonstrations. *Thomson Learning Testing Tools*™ is available to adopters of *Cognition: Theory and Applications, Fifth Edition*. This fully integrated suite of test creation, delivery, and classroom management tools includes *Test, Test Online,* and *Management* software (Dual platform Windows/Macintosh ISBN: 0-534-36868-9).

### CogLab

This edition is accompanied by a set of cognitive demonstrations created by Greg Francis. They not only allow the students to perform the experi-




***CogLab.*** *The plot produced at the end of the mental rotation demonstration (see Chapter 7) shows the classic finding that reaction time increases with rotation angle, both for situations where the images were the same or mirrored versions.* Image courtesy Greg Francis, http://psychology.wadsworth.com

ments, but also allow them to run multiple trials to collect and compare data.

At the end of each chapter, you'll find a reference to the appropriate CogLab demonstration that relates to that chapter. These demonstrations range from apparent motion to visual search.

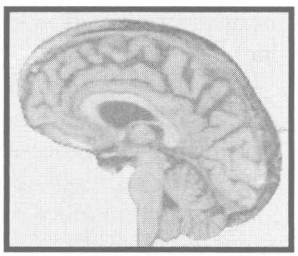
Enhanced CogLab has tools whereby teachers can modify their account information for a Cognitive Psychology Online Laboratory (CogLab) group for their class. Teachers will be able to set up accounts for their students. Teachers will have a group ID, a user ID, and a password for access and use of the enhanced CogLab.

## ACKNOWLEDGMENTS

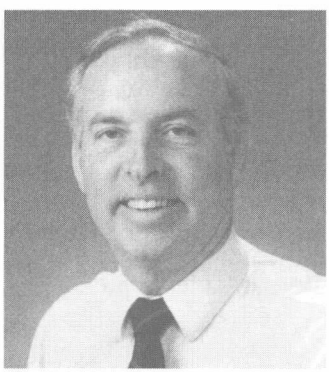
I wrote the first edition of this book while spending a sabbatical year at the University of California at Berkeley. I am grateful to Case Western Reserve University and the Group in Science and Mathematics Education at Berkeley for providing financial support during that year. The Group in Science and Mathematics Education also furnished me with a stimulating environment, and the Institute of Human Learning provided an excellent library. Shortly after arriving at Berkeley, I had the good fortune to meet C. Deborah Laughton, a psychology editor at Brooks/Cole. She expressed confidence in the book long before it was deserved and, with the assistance of an excellent staff at Brooks/Cole and first-rate reviewers, helped in the development of the text.

I am grateful to Marianne Taflinger and all the others listed on page ii who have contributed to this fifth edition. I would also like to thank the following reviewers for their helpful suggestions on this edition: Julie Allison, Pittsburg State University; Susan Baillet, University of Portland; Linda Buyer, Governors State University; Eric Eich, University of British Columbia; Beverly Roskos-Ewoldsen, University of Alabama; Ira Fischler, University of Florida; Nancy Franklin, SUNY, Stony Brook; Michael O'Boyle, The University of Melbourne; Matthew Sharps, California State University, Fresno; Janet Smith, Pittsburg State University; Steven Smith, Texas A & M University; Mark Stewart, Willamette University; and Margaret Thomas, University of Central Florida. The comments of others are always welcome, and I would appreciate receiving suggestions from readers.

*Stephen K. Reed*



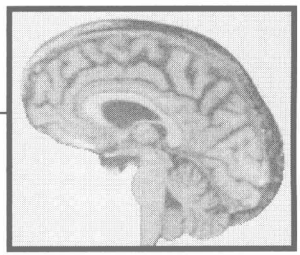
# About the Author



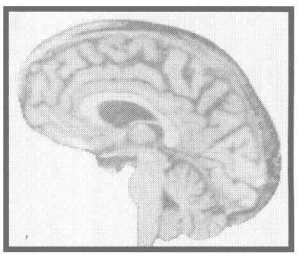
Stephen K. Reed is currently professor of psychology and a member of the Center for Research in Mathematics and Science Education at San Diego State University. He has also taught at Florida Atlantic University (1980–1988) and at Case Western Reserve University (1971–1980).

After receiving his BS in psychology from the University of Wisconsin in 1966 and his PhD in psychology from the University of California, Los Angeles, in 1970, Dr. Reed worked as an NIH postdoctoral fellow at the Laboratory of Experimental Psychology at the University of Sussex, Brighton, England.

His research on problem solving, carried out in part through grants from NIMH, the National Science Foundation, and the Air Force Office of Scientific Research, has been extensively published in numerous journals, including *Cognition and Instruction; Cognitive Psychology; The Journal of Experimental Psychology: Learning, Memory, and Cognition;* and *Memory and Cognition*. He is the author of numerous articles and books, including *Psychological Processes in Pattern Recognition* (Academic Press, 1973) and *Word Problems: Research and Curriculum Reform* (Erlbaum, 1999).

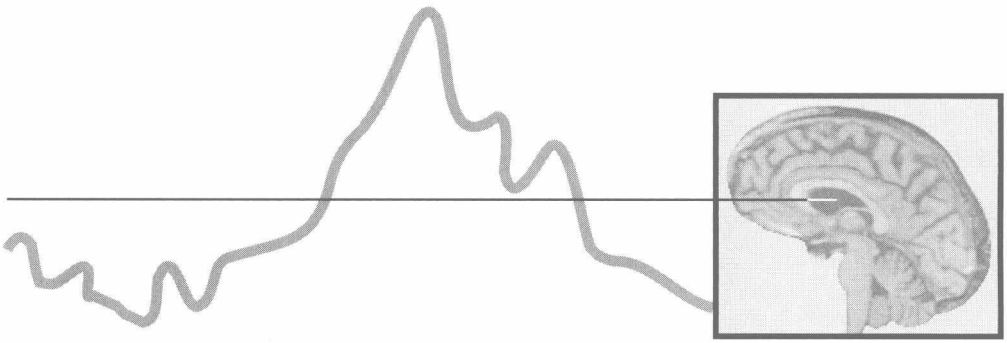


# Brief Contents



# Contents

# PART ONE INFORMATION-PROCESSING STAGES



# 1 Introduction

Cognitive psychology refers to all processes by which the sensory input is transformed, reduced, elaborated, stored, recovered, and used.

—ULRIC NEISSER (1967)