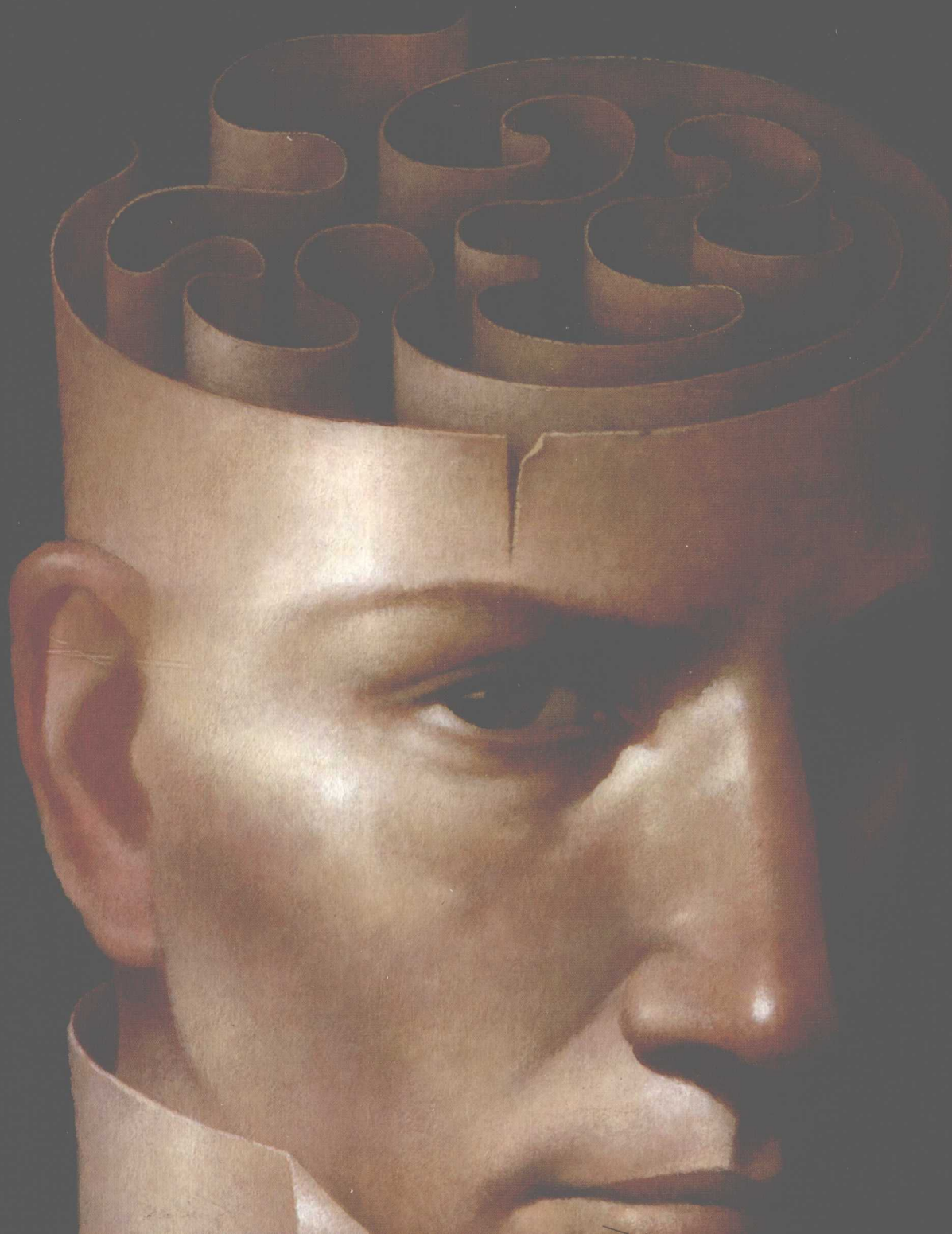


Learning and Memory

From Brain to Behavior



Mark A. Gluck • Eduardo Mercado • Catherine E. Myers



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PREFACE

The field of learning and memory has undergone enormous changes over the last decade, primarily as a result of new developments in neuroscience. As we have gained a greater understanding of the neurobiological bases of behavior, the boundary between the biological approach and the psychological approach to the study of learning and memory has begun to disappear.

A related consequence of this fusion of brain research and psychology is that it no longer makes sense to study animal learning and human memory as separate disciplines. After several decades during which animal and human learning were described by independent paradigms, the discovery of basic biological mechanisms common to all species has launched a unified approach to animal and human behavioral studies.

Recent advances in neuroscience as applied to learning and memory have also produced dramatic changes in clinical practices over the last decade. Neurologists, psychiatrists, clinical psychologists, and rehabilitation specialists are now able to use neuroscience in the diagnosis and treatment of the clinical disorders of learning and memory. Alzheimer's disease, autism, schizophrenia, Parkinson's disease, Huntington's disease, dyslexia, ADHD, and stroke are just a few of the disorders for which new treatment options have been developed as a result of basic behavioral and cognitive neuroscience studies of learning and memory.

With these developments in mind, we set ourselves the task of writing a comprehensive, accessible, and engaging introduction to learning and memory that provides an introduction to a field in transition. *Learning and Memory: From Brain to Behavior* presents a new curriculum that integrates coverage of human memory and animal learning and includes three key components of the field: behavioral processes, brain systems, and clinical perspectives.

Neuroscience Focus

Neuroscience has altered the landscape for behavioral research, shifting priorities and changing our ideas about the brain mechanisms of behavior. To that end, *Learning and Memory: From Brain to Behavior* integrates neuroscience research into each chapter, emphasizing how new findings from neuroscience have allowed psychologists to consider the functional and physiological mechanisms that underlie the behavioral processes of learning and memory. Chapter 2: The Neuroscience of Learning and Memory offers an accessible introduction to neuroscience for students unfamiliar with the basics.

Clinical Focus

Learning and Memory: From Brain to Behavior examines new research in learning and memory and traces how these findings have spurred the development of new diagnoses and treatments for a variety of neurological and psychiatric disorders. Each core content chapter (chapters 3–13) includes a section that shows how behavioral processes and brain substrates apply to clinical psychology. These “Clinical Perspectives” sections are one way in which the book emphasizes the influence of learning and memory research in the real world.

Research Focus

Throughout the pages of *Learning and Memory: From Brain to Behavior*, we introduce new breakthroughs, which will spark student interest and imagination, and discuss how material from each chapter applies to daily life. Two types of boxes support this focus on cutting edge research and real life applications:

- *Unsolved Mysteries* boxes explore compelling research conundrums to capture student interest and imagination. These include topics such as:
 - Why can't experts verbalize what they do?
 - Is working memory the key to intelligence?
 - Why did the cerebral cortex evolve?
 - Diagnosing and preventing Alzheimer's disease
- *Learning and Memory in Everyday Life* boxes in each chapter illustrate the practical implications of research, especially those that are relevant and interesting to undergraduate students. These include topics such as:
 - Top ten tips for a better memory
 - Are video games good for the brain?
 - Can we reduce memory overload?
 - Discrimination and stereotypes in generalizing about other people

Student Focus

- **No Prerequisites** We understand that students may come to this course from different backgrounds, even different disciplines, so we do not assume any level of familiarity with basic psychology or neuroscience concepts. The first two chapters of the text offer a complete overview of the field of the psychology of learning and memory and the neuroscience foundations of behavior. Later chapters explain all new concepts clearly with emphasis on real-life examples and teaching-oriented illustrations.
- **Memory First** In contrast to many older books, we cover memory topics before learning. The philosophy here is to start off with the big picture, giving students a broad overview of memory systems and brain regions, before getting into the fine details of neuronal processes and cellular interactions. We believe this ordering makes the material more accessible to students, and also prepares them to understand why the lower-level information matters. However, the chapters stand on their own to allow alternate organizations, if desired.
- **Engaging Narrative** We present learning and memory concepts using a lively, clear, and example-rich narrative. We have tried to present our vision of an exciting field in transition as a colorful dialogue—a conversation between authors and readers.
- **Full-Color Art Program** The first full-color book for the course, *Learning and Memory: From Brain to Behavior* uses original anatomical art, state-of-the-art brain scans, and color-coded figures to help students visualize the processes involved in learning and memory. Photos offer a link to the real world, as well as a look back in time; cartoons offer occasional comical commentary (and often additional insights) alongside the main narrative.
- **Real-World Implications** In addition to the section on clinical perspectives, we have included many concrete everyday life examples of learning and memory that help students grasp the implications of what they're studying and the relevance of learning and memory in their own lives.

Purposeful Pedagogy

- **Test Your Knowledge** features give students the opportunity to check their comprehension and retention of more challenging topics. Suggested answers are provided at the end of the chapter.

- **Interim Summaries** follow the behavioral processes and brain substrates sections, to help students review major concepts presented in the previous section.
- **Concept Checks** at the end of each chapter ask critical thinking questions that require an understanding and synthesis of the key material in the chapter. These features ask students to apply the knowledge they've gained to a real-life situation. Suggested answers are provided at the end of the book.
- **Key Points**, presented as bulleted summaries at the end of each chapter, review core material.
- **Key Terms** with page references appear at the end of each chapter; these allow students to review new terminology presented in the chapter. All key terms with their definitions are included in an end-of-text glossary.
- **Further Reading** sections at the end of each chapter offer accessible resources for students who wish to delve more deeply into the material.

Media/Supplements

Book Companion Site at www.worthpublishers.com/gluck

The companion site serves students as a virtual study guide, 24 hours a day, 7 days a week. The password-protected instructor's section offers a variety of assessment, presentation, and course management resources.

Book Specific Lecture & Art PowerPoint Slides

Mary Waterstreet, *St. Ambrose University*

To ease your transition to *Learning and Memory*, a prepared set of lecture and art slides, in easy-to-adopt PowerPoint format, are available to download from the instructor's side of the Book Companion Site.

Instructor's Resource Manual and Test Bank

(Mark Krause, *University of Southern Oregon*,
and Wendy Braje, *SUNY-Plattsburgh*)

The Instructor's Resource Manual includes extensive chapter-by-chapter suggestions for in-class presentations, projects and assignments, as well as tips for integrating multimedia into your course. It also provides more comprehensive material on animal learning for instructors who allocate more of their courses to the classic studies of animal learning. The Test Bank features approximately 75 multiple-choice questions per chapter as well as an assortment of short-answer and essay questions. Also included in the Test Bank are the chapter-specific Web quizzes (10-15 questions each) that appear on the Book Companion Site.

Diploma Computerized Test Bank (Available in Windows and Macintosh on one CD-ROM)

The CD-ROM allows instructors to add an unlimited number of questions, edit questions, format a test, scramble questions, and include pictures, equations, or multimedia links. With the accompanying gradebook, instructors can record students' grades throughout a course, sort student records and view detailed analyses of test items, curve tests, generate reports, add weights to grades, and more. This CD-ROM is the access point for Diploma Online Testing. Blackboard and WebCT formatted versions of the Test Bank are also available within the Course Cartridge and ePack.

Acknowledgments

This book has benefited from the wisdom of expert reviewers and instructors from laboratories and classrooms around the country. From the earliest stages of the development process, we solicited feedback and advice from the leading voices in the field of learning and memory to ensure that the book expresses the most current and accurate understanding of the topics in each chapter. Over the course of this book's development, we have relied on these experts' criticism, corrections, encouragement, and thoughtful contributions. We thank them for lending us their insight, giving us their time, and above all for sharing in our commitment to creating a new textbook and a new curriculum that reflects a contemporary perspective on the field.

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Charles Linsmeier, Acquisitions Editor, is bar none, the best acquisitions editor with whom we have ever dealt. At each choice point in the book's development, Chuck always focused on making sure that every part of the content and production was as strong and compelling as possible. He cut no corners, and was always available for email and phone conversations, day or night (no small task when dealing with three independently-minded authors). His attention to every aspect of the project provided us with a trusted source of knowledge on the multitude of issues that arise as a book approaches publication. We consider ourselves lucky to have had his guidance on this project.

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To Our Readers

The original plans for this book began to be formulated back in 2000, when Eddie Mercado was a postdoctoral fellow in Mark Gluck's lab at Rutgers University-Newark, working with Mark and Catherine on experimental and computational studies of animal and human learning. Over the last seven years—and especially the last three since we signed with Worth Publishers—creating this book has been a major focus of our professional lives. We tremendously enjoyed working on the book, collaborating with each other, and interacting with many scientists in the field of learning and memory who joined us in ways, small and large, to bring the book to its final form. We have learned much about our own field through the process of organizing the material and presenting it to you. We hope this book is as enjoyable and educational for you to read as it was for us to write.

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