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Learning and Memory

Second Edition

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Preface

We live in an age of information overload. We have driven the information highway, and it is clear that the accumulation of information is growing exponentially. As a consequence it is becoming more and more difficult to keep current. The days of the Renaissance person may be ending; it may no longer be possible to be an expert and excel in multiple fields of investigation. Psychology is no exception. Indeed, the U.S. Congress declared the 1990s to be the "Decade of the Brain," and it appears that the first decade of the new millennium will be named the "Decade of Behavior." These designations have had and will have an enormous impact on psychological science. The result will be an even greater increase in the number of psychological journals and the number of published papers in psychology. As the amount of information increases, our ability to access, then filter this information becomes critical. There are now ways to access information that were not available 10 years ago. We have instant access to vast sources of information through the Internet, but easy access to information is causing problems. How are we to discriminate between good information and bad? How do we sift through vast amounts of information and make sense of what we see? The answers lie in our ability to critically read and make informed decisions about the quality of the evidence and the methods by which that evidence was obtained.

CRITICAL READING, CRITICAL THINKING

This text is designed to help the student critically read and understand theoretical positions and to assess and interpret data in light of their theoretical implications. My colleagues and I have taken a subtle approach. We will present both sides of an issue, and we will consider the evidence for each position. We will approach issues from a historical perspective, and we will examine how the evidence has changed the questions that are asked and how theoretical positions are changed in light of new evidence. Often in this book the students may express concern because we will spend a fair amount of time considering a position only to conclude that a new theory is needed or that a new theory needs to be tested more thoroughly. Students may ask or demand that they simply be given the answer. The problem, of course, is that there may not be simple answers. Science moves forward, but its progress is not always evident. Thus, it is important for students to know that the study of learning and memory in psychological science is a work in progress. We have learned much, but we have much to learn. This text is designed to inform students about what we know and how we know it. But the text is also written with the goal that the student finishes the course knowing that it is only through the continued application of the scientific method that further progress can be made.

HOW BIOLOGY CONSTRAINS LEARNING

It would have been possible for my colleagues and I to write a book of this length with no reference earlier than 1990, but that would have been a mistake. Many of the important discoveries concerning the role of reinforcement in determining behavior were made 40 or more years ago, and much of the current literature builds on the foundation of those earlier studies. Indeed, many of today's theories rest on earlier theoretical positions, and these theories are often best understood in historical light. For example, to understand the current emphasis on biological constraints on learning and the adaptive role that learning plays in the life of an organism, it is important to remember that in the 1940s and 1950s learning was studied more or less as an end in and of itself. Most researchers in the 1940s and 1950s were not concerned with the role of evolutionary history in what an organism learned or remembered. Many of the apparatuses and most of the stimuli used in the study of learning and memory were designed to reduce the influence of evolutionary and ecological variables. This made sense because the current theme at the time was the belief that the general laws of learning transcended evolutionary history. As a result of this perception, working with a large number of species and worrying about the effects of the animal's evolutionary history and its ecological niche was viewed as nonproductive. However, with the finding that some animals can associate certain stimuli more easily than others and that in other

species the opposite is true, there was renewed interest in understanding learned behavior in the context of the organism's evolutionary and ecological background.

COMPREHENSIVE AND APPLIED

In writing this book, my colleagues and I faced difficult problems. We wanted the book to be comprehensive. We wanted to present discoveries and theoretical positions in a historical light and show how they changed as a result of more and better data. We wanted to provide students with a solid foundation of terminology and theory upon which they could begin to appreciate the depth of understanding already achieved, as well as an appreciation for the direction of future research. Finally, we wanted to provide a foundation for students to continue their study of learning and memory and to enhance their appreciation for the role that learning and memory play in all aspects of psychology. This latter goal was critical: Knowledge of learning and memory can help practicing clinicians devise effective therapy strategies. It also can inform educational psychologists of the means by which material is acquired and retained and provide insight into the best ways to present material. Knowledge of learning and memory can help the social psychologist understand how changes in attraction, prejudice, and attitude can occur, and it can help human factors engineers understand how to build safer and more efficient machines.

BLENDS ANIMAL AND HUMAN RESEARCH IN A WAY THAT'S BASIC AND APPLIED

In light of these emphases, this edition of *Learning and Memory* is a comprehensive text that combines current with classic research and includes a unique chapter 7 that bridges learning and memory by discussing the roles that stimulus generalization and discrimination learning play in concept formation in human and nonhuman animals. The text offers also an innovative blend of animal and human research that is both basic and applied. For example, basic research with animals includes comprehensive discussion of the observing response literature and sign tracking as well as extensive treatment of recent theories of classical conditioning by Wagner and others. Basic research with humans is considered in the discussions on concept formation as well as discussion of short-term and long-term memory. Applications of basic research in learning are considered in discussions of the role of classical conditioning in drug abuse and aversion therapies as well as the role of operant techniques in treating autism. Applications of basic research in memory are considered in discussions of false and repressed memories, amnesia, eyewitness memory, and memory practice and mnemonic improvement. My colleagues and I also made the text student friendly by providing examples and stories that introduce topics in ways that are easy to grasp and that are relevant and appropriate

for students. Chapter 7 opens with a scenario in which a researcher, having been awarded a federal grant to observe vervet monkeys in the wild, discovers the communication abilities of vervets as they encounter different predatory threats. In addition, the text includes many examples and figures, which not only serve as visual counterpoint but also help make the text easier to read and comprehend.

RESOURCES FOR TEACHERS AND STUDENTS

Wadsworth Publishing Company has made available several resources for the instructor and the student. These resources supplement the text, bring the material to life for the student, assist the student in the course, and reduce the instructor's teaching load by providing a test bank that contains numerous questions of varying formats. In addition, the test bank provides a description of Wadsworth's popular software package "Sniffy, the Virtual Rat." This interactive software program allows students enrolled in institutions with or without operant conditioning labs to learn in a hands-on manner how to shape an animal to perform an operant task and the basics of classical conditioning. Depending on the package you choose, the program supports 16 to 40 separate exercises that teach the student the basics of operant and classical conditioning. Students learn to shape a virtual rat to press a bar for virtual cheese. They learn about cumulative records, schedules of reinforcement, and more complex behavioral phenomena including generalization and discrimination learning, extinction, and spontaneous recovery. In the exercises on classical conditioning, students learn about basic acquisition and extinction of a conditioned response, the effects of varying the strength of the CS and US, pre-exposure effects, blocking and overshadowing, and others.

Students enjoy training Sniffy to perform in an operant and classical conditioning setting, and they learn from the various exercises. We do not propose that Sniffy should be substituted for actual experience with live animals. However, in many institutions there is no other option. For these schools, Sniffy is a must to bring to life the material in this book. For programs that have an animal laboratory component associated with this course, Sniffy provides a good starting place for teaching students about conditioning animals. The instructor's manual that accompanies this text outlines the various exercises available from the Sniffy programs and shows where the material is covered in the text. Through Sniffy, students are able to see and experience what they have read, and they obtain a better sense of what life in a learning laboratory might be like. For more ideas about how to use Sniffy in courses, call the Wadsworth Marketing Department at 1-877-999-2350 to request a six-minute video.

Another resource offered by Wadsworth is Info Trac College Edition. Info Trac is a fully searchable online university library that includes the full text of articles from hundreds of scholarly and popular publications. Hot linked, expertly indexed, and ready to use, Info Trac College Edition is updated daily

with articles going back as far as four years. You can give your students four months' access—24 hours a day, 7 days a week—to this online library if you choose to package Info Trac College Edition with this book. Included among the large number of journals available to the student and that would be of interest to students enrolled in a course in learning and memory are the *American Journal of Psychology, American Scientist, Annual Review of Psychology, British Journal of Psychology, Ecological Monographs, Ecology, Journal of Cognitive Neuroscience, Journal of Experimental Education, Journal of General Psychology, Journal of Neuroscience, Journal of Social Psychology, Psychological Record, Quarterly Review of Biology,* and *Science.*

SUMMARY STATEMENTS

The second edition of *Learning and Memory* was written by authors who are experts in the areas of learning and memory and whose experience teaching undergraduate courses in learning and memory total more than 50 years. The text has been updated and expanded. It offers many more references and new topics including a section on punishment and behavioral systems theory. The text also includes a new chapter on the interaction of classical and operant conditioning and the chapter on verbal learning has been omitted. Finally, the text is much more biologically oriented and attempts to couch the topics of learning and memory within the total ecological and evolutionary history of the animal. In this vein we include sections that address which areas of the brain underlie the various components of learning and memory.

We have enjoyed writing this book, and we believe students will enjoy reading it.

About the Authors

Dr. Jesse E. Purdy received his B.S. in psychology in 1974, his M.S. in general-experimental psychology in 1976, and his Ph.D. in 1978 from Colorado State University. He graduated with an emphasis in comparative psychology. He currently holds the title Brown Distinguished Research Professor and chairs the Department of Psychology at Southwestern University, where he has been since 1978.

Dr. Purdy has an active research program that extensively involves undergraduate students. With his students he has authored and co-authored more than 30 articles and made more than 40 conference presentations. His work is primarily carried out at Southwestern University's Aquatic Animal Research Laboratory, a facility that houses both fresh water and salt water organisms. The focus of his work is on basic animal learning processes in aquatic animals, where he continues to explore the mechanisms of learning involved in sign tracking in goldfish and cuttlefish. He is also interested in questions relating to optimal foraging, defensive behaviors, and predator-prey interactions in aquatic animals. His work with cuttlefish has been highlighted on the Discovery Channel's *World of Wonder.*

Dr. Purdy has been active in several professional organizations, including the Southwestern Comparative Psychology Association, the Southwestern Psychological Association, and Psi Chi. He served on the board of directors for SCPA and he served as president of SWPA. He is currently president-elect of Psi Chi, the national honor society in psychology.

Dr. Michael R. Markham is Assistant Professor of Psychology at Florida International University. He received his B.A. from the University of New Mexico in 1990 and his Ph.D. in psychology from the University of New Mexico in 1994. His courses include Introduction to the Experimental Analysis of Behavior, Biological Psychology, and Theories of Learning. His research interests focus on interactions of Pavlovian conditioning and stimulus classes in humans and nonhuman animals.

Bennett L. Schwartz is an Associate Professor of Psychology at Florida International University in Miami, Florida. He received his Ph.D. in psychology from Dartmouth College in 1993. He has published papers on memory, metacognition, and the tip-of-the-tongue phenomenon in journals such as *Journal of Experimental Psychology: Learning, Memory, and Cognition, Memory & Cognition,* and *Memory.* He has taught Memory and Cognitive Psychology at FIU since 1993. He recently became the proud father of an infant daughter, Sarina.

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