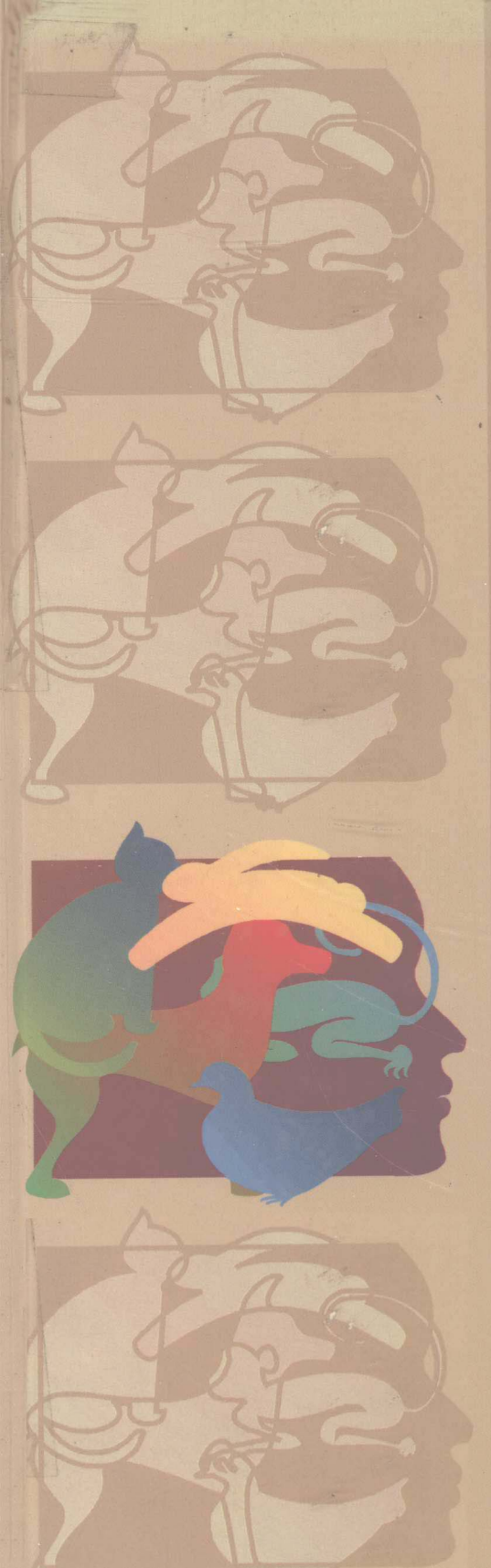

Domjan and Burkhard's

THE PRINCIPLES OF LEARNING AND BEHAVIOR

RD EDITION

Revised by Michael Domjan

3RD EDITION

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3RD EDITION

The Principles of Learning and Behavior

To Alice, Katherine, and Paul

Preface

Investigations of learning and behavior have been an integral part of the study of psychology throughout much of the twentieth century. In addition to providing important insights into the ways in which experience can lead to long-lasting changes in behavior, investigations of learning and behavior provide the behavioral technology for many allied fields, including behavioral neuroscience, developmental psychobiology, psychopharmacology, behavioral medicine, and behavioral toxicology. Studies of basic associative learning phenomena also provide the building blocks for some prominent theories of cognitive function. Thus, the study of learning is at the crossroads of many different approaches to investigating behavior.

The aim of the third edition of this book is the same as the aim of previous editions—to provide a lucid introduction to contemporary phenomena and theories about learning and behavior. The book strives to present a balanced perspective of the contemporary state of the field, rather than advocating a particular point of view. We attempt to point out the strengths and weaknesses of ideas in an even-handed fashion. As before, we have tried to emphasize the development of ideas instead of simply listing major findings. Although some contemporary ideas and phenomena cannot yet be fully integrated with previous findings, we have tried to provide an integrated approach wherever possible.

The order of chapters in the third edition is the same as it was in the second edition. Information is presented in increasing order of complexity, both within chapters and across chapters. The basic ideas presented at the beginning of each chapter serve as a foundation for material presented in subsequent chapters, with critical concepts repeated as they are needed. Technical terms are identified by bold-faced type the first time they appear, and definitions for them are provided in the Glossary.

Much has happened in the field of learning and behavior since 1985, when the previous edition of this book was prepared. The third edition presents new perspectives on old phenomena, as well as new phenomena and ideas that have become important in recent years. Numerous new examples of learning are provided in the revised text, many involving human subjects. In addition, we made a greater effort to use actual rather than hypothetical data in the illustrations.

Chapter 1 has been largely rewritten to include discussion of the roots of learning studies in questions dealing with comparative cognition, functional neurology, and animal models of human behavior. Chapter 1 also includes a more detailed discussion of methodological issues in the study of learning, as well as discussions of the use of animals in research and alternatives to animal research. Chapter 2 introduces the concept of a "modal action pattern" in place of "fixed action pattern" and includes numerous new human examples of habituation and sensitization. Chapter 3 includes new information about the origins of classical conditioning and a revised discussion of control procedures in classical conditioning. In Chapter 4, the discussion of the Rescorla/Wagner model has been expanded and its shortcomings better described. In addition, a number of new theories have been added to the chapter, including scalar expectancy theory, the comparator hypothesis, SOP, and AESOP. Chapter 5 includes an expanded discussion of response shaping and an expanded discussion of reinterpretations of the learned helplessness effect in terms other than learned helplessness theory. In Chapter 6, discussions of the matching law and of concurrent-chain schedules have been updated and expanded. Chapter 7 now includes a critical appraisal of the behavioral bliss point approach and an expanded discussion of optimal foraging within the context of behavioral regulation. In Chapter 8, much new information has been added about configural conditioning, contextual conditioning, and control of behavior by hierarchical relations among stimuli. In Chapter 9, the concept of predatory imminence, and related ideas, has been added. Chapter 10 includes a new section on contemporary studies of the associative structure of instrumental conditioning. In Chapter 11, the discussion of memory mechanisms is now organized around the concepts of acquisition and stimulus coding, retention and rehearsal, retrieval, and forgetting. In Chapter 12, new information has been added on serial pattern learning in simultaneous chains, perceptual concept learning, and language learning by nonhuman animals.*

I am grateful for the assistance of a number of individuals including Dr. Robert H. I. Dale, Butler University; Dr. Michael S. Fanselow, University of California, Los Angeles; Dr. Robert Ferguson, Buena Vista College; Dr. Nelson Freedman, Queen's University; Dr. Lewis R. Gollub, University of Maryland at College Park; Dr. Harry Strub, University of

*As before, the book is accompanied by a test bank.

Winnipeg; and Dr. Michael Zeiler, Emory University, who provided thoughtful reviews of the revision, and numerous others who also provided information and suggestions. I am also grateful to Vicki Knight for her editorial guidance and to Linda Loba for coordinating the production of the book.

Michael Domjan

Brief Contents

Contents

1 Introduction

The goal of this chapter is to introduce the reader to the study of learning and behavior. We begin by discussing key concepts in the study of learning from a historical standpoint, including a description of the origins of experimental research in the area. These origins lie in studies of the evolution of intelligence, functional neurology, and animal models of human behavior. The defining characteristics of learning will be described next, followed by a discussion of methodological approaches to the study of learning. Because numerous experiments on learning have been performed with animal subjects, we will conclude the chapter by considering the pros and cons of using animals in research.

People have always been interested in understanding behavior, be it their own or the behavior of others. This interest is more than idle curiosity. How we live our lives is largely governed by our own actions and the actions of others. Whether you were admitted to the college of your choice depended mainly on your prior scholastic record and the decisions of an admissions officer. Whether you get along well with your roommates depends on how accommodating you are and on what they do that you find irritating. Whether you get to school on time depends on how crowded the roads are and how well you manage to navigate the traffic.

Any systematic effort to understand behavior must include consideration of what we learn and how we learn it. Numerous aspects of both human and animal behavior are the products of learning. We learn to read, to write, and to count. We learn how to walk down stairs without falling, how to open doors, how to ride bicycles, and how to swim. We also learn when to relax and when to become anxious. We learn what foods are good for us and what will make us sick. We learn who will be fun to visit with and whose company to avoid. We learn how to tell when someone is unhappy and when that person feels fine. We learn when to carry an umbrella and when to take an extra scarf. Life is filled with activities and experiences that are shaped by what we have learned.

Learning is one of the biological processes that are crucial for the survival of many forms of animal life. The integrity of life depends on a variety of biological functions. Animals have to take in nutrients, eliminate metabolic wastes, and otherwise maintain proper balance in internal functions. Through evolution, a variety of biological systems have emerged to accomplish these tasks. Many of these systems are primarily physiological, such as the respiratory, digestive, and excretory systems. However, finely tuned internal physiological processes are often not enough to maintain the integrity of life. Animals and people live in environments that are constantly changing because of climatic changes, changes in food resources, the coming and going of predators, and other external factors. Adverse effects of environmental change often have to be minimized by behavioral adjustments. Animals have to know, for example, how to find and obtain food as food sources change, avoid predators as new ones enter their territory, and find new shelter when storms destroy their old homes. Accomplishing these tasks obviously requires motor movements, such as walking and manipulating objects. These tasks also require the ability to predict important events in the environment, such as the availability of food in a particular location and at a particular time. Acquisition of new motor behavior and new anticipatory reactions involves learning. Thus, animals learn to go to a new water hole when the old one dries up and learn new anticipatory reactions when new sources of danger appear. These learned adjustments to the environment are no less important for survival than internal physiological processes such as respiration and digestion.

Most people automatically associate learning with the acquisition of new behavior. That is, they identify learning by the gradual appearance of a new response in the organism's repertoire. This is the case when people learn to read, ride a bicycle, or play a musical instrument. However, the behavior change involved in learning can just as well consist of the decrease or loss of some behavior in the organism's repertoire. A child, for example, may learn not to cross the street when the traffic light is red, not to grab food from someone else's plate, and not to yell and scream when someone is trying to take a nap. Learning to withhold responses is just as important as learning to make responses, if not more so.

When considering learning, people commonly focus on the kinds of learning that require special training—the kinds of learning that take place in public schools and colleges,