FIFTH EDITION

Introduction to Learning and Behavior

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***Introduction to Learning and Behavior*, Fifth Edition**
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To parents, mentors, and students who shaped our behavior so well as to make this book a reality.

Brief Contents

Contents

Preface

"I wouldn't do this to my budgie," a student once muttered following a lecture in which I (the senior author of this text) had discussed the process of reinforcement. She apparently saw the use of reinforcement as manipulative and reprehensible. I can't remember how I responded (probably with something a bit more diplomatic than what follows), but I could have said that she actually does "this" to her budgie all the time and is simply not aware of it. Moreover, because she's not aware of it, she may be reinforcing her budgie's behavior quite erratically, with the result that the two of them are having a much less satisfying relationship than they could be having. Unfortunately, this student's negative reaction to behavioral principles of conditioning is not uncommon, and most instructors who teach such courses can probably recount similar instances. Thus, one goal of this text is to help convince students that conditioning is not a dangerous form of manipulation but rather a natural process that we do far better to understand and apply wisely than to ignore and apply carelessly.

Another opinion sometimes voiced is that the principles of conditioning, many of which have been derived from research with animals, are largely irrelevant to important aspects of human behavior. After all, how can studies of lever-pressing rats or key-pecking pigeons say anything meaningful about what truly matters to us? This was the very conclusion that I (the senior author again) came to when, as an undergraduate, I first encountered a demonstration of operant conditioning in my introductory psychology class. We were shown a film in which pigeons were taught to peck a little plastic disk (which I later learned is called a "response key") to earn food. The whole endeavor struck me as so completely artificial—not to mention mind-numbingly boring—that I couldn't understand why anyone would waste his or her time on it. Little did I know that some years later I would find myself sitting in a pigeon lab, thrilled that I had been given an opportunity to study something so interesting and important! What I had learned in the interim was

that: (1) you have to be careful what you criticize (fate has a way of making us pay for our arrogance) and (2) many of the principles derived from conditioning experiments with animals are among the most useful principles ever discovered by psychologists. Thus, a second goal of this text is to help convince students that the principles derived from behavioral research are far from irrelevant, and that they often have useful and provocative things to say about human behavior.

An even more basic goal of this text is to provide students with a clear introduction to the basic principles of learning and behavior that is both accessible and engaging, especially for those who may have had only limited prior exposure to these principles (such as in an introductory psychology course). Those students who later proceed to a higher-level course in the subject matter will then have a solid foundation on which to build. Students who do not proceed to a higher-level course will nevertheless have gained an appreciation for the behavioral perspective and learned much that may be of relevance to their everyday lives and future careers.

Key Characteristics

The following summarizes some key characteristics of this text:

- **It emphasizes basic principles of learning and behavior rather than theory.** To the extent that theory is discussed, it is either because the theory itself has something meaningful and provocative to say about human behavior (e.g., melioration theory as discussed in Chapter 10) or because a general overview of certain theories (e.g., the Rescorla-Wagner theory, as presented in Chapter 5) can help prepare students for a more in-depth discussion of those theories in a higher-level course.
- **It attempts to strike an appropriate balance between basic research findings, many of which are derived from animal research, and the application of those findings to important and interesting aspects of human behavior.** Although many texts make this claim, we feel that this text represents a truly concerted effort in that regard. Wherever possible, examples from research paradigms with rats or pigeons are juxtaposed with everyday examples with humans. And although some of the applications to humans are highly speculative, they nevertheless represent the type of speculation that behaviorists themselves often engage in and that many students find interesting and memorable.
- **Following from the above, this text is especially innovative in the many examples given of the application of behavioral principles to understanding certain aspects of romantic relationships.** In particular, scattered throughout the text are *Advice for the Lovelorn* columns in which hypothetical students are given behavioral-type advice concerning their relationship difficulties. Personal relationships are, of course, a key concern for many students, and they are often fascinated by the notion that

behavioral principles may be helpful in understanding and resolving problematic relationships. These columns have thus proven to be an effective way to maintain students' interest in the material, enhance their grasp of certain concepts, and provide them with a sense of what it means to think like a behaviorist. (Students are of course given due warning that the advice in these columns is quite speculative and not to be taken too seriously.)

- **The text contains many interesting and thought-provoking topics not normally found in textbooks on learning and behavior.** This includes such topics as what it means to have "willpower," the controversy over the inadvertent creation of multiple personalities during psychotherapy, and how difficulties in life often contribute to a sense of "meaning" in life, all discussed from a behavioral perspective. Many of these topics are presented in special boxed inserts titled *And Furthermore*, which are intended to expand on material presented in the preceding section.
- **This text contains numerous pedagogical features that are designed to facilitate students' ability to study and understand the material.** These features are described later in the section on learning aids. See also the discussion below on the "Study Tips" and self-management features that are new to this edition.

Changes to the Fifth Edition

In the preface to the last edition, we commented on how difficult it is to revise a textbook that seems to be working well for so many students and instructors. Unfortunately (or fortunately), we found ourselves in very much the same boat with respect to this revision. Although some reviewers did have major suggestions for improving certain aspects of the text, these were often contradicted by feedback from other reviewers and instructors who indicated that they very much liked those aspects. Even some of our own suggestions for improvement resulted in such strong reactions from reviewers that we quickly dropped them. It also made us realize the extent to which a successful textbook is no longer the sole property of the publisher and authors but is a shared endeavor with those who have come to rely on it, and we therefore became duly cautious in considering which changes to make. As a result, the most significant changes in this edition consist of value-added material in the form of study tips and advice on behavior self-management, as well as paring down one chapter that, in our experience, was a bit too complicated for many students to handle. We also strove to simplify or shorten sections wherever possible to try and counter the dreaded disease of the ever-expanding textbook.

Thus, one of the most significant changes to this edition is the inclusion of an appendix, titled "A Brief Guide to Behavior Self-Management." This appendix provides practical advice on the use of behavioral principles to

enhance self-control and complements the more theoretical presentation of self-control in Chapter 10. It should prove especially useful for students who are asked to do a behavior self-management project as a course assignment, as well as for students who personally struggle with such issues as procrastination. Related to this, a boxed "Study Tips" insert has also been added to each chapter (except the last), which offers specific advice to students on how to improve and manage their study behavior. The Study Tips insert in Chapter 1, for example, describes the 3R (read-recite-review) method for reading a textbook, something that many students have never been taught. Study tips in other chapters generally build upon behavioral concepts covered in those chapters. For example, the study tips insert for Chapter 7 (which covers schedules of reinforcement) discusses the "just-get-started" tactic for overcoming procrastination and relates it to the "break-and-run" pattern of behavior that is typically found in fixed ratio schedules of reinforcement. Our hope is that this material will provide students with the skills needed to become "independent learners," which is a commonly cited goal in higher education but one that educators often make little effort in trying to achieve. The study tips and self-management advice offered in this text therefore represent a concerted attempt to correct that situation.

The other major change in this edition involves Chapter 4, which in our experience many students found rather confusing. We have therefore simplified this chapter by (1) moving the discussion of pseudoconditioning and temporal conditioning to Chapter 3, (2) eliminating the discussion of external inhibition, and (3) consolidating the remaining conditioning procedures under the two categories of extensions to conditioning and specificity in conditioning. This chapter will hopefully now be considerably less difficult for students to work through.

Other changes (many of which were suggested by reviewers) include the following: In the Chapter 1 section on radical behaviorism, the separate discussion of molar versus molecular approaches to the study of behavior has been dropped. Chapter 1 also includes a brief description of the Board Certification program in applied behavior analysis to alert students to the growing number of career opportunities in applied behavior analysis. In Chapter 2, the term "establishing operation" has been updated to the more global term "motivating operation," which encompasses both establishing operations and abolishing operations. In Chapter 3, the brief discussion of preparedness in backward conditioning has been moved to the Chapter 12 discussion of biological preparedness in conditioning. In Chapter 5, the discussion of S-S versus S-R models of conditioning has been dropped; it overlaps too much with other theories of conditioning, which students found confusing. As well, the And Furthermore box on the search for Little Albert has been updated to include the recent discovery of a person who is very likely to have been the real Little Albert.

Chapter 9 eliminates the And Furthermore discussion of "Repression as Avoidance" and replaces it with a description of approach-avoidance conflict.

Students seem to find the concept of approach-avoidance quite interesting, given its relevance for understanding certain relationship issues. In Chapter 10, the And Furthermore box, "Self-Control: How Sweet It Is! Or Is It?", has been updated to include recent findings that seem to contradict Baumeister's strength model of self-control. And Chapter 11 now includes a brief description of Skinner's general approach to verbal behavior, thereby providing a context to the following discussion of rule-governed behavior.

Finally, the number of study questions at the end of each chapter has been somewhat reduced, often by combining two or more related concepts into the same question. The hope is that this will prompt students to more often ponder the similarities and differences between concepts, and thereby enhance their understanding of those concepts.

Learning Aids

This text contains many pedagogical features designed to facilitate students' reading and comprehension of the material. These include the following:

- **Quick Quizzes.** Scattered throughout each chapter are several fill-in-the-blank quizzes. The purpose of these quizzes is to help students actively work with the material as they read it. Although an early reviewer of the first edition commented that such frequent quizzing might frustrate students by interrupting their reading, actual use of the material in class revealed quite the opposite. Students commented that the quizzes were extremely beneficial in helping them engage with the material. They especially appreciated quizzes that were embedded within sections that they perceived as quite technical, simply because the quizzes broke the material up into short chunks that they were better able to assimilate. Students therefore demanded more quizzes, not fewer, and the authors duly complied.
- **Study Questions.** A focused set of around 10–15 study questions is included at the end of each chapter. These study questions cover the most basic concepts discussed in that chapter. Students can be motivated to answer these questions if instructors inform them that some of these questions may appear as short-answer items on quizzes or exams. In fact, the senior author's own strategy is to give students a random sample of four or five of these questions as a weekly chapter test, with students in each class being unaware of which questions they will be asked.
- **Concept Reviews.** Each chapter is followed by a concept review, which lists all key terms and definitions in the chapter. These key terms and definitions are then reiterated in the glossary at the end of the text.
- **Chapter Tests.** Each chapter ends with a chapter test, consisting mostly of fill-in-the-blank items. This test provides comprehensive coverage of the material presented in the chapter. It differs from the *Quick Quizzes* in that more items are of a conceptual, rather than factual or definitional,

nature, thereby encouraging students to think more deeply about the material. These test items are numbered in random order, so that students can immediately look up the answer to any particular item without having to worry about inadvertently seeing the answer to the next item.

- **Opening Vignettes.** Each chapter begins with a chapter outline, followed by either a quotation or a vignette related to the material presented in that chapter. The vignettes usually consist of a short, fictional scenario illustrating a particular concept. The exact concept involved is not immediately revealed, however, thus encouraging students to actively ponder how the material they are reading may be related to the scenario. (An explanation of the concept each scenario is intended to illustrate can be found in the instructor's manual.)

Instructor's Manual

The instructor's manual includes a revised test bank that contains a large number of multiple-choice items per chapter. Many of these items are conceptual in nature, and they are organized by textbook headings and subheadings. The instructor's manual also contains answers to all of the *Quick Quiz* and study question items for each chapter, as well as a set of annotated Web links where students will find information of interest. The manual also contains a description of how the *Advice for the Lovelorn* column can be adapted as a student assignment (along with additional examples of such columns that can be provided to students to facilitate their own efforts).

Sniffy™ the Virtual Rat Lite, Version 2.0: An Available Option

Sniffy the Virtual Rat Lite provides every student with hands-on experience in applying, either at home or in school, the principles of operant and classical conditioning. Sniffy is a computer-generated rat that can be taught to press a lever to earn food, a protocol that is then used to demonstrate many aspects of both operant and classical conditioning. Students purchasing Sniffy receive a laboratory manual with instructions, and a hybrid CD-ROM that operates on Mac OS Version 8.6 or later and Windows 95 SE, ME, 2000, or XP.

The Lite version of Sniffy includes 16 exercises that cover the essential phenomena of learning psychology. The stimulant operant phenomena covered include magazine training; shaping; primary and secondary reinforcement; variable-interval, variable-ratio, fixed-interval, and fixed-ratio schedule effects; and the partial-reinforcement effect. The classical conditioning phenomena covered include acquisition, extinction, and spontaneous recovery.

Students enjoy working with Sniffy and report that these exercises greatly enhance their understanding of the basic principles. We do not, of

course, propose that Sniffy can fully substitute for the actual experience of working with live animals. Unfortunately, for various reasons, most institutions are no longer able to offer this valuable opportunity to their undergraduates. Sniffy was created precisely to fill this void. Additionally, some schools use Sniffy as a warm-up before allowing students to work with real animals. For more information about Sniffy the Virtual Rat Lite, Version 2.0, visit cengagebrain.com. Sniffy's creators discuss how they use Sniffy in their classes, and students describe their experiences working with Sniffy.

Acknowledgments

We wish to thank "Dr. Dee," Ally McBeal (who was all the rage on television when this text was first conceived), and all the other people (real and fictional) who inspired the Advice to the Lovelorn features and other aspects of this text. We also thank the following reviewers for their comments and suggestions, which contributed greatly to the improvements made in this edition: Joseph J. Benz, University of Nebraska, Kearney; James MacDonall, Fordham University; Christy Porter, College of William and Mary; and Elizabeth Cooper, University of Tennessee, Knoxville.

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Finally, a special thanks to Dr. Suzanne E. MacDonald, who served as coauthor on early editions of the text and whose influence can still be seen within certain chapters.

Russ Powell
Lynne Honey
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About the Authors

Russell A. Powell

Russ Powell earned his Ph.D. in psychology under the engaging mentorship of Frank Epling and David Pierce at the University of Alberta. As a veteran faculty member at MacEwan University, Russ has taught classes in learning and behavior for over 30 years using a variety of behaviorally inspired formats. He has also conducted and published research on a wide range of topics, including operant conditioning (choice behavior), dissociative identity disorder, sleep paralysis nightmares, self-regulation, and the history of psychology. Most recently, he helped identify the individual now believed to have been Little Albert, the infant in whom Watson & Rayner (1920) famously (or infamously) attempted to condition a phobia of furry animals (e.g., Powell, Digdon, Harris, & Smithson, 2014).

P. Lynne Honey

Lynne Honey—a self-described "evolutionary behaviorist"—completed a Ph.D. in experimental psychology in Jeff Galef's lab at McMaster University, studying the role of social learning on alcohol consumption in rats. She has published a number of papers on this topic and considers social learning to be one of the most powerful adaptations available to our species and others. Dr. Honey joined the Department of Psychology at MacEwan University in 2003 because of its focus on teaching and student engagement. She currently conducts research on human social behavior in an evolutionary context, including studies of social dominance and the influence of personality traits on social behaviors. She also studies the effectiveness of various teaching methods, including peer review and various uses of technology for learning, and has won an award for innovation in teaching.

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Diane Symbaluk received her Ph.D. in sociology from the University of Alberta in 1997, with a specialization in criminology and social psychology. She joined MacEwan University in 1996 in order to pursue her joint passion for teaching and research. She has taught courses in a variety of areas including social psychology, criminology, statistics, and research methods. She is presently the faculty advisor for MacEwan University's Community-Based Sociology Project, a student-led research program. Her extensive list of publications includes textbooks, journal articles, and more than 40 pedagogical resources (e.g., study guides, test banks, instructor manuals, and online resources). A Distinguished Teaching Award winner, Diane is currently conducting research on published student ratings of instruction and character strengths of award-winning instructors.

Introduction to Learning and Behavior

Chapter 1

INTRODUCTION

CHAPTER OUTLINE

> A review of Gerald Zuriff's *Behaviorism: A Conceptual Reconstruction* (1985)…begins with a story about two behaviorists. They make love and then one of them says, "That was fine for you. How was it for me?" The reviewer, P. N. Johnson-Laird, insists that [this story has a ring of truth about it]. Behaviorists are not supposed to have feelings, or at least to admit that they have them. Of the many ways in which behaviorism has been misunderstood for so many years, that is perhaps the commonest. …[In fact,] how people feel is often as important as what they do.
>
> **B. F. Skinner, 1989, p. 3**

> Of all contemporary psychologists, B. F. Skinner is perhaps the most honored and the most maligned, the most widely recognized and the most misrepresented, the most cited and the most misunderstood.
>
> **A. Charles catania, 1988, p. 3**

Imagine that while flipping through a new textbook you see that it spends a lot of time discussing experiments with rats and pigeons. Pretty boring, huh? But what if the principles discovered in those experiments could help you improve your study habits, understand your eating disorder, and overcome your fear of spiders? In fact, what if those same principles could even help you improve your romantic relationships? Hmm, perhaps not so boring after all. Well, you might be holding just such a book in your hands. Let's consider a few of these claims in more detail.

Improving self-control. Do you too often find yourself watching television rather than studying? Or hanging out with friends rather than heading to the gym? In other words, do you often find yourself being sidetracked from your long-term goals by activities that are more immediately pleasurable? This book outlines the principles by which the environment around us affects our behavior, including behaviors involved in issues of self-control. Chapter 10, in particular, provides a theoretical account of why self-control is so often difficult for us to achieve, while the appendix, *A Brief Guide to Behavior Self-Management*, offers practical advice on how to improve self-control. In addition, as noted in the preface, scattered throughout the text are boxed inserts on Study Tips that offer specific advice on how to improve both the quality and quantity of studying that you do. The first one, in particular, which directly follows this section, offers research-based advice on how to effectively study a textbook, something that many students have never been taught. Additional information on improving study behavior, as well as other behaviors we may wish we had more control over, can be found scattered throughout the textbook.

Understanding eating disorders. Contrary to popular belief, eating disorders are not necessarily indicative of a psychological problem. For example, through a simple manipulation of a rat's feeding schedule, the rat can be induced to stop eating and engage in extreme levels of exercise. In this book, you will learn how similar processes might account for the development of a clinical disorder in humans known as anorexia nervosa.

Overcoming fears and phobias. Whether you fear spiders, snakes, or exams, this textbook will provide you with insight into how these fears develop. You will learn how the principles of classical conditioning and negative reinforcement underlie many of our fears and anxieties, and how these same principles suggest effective means for treating such symptoms.

Improving relationships with others. In this text, we often use relationship issues to illustrate basic principles of learning and behavior. As well, each chapter contains an *Advice for the Lovelorn* column, in which relationship problems are discussed from a behavioral perspective. Although the advice given is necessarily speculative—and as such should not be taken too seriously—these columns highlight the manner in which behavioral principles have the potential to enrich our understanding of human relationships.

Raising children. Our students sometimes comment that "no one should be allowed to have children until they have taken a course like this." Although this is admittedly an exaggeration, it is nevertheless the case that many of the principles discussed in this text are directly applicable to many common parenting problems.

In general, a proper grounding in the basic principles of learning and behavior will help you understand why you behave the way you do and how your behavior can often be changed for the better. This knowledge can make you a better student, a better parent, a better worker, and a better friend or partner. In a very real sense, the principles described in this text have the potential to enrich both your life and the lives of others—even though many of these principles have been derived from research with rats and pigeons!

Study Tip: Many students are unaware of how best to study a textbook. Too often, for example, they simply read and reread the material in the hope that something will sink in. But research has shown that, for most students, this method is largely ineffective. Better approaches involve the "testing effect," in which testing your ability to recall the information you just read can greatly enhance your memory for it (e.g., Dunlosky, Rawson, Marsh, Nathan, & Willingham, 2013). A recent version of this approach is the 3R method of studying (McDaniel, Howard, & Einstein, 2009). The 3R strategy, which stands for *read-recite-review*, involves the following steps:

1. You first *read* a short section of material, such as the material under a particular subheading—though it could be shorter or longer than this depending on the difficulty or complexity of the material.
2. Once you finish reading, you then *recite* to yourself, without looking at the material, the main points in what you just read. Don't worry about how well you do at this point—you may in fact find it quite difficult—just do the best you can.
3. After attempting to recite the material, then *review* the material by going back over it, paying particular attention to anything you missed in step 2.

Research has shown that, for many students, this approach can significantly enhance learning. Unfortunately, students tend not to study this way because it is difficult and effortful, unaware of the fact that *it is the effort that makes it effective*.

Many students also like to underline (or highlight) as they read, but they unfortunately do so in ways that contribute little to learning (Dunlosky et al., 2013). A frequent problem is that students underline too much information, both important and unimportant. An alternate approach, which we'll call "selective underlining," is to first read the paragraph *without underlining*; you instead simply search for the important points you will want to underline later. After finishing the paragraph, you then go back and underline just the important points. This means that you will often be underlining only parts of sentences rather than whole sentences. This process is slower and more effortful than the typical way students underline, but your recall for the information is likely to be much greater. The underlined passages also provide an excellent summary of the chapter for you to review or use as a basis for making study notes.

As you no doubt noticed, the paragraph you just read provides an example of selective underlining (though you yourself may have chosen a somewhat different set of phrases). Another possibility that you may wish to experiment with would be to combine selective underlining with the 3R approach; for example, selectively underline each paragraph within a section, then when you finish the section try to recite the information you underlined.

You can find plenty of how-to-study advice on the Internet—but be careful with it; the Internet contains a lot of advice, both good and bad—or at your campus counseling center. The important thing is to find the combination of study tactics that works best for you, which may be rather different from what works best for someone else. Of course, this advice is of little use if you tend to procrastinate and rarely study in the first place. In that case, you may wish to consult the appendix at the end of this text for advice on behavior self-management. Even if your instructor has not assigned the appendix as part of your course, you may find useful advice in it that could help decrease your tendency to procrastinate.

Let's begin with a brief outline of what this textbook is about. Simply put, ***behavior*** is any activity of an organism that can be observed or somehow measured. As we discuss in Chapter 2, the activity may be internal or external and may or may not be visible to others. ***Learning*** is a relatively permanent change in behavior that results from some type of experience. For example, reading this text is an example of a behavior, and any lasting change in your behavior as a result of reading this text (e.g., a change in your ability to speak knowledgeably about the subject matter) is an example of learning.

Note that the change in behavior does not have to be immediate, and in some circumstances the change might not become evident until long after the experience has occurred.

This text emphasizes two fundamental forms of learning: classical and operant conditioning. Although these will be discussed in more detail later, a brief description of each is useful at this point. At its most basic level, *classical conditioning* (also known as Pavlovian or respondent conditioning) is the process by which certain inborn behaviors come to be elicited in new circumstances. The behaviors involved are often what the average person regards as reflexive or "involuntary," such as sneezing in response to dust or salivating in response to food. A familiar example of classical conditioning, which is often presented in introductory psychology textbooks, is that of a dog learning to salivate in response to a bell that was previously followed by food. This process can be diagrammed as follows:

Bell: Food → *Salivation*
Bell → *Salivation*

(See "Notation for Conditioning Diagrams" in the And Furthermore box.)

And Furthermore

Notation for Conditioning Diagrams

In this text, you will encounter many diagrams of conditioning procedures. In these diagrams, a colon separating two events indicates that the events occur in sequence. For example, the term "Bell: Food" means that the sound of a bell is followed by the presentation of food. An arrow between two events also indicates that they occur in sequence, but with an emphasis on the fact that the first event *produces* or *causes* the second. For example, "Food → *Salivation*" means that the presentation of food causes the dog to salivate. Thus, with respect to a standard classical conditioning procedure, the term:

Bell: Food → *Salivation*

means that the bell is presented just before the food, and the food in turn causes salivation. This is followed by:

Bell → *Salivation*

which indicates that the presentation of the bell itself now causes the dog to salivate (because of the bell's previous pairing with food). For clarity, we will usually italicize the behavior that is being conditioned (which is often called the "target behavior"). In writing out your notes, however, you may find it easier to indicate the target behavior by underlining it. For example:

Bell: Food → <u>Salivation</u>
Bell → <u>Salivation</u>

As you will learn in this text, classical conditioning underlies many of our emotional responses and contributes to the development of our likes and dislikes. It can also lead to the development of debilitating fears and powerful feelings of sexual attraction.

In contrast to classical conditioning, *operant conditioning* involves the strengthening or weakening of a behavior as a result of its consequences. The behaviors involved are often those that the average person regards as goal-directed or "voluntary." A common experimental example is that of a rat that has learned to press a lever (the behavior) to obtain food (the consequence), the future effect of which is an increase in the rat's tendency to press the lever. This can be diagrammed as follows:

***Lever press* → Food pellet**
Future effect: Likelihood of lever pressing increases

Because the lever press produced a food pellet, the rat is subsequently more likely to press the lever again. In other words, the consequence of the behavior (the food pellet) has served to strengthen future occurrences of that behavior. Many of the behaviors that concern us each day are motivated by such consequences; we hit the remote button to turn on a favorite television show, compliment a loved one because it produces a smile, and study diligently to obtain a passing grade. The consequences can be either immediate, as in the first two examples, or delayed, as in the last example—though, as we will later discuss, the effect of delayed consequences on behavior can involve certain complexities. Because of its importance for humans, operant conditioning is the type of learning most strongly emphasized in this text.

Although the text concentrates on classical and operant conditioning, other types of behavioral processes are also discussed. For example, in *observational learning* the act of observing someone else's behavior facilitates the occurrence of similar behavior in oneself. Certain types of largely inherited (non-learned) behavior patterns, such as *fixed action patterns*, are also discussed, as is the effect of inherited dispositions in either facilitating or inhibiting certain types of learning. Let's begin, however, with a brief overview of the historical background to the study of learning and behavior.

QUICK QUIZ A

While reading the text, you will frequently encounter fill-in-the-blank quizzes. Students report that these quizzes greatly facilitate the task of reading by dividing the material into small chunks and by encouraging them to be actively involved with the material. Also, if you are using the 3R or underlining approach mentioned in the earlier section on study tips, the quizzes provide a way for you to assess how well these techniques are working for you. Note that many of the items contain helpful hints, usually in the form of the initial letter or two of the word that should be inserted into the blank. We have not, however, provided the answer key. This is partly because most of the answers can easily be found in the text; more importantly, though, a certain amount of uncertainty can actually facilitate learning (Dunlosky et al., 2013; Karpicke & Blunt, 2011; Schmidt & Bjork, 1992). In other words, even if

you are uncertain about the answer to a particular item, your struggle to figure out the answer will very likely lead you to a better understanding of the relevant concept.

1. The term *behavior* refers to any activity of an organism that can be o_____ or somehow m_____, whereas the term *learning* refers to a relatively p_____ change in behavior as a result of some type of ex_____.
2. In _____ conditioning, behaviors that the average person typically regards as (voluntary/involuntary) *[for these types of items, simply underline the correct answer]* come to be elicited in new situations.
3. In _____ conditioning, a behavior produces some type of consequence that strengthens or weakens its occurrence. Such behaviors are typically those that are generally regarded as "g_____-directed" and which the average person often perceives as being "v_____" in nature.
4. Feeling anxious as you enter a dentist's office is an example of a behavior that has most likely been learned through _____ conditioning. *[Think: Is anxiety the type of behavior you perceive as reflexive and involuntary or as goal-directed and voluntary?]*
5. Speaking with a loud voice in a noisy environment so that others will be able to hear you is an example of a behavior that has most likely been learned through _____ conditioning.
6. According to the notational system to be used in this text, the term "A: B" means that event A (produces/is followed by) event B, and the term "X → Y" means that event X (produces/is followed by) event Y.

Historical Background

Just as it is impossible to outline all of the experiences that have made you who you are, it is impossible to outline all of the historical events that have contributed to the modern-day study of learning and behavior. Some particularly important contributions, however, are discussed in this section.

Aristotle: Empiricism and the Laws of Association

Aristotle was a Greek philosopher who lived between 384 and 322 B.C. Aristotle's teacher, Plato, believed that everything we know is inborn (which he conceived of as "residing in our soul"); thus, learning is simply a process of inner reflection to uncover the knowledge that already exists within. Aristotle, however, disagreed with Plato and argued that knowledge is not inborn but instead is acquired through experience.

Aristotle's disagreement with Plato is an early example of the classic debate between nativism and empiricism, or nature and nurture. The ***nativist*** (***nature***) perspective assumes that a person's abilities and tendencies are largely inborn, whereas the ***empiricist*** (***nurture)*** perspective assumes that a person's

abilities and tendencies are mostly learned. Plato is thus an early example of a nativist and Aristotle is an early example of an empiricist.[1]

Aristotle also suggested that ideas come to be connected or associated with each other via four laws of association (well, actually three, but he also hinted at a fourth that later philosophers expanded upon).

1. **The Law of Similarity.** According to this law, events that are similar to each other are readily associated with each other. For example, cars and trucks are readily associated because they are similar in appearance (wheels, doors, headlights, etc.) and function (both are used to carry passengers and materials along roadways). These similarities enable us to learn to view cars and trucks as instances of a larger category of objects known as automobiles.
2. **The Law of Contrast.** According to this law, events that are opposite from each other are readily associated. For example, on a word association test the word *black* often brings to mind the word *white*, and the word *tall* often brings to mind the word *short*. Likewise, the sight of your unwashed car reminds you of how nice it would look if you washed it, and an evening of studying reminds you of how enjoyable it would be to spend the evening not studying.
3. **The Law of Contiguity.** This law states that events that occur in close proximity to each other are readily associated (*contiguity* means "closeness"). For example, a child quickly learns to associate thunder and lightning because the sound of thunder soon follows the flash of lightning. Thunder and lightning are also perceived as coming from the same direction. Imagine how difficult it would be to associate thunder and lightning if the thunder occurred several minutes after the lightning flash and came from a different direction.
4. **The Law of Frequency.** In addition to the three preceding laws, Aristotle mentioned a supplement to the law of contiguity, which is that the more frequently two items occur together, the more strongly they are associated. You will more strongly associate a friend with a certain perfume the more frequently you smell that perfume upon meeting her. Likewise, you will more strongly associate a term (such as the law of frequency) with its definition the more frequently you practice saying that definition whenever you see the term (as when using flash cards to help memorize basic terminology).

[1]In philosophy, the term *empiricism* usually refers to the notion that *knowledge* can be gained only through sensory experience rather than through heredity or by pure reasoning. In psychology, the term has a slightly altered meaning, which is that a certain *behavior* or *ability* is the result of experience rather than heredity. Thus, the notion that great musicians have inherited a "gift" for music is a nativist viewpoint, whereas the notion that almost anyone can become a great musician given the right kind of experiences is an empiricist viewpoint. But the word *empiricism* can also be used in a methodological sense to refer to the gathering of information through systematic observation and experimentation, as in "behavioral psychology is an empirical approach to the study of behavior."

Aristotle's laws of association are not merely of historical interest. As you will read later, *the laws of contiguity and frequency are still considered important aspects of learning*. After all, how well could a dog learn to salivate to the sound of a bell if the bell preceded the presentation of food by several minutes, or if there was only one pairing of bell and food?

QUICK QUIZ B

1. The nativist position, as exemplified by the Greek philosopher _____, emphasizes the role of (learning/heredity); the empiricist position, as exemplified by the Greek philosopher _____, emphasizes the role of (learning/heredity).
2. Nativist is to (nature/nurture) as empiricist is to (nature/nurture). (*If you find analogy questions like this confusing, a search of the Internet will yield helpful information on how to handle such questions.*)
3. The law of _____ states that we associate events that are opposite to each other, whereas the law of _____ states that we associate events that occur in close proximity to each other.
4. According to the law of _____, we easily associate events that resemble each other. According to the law of _____, the more often two events occur together, the stronger the association.
5. Animals that have fur, four legs, a tail, and can bark are quickly perceived as belonging to the same species. This is an example of the law of _____.
6. The fact that the words *full* and *empty* are easily associated with each other is an example of the law of _____.
7. The *more often* one practices a particular move in wrestling, the more likely one is to perform that move in a real match. This is an example of the law of _____.
8. After once encountering a snake in her garage, Lisa is now quite nervous each time she enters the garage. This is an example of the law of _____. This is also an example of (classical/operant) conditioning.

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René Descartes
(1596–1650)

Descartes: Mind–Body Dualism and the Reflex

René Descartes (1596–1650) is the French philosopher who wrote the famous line "I think, therefore I am." Fortunately for psychology, this was not his only contribution. In Descartes' time, many people assumed that human behavior was governed entirely by free will or "reason." Descartes disputed this notion and proposed a dualistic model of human nature. On the one hand, he claimed, we have a body that functions like a machine and produces involuntary, reflexive behaviors in response to external stimulation (such as sneezing in response to dust). On the other

hand, we have a mind that has free will and produces behaviors that we regard as voluntary (such as choosing what to eat for dinner). Thus, Descartes' notion of ***mind–body dualism*** proposes that some human behaviors are reflexes that are automatically elicited by external stimulation, while other behaviors are freely chosen and controlled by the mind. Descartes also believed that only humans possess free will, while the behavior of nonhuman animals is entirely reflexive.

Descartes' dualistic view of human nature was a major step in the scientific study of learning and behavior because it suggested that at least some behaviors—namely, reflexive behaviors—are mechanistic and could therefore be scientifically investigated. It also suggested that the study of animal behavior might yield useful information about the reflexive aspects of human behavior.

The British Empiricists

Although Descartes believed that the human mind has free will, he also assumed, like Plato, that some of the ideas contained within it (e.g., the concepts of time and space) are inborn. By contrast, a group of British philosophers, known as the ***British empiricists***, maintained that almost all knowledge is a function of experience. For example, one of the major proponents of British empiricism, John Locke (1632–1704), proposed that a newborn's mind is a *blank slate* (in Latin, *tabula rasa*) upon which environmental experiences are written. The British empiricists also believed that the conscious mind is composed of a finite set of basic elements (specific colors, sounds, smells, etc.) that are combined through the principles of association into complex sensations and thought patterns—a sort of psychological version of the notion that all physical matter consists of various combinations of the basic elements.

QUICK QUIZ C

1. Descartes' dualistic model proposed that human behavior has two aspects: an inv_____ or ref_____ aspect that functions like a machine, and a v_____ aspect that is f_____ chosen. By contrast, the behavior of animals was believed to be entirely _____.
2. The British _____, such as John _____, maintained that knowledge was largely a function of ex_____ and that the mind of a newborn infant is a (in Latin) t_____ r_____ (which means _____ _____).
3. They also believed that the mind is composed of a finite set of basic _____ that are combined through the principles of _____ to form our conscious experiences.

Structuralism: The Experimental Study of Human Consciousness

The British empiricists did not conduct any experiments to test their notion that the mind is composed of basic elements; their conclusions were instead based upon logical reasoning and the subjective examination of their own

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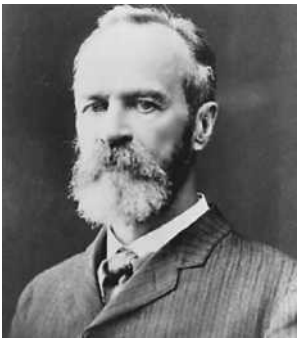
Edward B. Titchener
(1867–1927)

conscious experience. Realizing the deficiencies in this approach, the German philosopher Wilhelm Wundt (1832–1920) proposed using the scientific method to investigate the issue. This approach was strongly promoted by an American student of his, Edward Titchener (1867–1927), and became known as structuralism. ***Structuralism*** assumes that it is possible to determine the structure of the mind by identifying the basic elements that compose it.

Structuralists made great use of the method of ***introspection***, in which the subject in an experiment attempts to accurately describe his or her conscious thoughts, emotions, and sensations. To get a feel for how difficult this is, try to describe your conscious experience as you listen to the ticking of a clock (and just saying, "I'm bored" doesn't cut it). One thing you might report is that the ticks seem to have a certain rhythm, with a series of two or three clicks being clustered together. You might also report a slight feeling of tension (is it pleasant or unpleasant?) that builds or decreases during each series of ticks. As you can see, an accurate report of what we introspectively observe can be quite difficult.

Although this approach to psychology died out by the early 1900s (for reasons described shortly), its emphasis on systematic observation helped establish psychology as a scientific discipline. More importantly, its extreme emphasis on conscious experience as the proper subject matter for psychology resulted in a great deal of frustration and dissatisfaction—which eventually led to the later establishment of a more objective approach to psychology, known as behaviorism.



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William James
(1842–1910)

Functionalism: The Study of the Adaptive Mind

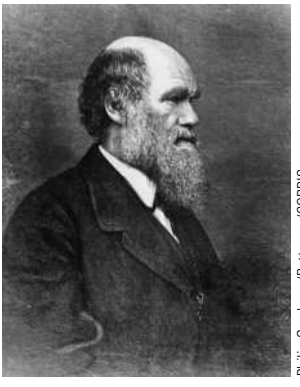
William James (1842–1910), often regarded as the founder of American psychology, helped establish the approach to psychology known as functionalism. ***Functionalism*** assumes that the mind evolved to help us adapt to the world around us and that the focus of psychology should be the study of those adaptive processes. This proposition was partially derived from Darwin's theory of evolution, which proposes that adaptive characteristics that enable a species to survive and reproduce tend to increase in frequency across generations while nonadaptive characteristics tend to die

out. Thus, according to a functionalist perspective, characteristics that are highly typical of a species, such as the characteristic of consciousness in humans, must have some type of adaptive value.

Based on such reasoning, functionalists believed that psychologists should not study the structure of the mind, but instead study the adaptive significance of the mind. Learning, as an adaptive process, was therefore a topic of great interest to the functionalists. Moreover, although functionalists still made use of introspection and still emphasized the analysis of conscious experience (in this manner, being similar to the structuralists), they were not opposed to the study of animal behavior. Like Darwin, they believed that humans evolved in the same manner as other animals and that much of what we learn from studying animals might therefore be of direct relevance to humans. Not surprisingly, two of the most important figures in the early history of behaviorism, E. L. Thorndike (discussed in Chapter 6) and John B. Watson (discussed later in this chapter), were students of functionalist psychologists.

QUICK QUIZ D

1. The st_____ approach proposed that the goal of psychology should be to identify the basic elements of the mind. The primary research method used for accomplishing this was the method of i_____.
2. Those who adopted the f_____ approach to psychology emphasized the adaptive processes of the mind and were thus very interested in the study of learning.
3. The _____ approach viewed animal research as (relevant/irrelevant) to the study of human behavior in that humans were assumed to have evolved in a (similar/dissimilar) way to other animals.
4. The functionalists were similar to the structuralists in that they emphasized the study of c_____ experience and often used the method of i_____.
5. William James was a (functionalist/structuralist), and Edward Titchener was a _____.



Philip Gendreau/Bettmann/CORBIS

Charles Darwin
(1809–1882)

The Theory of Evolution: Humans as Animals

As we have seen, the theory of evolution had a significant influence on the development of behaviorism, which continues today. We should therefore take some time to discuss this theory more fully. Charles Darwin published the theory of evolution in 1859 in his book, *On the Origin of Species by Means of Natural Selection* (often simply called *The Origin of Species*). It describes how species, including humans, change across generations in response to environmental pressures. The basis of this theory is the principle of ***natural***

selection, which is the concept that individuals or species that are capable of adapting to environmental pressures are more likely to reproduce and pass along their adaptive characteristics than those that cannot adapt.

There are three main components to the principle of natural selection. The first is that *traits vary, both within a species* (e.g., some dogs are larger than other dogs) *and between species* (e.g., humans have a slower metabolism than hummingbirds). The second is that *many traits are heritable*, meaning that they have a genetic basis and can be inherited by offspring. The third component of natural selection is that *organisms must compete for limited resources* (bearing in mind, however, that being an effective competitor might sometimes involve cooperation as much as conflict).

Now let us put all three ideas together. Some individuals will acquire more resources than others based on certain inherited traits that give them an advantage. These individuals are therefore better able to survive—which is commonly referred to as "survival of the fittest." However, the real driving force behind evolution is not survival of the fittest but the *reproductive advantage held by those individuals possessing traits that are best suited to the environment*. In other words, successful individuals are more likely to have offspring who, when they inherit the successful traits from their parents, are also more likely to survive and have offspring. As this process continues through succeeding generations, the proportion of individuals possessing the successful traits increases while the proportion of individuals possessing the unsuccessful traits decreases. Eventually, the changed population might differ so much from the original population that it becomes a new species.

Thus, an ***evolutionary adaptation*** is an adaptive trait that evolves as a result of natural selection. We usually think of such adaptations as physical characteristics (e.g., the trunk of an elephant), but adaptations can also be behaviors. For example, as you will learn in Chapter 3, if you inadvertently place your hand over a flame, a *flexion response* will cause you automatically to pull your hand away from the damaging fire even before you consciously feel pain. You can imagine how an inborn reflex like this would help an individual live long enough to reproduce, compared to an individual who lacked such reflexes.

A particularly important evolutionary adaptation, which is the focus of this text, is the ability to learn. From an evolutionary perspective, the ability to learn evolved because it conferred significant survival advantages on those who had this ability. Thus, the distinction between nature and nurture can be seen as highly simplistic, since the ability to learn (nurture) is itself inherited (nature).

In this text, you will learn about features of learning that are common across a variety of species, which suggests that the ancestors of these species faced similar environmental pressures that resulted in the evolution of similar features. Nevertheless, you will also learn about certain between-species differences in learning ability.

As noted, Darwin's theory of evolution had a strong effect on the early development of behaviorism, especially through its influence on the functionalist school of psychology out of which behaviorism developed.

It continues to have an effect through the increased attention given these days to the role of genetic factors in learning, and through the recent establishment of "evolutionary psychology" as a major area of study within psychology.

QUICK QUIZ E

1. The three main components to the theory of natural selection are:
   a.
   b.
   c.
2. To say that a trait is h_____ means that it has a genetic basis and can be inherited by offspring.
3. The real driving force behind evolution is not survival of the fittest, but rather the re_____ advantage held by individuals who possess adaptive traits.
4. It is simplistic to assume that one can draw a clear distinction between n_____ and n_____, because the way we learn is itself an inh_____ trait.

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John B. Watson
(1878–1958)

Behaviorism: The Study of Observable Behavior

In 1913, a flamboyant young psychologist by the name of John B. Watson published a paper titled "Psychology as the Behaviorist Views It." In it, he lamented the lack of progress achieved by experimental psychologists up to that time, particularly the lack of findings that had any practical significance. A major difficulty, Watson believed, was the then-current emphasis on the study of conscious experience, especially as promoted by the structuralists. In particular, the method of introspection was proving to be highly unreliable. Researchers frequently failed to replicate each other's findings, which often led to bitter squabbles. Watson mockingly described the types of arguments that often ensued:

> If you fail to reproduce my findings, it is not due to some fault in your apparatus or in the control of your stimulus, but it is due to the fact that your introspection is untrained.… If you can't observe 3–9 states of clearness in attention, your introspection is poor. If, on the other hand, a feeling seems reasonably clear to you, your introspection is again faulty. You are seeing too much. Feelings are never clear. (Watson, 1913, p. 163)

The difficulty, of course, is that we are unable to directly observe another person's thoughts and feelings. We therefore have to make an *inference* that

the person's verbal reports about those thoughts and feelings are accurate.[2] It is also the case that many of the questions being tackled by the structuralists were essentially unanswerable, such as whether sound has the quality of "extension in space" and whether there is a difference in "texture" between an imagined perception of an object and the actual perception of the object (Watson, 1913, p. 164). In a very real sense, experimental psychology seemed to be drowning in a sea of vaguely perceived images and difficult-to-describe mental events. Moreover, the notion that the proper subject matter of psychology was the study of consciousness was so strongly entrenched that it affected even those who studied animal behavior. As Watson exclaimed,

> On this view, after having determined our animal's ability to learn, the simplicity or complexity of its methods of learning, the effect of past habit upon present response…we should still feel that the task is unfinished and that the results are worthless, until we can interpret them by analogy in the light of consciousness. [In other words,] we feel forced to say something about the possible mental processes of the animal. (Watson, 1913, p. 160)

Watson reasoned that the only solution to this dilemma was to make psychology a purely "objective science" based solely on the study of directly observable behavior and the environmental events that surround it. All reference to internal processes, such as thoughts and feelings, were to be stricken from analysis. By objectifying psychology in this manner, Watson hoped that psychology could then join the ranks of the *natural sciences*—biology, chemistry, and physics—which had traditionally emphasized the study of observable phenomena. In Watson's now-classic words,

> Psychology as the behaviorist views it is a purely objective experimental branch of natural science. Its theoretical goal is the prediction and control of behavior. Introspection forms no essential part of its methods, nor is the scientific value of its data dependent upon the readiness with which they lend themselves to interpretation in terms of consciousness. (Watson, 1913, p. 154)

Thus, as originally defined by Watson, ***behaviorism*** is a natural science approach to psychology that focuses on the study of environmental influences on observable behavior.

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[2]An *inference* is a supposition or guess based on logical deduction rather than on observation. For example, if you describe to me a dream that you had last night, your report is based on your direct observation of a subjective experience. But if I accept that description (because there seems to be no reason for you to lie about it), I am making an inference that your report is accurate. Now suppose I interpret the dream as indicating that you have some unresolved, unconscious conflict, and you accept that interpretation as true. We are now both making an inference that this unconscious conflict exists, because neither you nor I have directly observed it. Needless to say, inferences about unconscious processes are even more problematic than inferences about conscious processes, because not even the person in whom the unconscious process exists is able to directly observe it.

Watson also believed strongly in the value of animal research. In keeping with his functionalist background—in turn following from Darwin's theory of evolution—he believed that the principles governing the behavior of nonhuman species might also be relevant to the behavior of humans. Thus, traditional behavioral research is often conducted using nonhuman animals, primarily rats and pigeons. As many of the examples in this text illustrate, the results obtained from such research are often highly applicable to human behavior.

It is worth noting that Watson was not the first psychologist to recommend a more objective, natural science approach to psychology. He simply reflected a growing sentiment among many researchers at that time that such a move was necessary. Watson's arguments, however, were the most clearly stated and therefore had a strong effect. Thus, while his 1913 paper (which later became known as the "Behaviorist Manifesto") did not have an immediate impact, its influence slowly grew until, by the 1920s, the behaviorist revolution was well under way. (For a brief discussion of Watson's personal life, see "John B. Watson: Behaviorism's Controversial Founder" in the And Furthermore box.)

And Furthermore

John B. Watson: Behaviorism's Controversial Founder

John B. Watson was a charismatic and aggressive individual and as such was perhaps ideally suited for lifting psychology out of the mentalistic quagmire in which it had become immersed. Unfortunately, those same traits led to a life of conflict. The most infamous story concerns the manner in which Watson was forced to resign from his university position. One version has it that he and a female student were caught conducting intimate experiments on human sexual responding, and he was forced to resign over the resultant scandal. There is, however, little evidence for this story (see Benjamin, Whitaker, Ramsey, & Zeve, 2007, for a description of how this rumor became established), and the real events appear to be as follows.

In 1920, at the height of his academic career, Watson began an affair with Rosalie Rayner, a graduate student whose family was well connected and powerful. Catching wind of the affair, Watson's wife entered Rosalie's room during a social visit to the Rayners and stole the letters Watson had written to his young lover. She then filed for divorce and used the letters to help win a lucrative settlement. Meanwhile, the university ordered Watson to end his affair with Rosalie. Watson refused and immediately tendered his resignation. Soon after, news of Watson's divorce and of the affair found its way into the media, with one of Watson's love letters even appearing in several newspapers. Watson's academic career was ruined.

Cast adrift, Watson married Rayner and obtained a job with a New York advertising firm. In his new position, he attempted to promote a more scientific approach to the

discipline of advertising—though the extent to which he had any significant influence on the industry is questionable (Coon, 1994). He also continued to publish books and magazine articles promoting his behavioristic views. In fact, Watson was very much the pop psychologist of his era, much like the present-day Dr. Phil. Unfortunately, as with pop psychology today, some of his advice was based more on personal opinion than on well-established principles. For example, Watson believed that children should be trained to act like adults and even recommended giving them a handshake, rather than a hug or a kiss, when sending them to bed! In fact, the only time he ever showed affection to his own children was when his wife died in 1935. Teary eyed, Watson lightly put his arms around his children as he told them that their mother had passed away, then never again mentioned her name. Not surprisingly, his children retained bitter memories of their upbringing, and one son later committed suicide.

It has been suggested that Watson had an underlying fear of emotions. In his love relationships (and he had numerous affairs throughout his life), he was extremely impulsive and amorous; yet in a group setting he would reportedly flee the room when the discussion turned to emotional issues. Thus, although Watson's proposal to banish thoughts and feelings from psychology helped establish it as a more objective science, it may also have reflected some personal difficulties.

In his later years, Watson became something of a recluse, living in the country and raising animals. He had always been fond of animals—sometimes claiming he preferred their company to that of humans—which may account for his early interest in animal research. He died in 1958 at the age of 80. (See Buckley, 1989, for a comprehensive biography of Watson.)

QUICK QUIZ F

1. Watson noted that a major problem with the method of _____ was that the results obtained were often unreliable.
2. A basic problem with relying on someone's report about his or her thoughts and feelings is that we are making an i_____ that the report is accurate. This term is defined in the footnote as a supposition or guess based on logical d_____ rather than direct o_____.
3. The notion that the proper subject matter of psychology should be the study of consciousness was so strong that even those who studied _____ behavior felt compelled to make inferences about mental processes in their subjects.
4. Watson argued that psychology needed to become a n_____ science (like biology, chemistry, and physics) based solely on the study of directly ob_____ events.

Five Schools of Behaviorism

Many people mistakenly believe that behaviorism is a monolithic entity, with Watson's views being the same views held by other behaviorists. In fact, there are several schools of behaviorism, each based on a somewhat different set of assumptions about how best to study environmental influences on

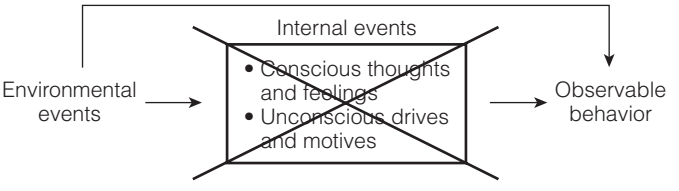
behavior. In this section, we describe five of these schools, beginning with Watson's original brand of behaviorism, which is sometimes referred to as methodological behaviorism (e.g., O'Donohue & Ferguson, 2001).[3]

Watson's Methodological Behaviorism

One of the most extreme versions of behaviorism is the one originally proposed by Watson (1913). ***Methodological behaviorism*** asserts that, for methodological reasons, psychologists should study only those behaviors that can be directly observed (see Figure 1.1). Subjectively perceived activities, such as thinking, are methodologically too difficult to assess to be of much use in a scientific analysis of behavior. Such activities can be included for analysis only if they can, in some way, be directly measured. Watson, for example, hypothesized that thinking involves minute movements of the vocal cords in the larynx—and he enjoyed goading his critics by referring to his own thoughts as "laryngeal activity" (Buckley, 1989). If this were true, and if such movements could be precisely measured, then the act of thinking could be subjected to scientific analysis. (As it turns out, laryngeal activity is not a reliable measure of thinking.)

It is important to emphasize that Watson's behavioristic proposal to ignore thoughts and feelings in scientific analysis was not simply an attempt to dehumanize people or to pretend that thoughts and feelings do not exist (whatever his own personal biases may have been); rather, it was in part a logical response to a crisis. If the discipline of psychology was to survive, it would need to break free from the extreme mentalism of the time and adopt

FIGURE 1.1 In methodological behaviorism, internal events, such as consciously perceived thoughts and feelings as well as unconscious drives and motives, are excluded from the analysis of behavior. Instead, one studies the direct relationship between changes in the environment and changes in observable behavior.



[3]Be aware that the names of the different schools presented here are not at all standardized. For example, a quick search of scholarly postings on the Internet will soon reveal alternative names for Watson's approach, such as *classical behaviorism* and even *radical behaviorism* (which is usually reserved for Skinner's version of behaviorism). And the term *methodological behaviorism* is sometimes applied to any approach that rejects the value of data gathered through introspection, including many cognitive approaches to psychology.

a much different perspective. Watson's behavioristic call to arms, though extreme, accomplished just that.

From a theoretical perspective, Watson's specific view of learning was rather mechanistic. Drawing from Pavlov's work on classical conditioning, he came to believe that all learning involves the development of a simple connection between an environmental event (the "stimulus") and a specific behavior (the "response"). Watson's theory of learning is therefore regarded as a type of ***stimulus-response (S-R) theory***, in which a connection is formed between a specific stimulus and a specific response. Complex behavior is presumed to involve extremely long chains of these S-R connections.

Over time, Watson also became something of an extremist regarding the nature–nurture issue. In his original 1913 article, he had emphasized the influence of both heredity and environment on behavior. In fact, he was one of the first individuals to systematically study innate behavior patterns in animals (he spent several strenuous summers engaged in field research with a type of seabird). Later, however, following extensive observations of human infants, he came to the conclusion that humans inherit only a few fundamental reflexes along with three basic emotions: love, rage, and fear. Everything else, he believed, is learned. This led Watson, in 1930, to make one of his most famous claims:

> Give me a dozen healthy infants, well-formed, and my own specified world to bring them up in and I'll guarantee to take any one at random and train him to become any type of specialist I might select—doctor, lawyer, artist, merchant-chief, and, yes, even beggar-man and thief, regardless of his talents, penchants, tendencies, abilities, vocations, and race of his ancestors. (p. 104)

Unfortunately, many textbooks quote only this passage and omit the very next sentence, which reads, "I am going beyond my facts, but so have the advocates of the contrary and they have been doing it for many thousands of years" (p. 104). And this was precisely Watson's point: The supposition that a person's abilities are largely inherited has been strongly promoted throughout history (and has often been used to justify acts of discrimination and racism). Watson was one of the first to issue a strong challenge to this assumption, arguing instead that there is at least as much evidence suggesting that human abilities are mostly learned. For this reason, Watson's behavioral model became quite popular among the reformists of his day who were attempting to combat racism. (For recent evidence on the importance of learning as opposed to innate ability, see "Deliberate Practice and Expert Performance" in the And Furthermore box.)

As we previously noted, many people mistakenly equate behaviorism with Watson's rather extreme version. In fact, few behaviorists were this extreme; instead, they developed approaches that were considerably more moderate. One of the most influential of these was Hull's neobehaviorism, which we discuss next.

QUICK QUIZ G

1. Watson's brand of behaviorism is often referred to as _____ behaviorism.
2. According to this type of behaviorism, psychologists should study only those behaviors that can be _____ _____.
3. Watson believed that all reference to _____ events should be eliminated from the study of behavior.
4. Watson proposed a(n) _____-_____ theory of learning, which hypothesizes that learning involves the formation of a direct connection between a st_____ and a r_____.
5. In his 1913 article on behaviorism, Watson emphasized the influence of (heredity/environment/both) in the development of behavior. In his later theorizing, he downplayed the role of _____ in the development of human behavior.
6. In his later theorizing, Watson proposed that humans inherit (many/a few) basic reflexes, along with three basic emotions: _____, _____, and _____.

And Furthermore

Deliberate Practice and Expert Performance

Watson's emphasis on the importance of nurture over nature in determining human behavior is often viewed with skepticism. This is especially the case when it comes to behaviors that are indicative of exceptional ability. Most people, including many psychologists (e.g., Gardner, 1993), assume that, unless a person is born with a certain amount of talent, there are limits in how far he or she will be able to progress in a particular endeavor. Indeed, the notion that a Babe Ruth, Albert Einstein, or Wolfgang Amadeus Mozart is to a large extent born, and not made, is part of the mystique surrounding these individuals. But consider the following:

- Expert performers in almost all fields of endeavor, ranging from music to athletics to chess, require a minimum of 10 years of intensive training before achieving a high level of performance. Even Mozart, who started composing at age 4, did not compose world-class music until his late teens. Mozart's father was also a professional musician who published the first book on violin instruction and provided his children with intensive musical training from an early age. (Mozart's reputation has also benefitted from certain dubious claims: For example, the notion that he could compose entire works in memory and then write them down with little or no editing is based on a single passage in a supposed letter of his that is now believed to be a forgery [Colvin, 2008]).
- As an experiment, a Hungarian educator, Polgar, set out to systematically train his daughters to become expert chess players. All three daughters have achieved high rankings in international chess, and one daughter, Judit, at one point held the record for becoming the youngest grand master ever, at 15 years of age.
- The superlative abilities shown by experts are almost always specific to their field of endeavor. For example, chess experts have the ability to memorize the exact positions of all the chess pieces in a game after only a few seconds' glance at the chessboard.

But they perform no better than non-chess players at memorizing chess pieces randomly distributed around the board in a non-game pattern.

- Almost all of the remarkable feats displayed by *savants*—individuals of low intellectual ability who nevertheless possess some remarkable skill—have been taught to normal individuals. For example, the ability of some savants to name the day of the week for any arbitrary date (e.g., "What day of the week was June 30, 1854?") has been duplicated by ordinary college students after only a few weeks of training.

Based on findings such as these, Ericsson, Krampe, and Tesch-Römer (1993; see also Ericsson & Charness, 1994) argued that the most critical factor in determining expert performance is not innate ability but deliberate practice. Deliberate practice is practice that is not inherently enjoyable; it instead involves intense concentration and considerable effort with a view toward improving one's performance. More than any other variable, the accumulated amount of deliberate practice in an activity is strongly predictive of an individual's level of performance.

Because deliberate practice is so effortful, the amount that can be tolerated each day is necessarily limited. For this reason, elite performers often practice about 4 hours per day. Ericsson et al. (1993), for example, found that the best violin students engaged in solitary practice (which was judged to be the most important type of practice) for approximately 3.5 hours per day, spread out across two to three sessions, each session lasting an average of 80 minutes. Note that this did not include time spent receiving instruction, giving performances, or playing for enjoyment. The students also devoted about 3.5 hours a day to rest and recreation and obtained more than average amounts of sleep.

Top-level performers in intellectual pursuits display similar characteristics. Novelists typically write for about 3 to 4 hours each day, usually in the morning. Eminent scientists likewise write for a few hours each morning—the writing of articles arguably being the most important activity determining their success—and then devote the rest of the day to other duties. B. F. Skinner is especially instructive in this regard. In his later life, he would rise at midnight and write for 1 hour, then rise again at 5:00 A.M. and write for another 2 hours. The remainder of the morning was devoted to correspondence and other professional tasks, while much of the afternoon was devoted to leisure activities such as tinkering in his workshop and listening to music. He deliberately resisted any urge to engage in serious writing at other times of the day, feeling that this often resulted in poor-quality writing the next morning. However, the limited amount of writing he did each day was more than compensated for by the consistency with which he wrote, resulting in a steady stream of influential articles and books throughout his career (Bjork, 1993).

Of course, Ericsson et al. (1993) do not completely discount the role of heredity in expert performance. Heredity might well affect the extent to which one becomes interested in an endeavor, as well as one's ability to endure the hard work needed to become a top performer. Nevertheless, the obvious importance of deliberate practice suggests that we should not be too quick to discount our ability to acquire a certain skill. Although many of us might not have the desire, time, or resources to become elite athletes, excellent musicians, or famous scientists, this does not rule out the possibility of becoming better tennis players, learning how to play the guitar, or significantly improving our math skills. After all, the best evidence available suggests that it is largely a matter of practice. (See Ericsson, 2009, for further information on this topic.)

Deane Keller, "Dr. Clark Leonard Hull (1884–1952), M. A. (Hon.) 1929" Yale University Art Gallery, Gift of Colleagues, Friends and students of the sitter

Clark L. Hull
(1884–1952)

Hull's Neobehaviorism

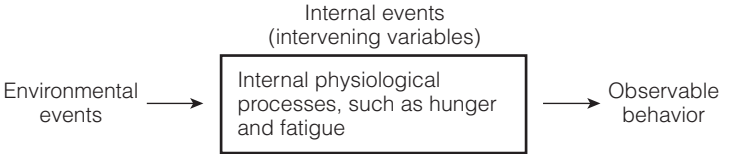
A major challenge to methodological behaviorism came from Clark Hull (1884–1952), who claimed that Watson's rejection of unobservable events was scientifically unsound. Hull noted that both physicists and chemists make inferences about events they have never directly observed but that can nevertheless be *operationalized* (i.e., defined in such a way that they can be measured). For example, gravity cannot be directly observed, but its effect on falling objects can be precisely measured. Hull believed that it might likewise be useful for psychologists to infer the existence of internal events that might *mediate* (form a connection) between the environment and behavior.

The mediating events that Hull incorporated into his theory consisted largely of physiological-type reactions, for example, a "hunger drive" that can be operationalized as number of hours of food deprivation. Such mediating events are formally called *intervening variables*, meaning that they intervene between a cause (such as food deprivation) and an effect (such as speed of running toward food). Thus, Hull's ***neobehaviorism*** utilizes intervening variables, in the form of hypothesized physiological processes, to help explain behavior (see Figure 1.2).

It is important to note that Hull's use of intervening variables did not mean that he advocated a return to mentalism. Like Watson, he strongly opposed the use of introspection as a scientific tool, believing that subjective experiences are too vague and unreliable to be of much use. Thus, whether the organism actually experienced a feeling of hunger was of no concern to him. What did concern him was whether the *concept of hunger*, as defined in some measurable way (such as number of hours of food deprivation), was scientifically useful and led to testable hypotheses.

Hull's theory was also an S-R theory because it assumed that learning consists of the establishment of connections between specific stimuli and specific

FIGURE 1.2 In Hull's neobehaviorism, theorists make use of intervening variables in the form of hypothesized physiological processes to help explain the relationship between the environment and behavior.



responses. Thus, like Watson, he viewed behavior in a very mechanistic, stimulus-response fashion. Lest this seem dehumanizing, recognize that it is not far removed from some modern-day cognitive approaches, which view humans as analogous to computers that process bits of information from the environment (input) to produce responses (output). This is actually quite similar to Hull's model of behavior. In fact, some versions of modern-day cognitive psychology can even be considered outgrowths of Hull's neobehaviorism.[4]

Hull was the most influential experimental psychologist of the 1940s and 1950s. Unfortunately, many aspects of his theory (which are beyond the scope of this text) were very difficult to test. The theory was also highly mathematical and grew increasingly complex as equations were expanded and modified. Some of these modifications were forced on Hull by his critics, the most famous of whom was Edward C. Tolman. (For an overview of Hull's theory, as well as to gain a sense of its complexity, see Hull, 1943.)

QUICK QUIZ H

1. Hull believed that it might be useful to incorporate internal events into one's theorizing so long as they can be op_____ by defining them in such a way that they can be measured.
2. In Hull's approach, the internal events he included were hypothetical ph_____ processes.
3. Such internal events are called i_____ variables in that they are presumed to m_____ between the environment and behavior.
4. Hull's theory was a(n) _____ theory in that it assumed that the process of learning involves the creation of connections between specific s_____ and specific r_____.

Tolman's Cognitive Behaviorism

Hull's S-R theory of learning is often categorized as a "molecular" theory insofar as it assumed that specific S-R connections are the building blocks of behavior in the same way that molecules are the building blocks of matter. Edward Tolman (1886–1959) disagreed with this approach and believed that it would be more useful to analyze behavior on a "molar" (i.e., broader) level.

[4]Interestingly, people seem less critical of the cognitive information-processing approach to psychology, which draws an analogy between humans and computers, than they are of the traditional behavioral approach, which draws an analogy between humans and animals such as rats. Perhaps this is because we are impressed by the ability of computers to perform certain human-like tasks (e.g., play chess), and we are insulted by the notion that humans and rats have anything in common. Yet, outside their specialized abilities, computers are quite inferior to rats. Imagine, for example, that a man, a rat, and a computer are washed up on a deserted island. To the extent that the man emulates the rat (if he is capable of it), he will likely survive; to the extent that he emulates the computer, he will sit on the beach and rot. Rats have a marvelous ability to learn and adapt; present-day computers do not. Fortunately for us, humans are far more rat-like than computer-like.