



SECOND EDITION

An Introduction to  
**THEORIES  
OF LEARNING**

B.R. Hergenhahn

# an introduction to **THEORIES OF LEARNING**

**Second Edition**

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Dedicated to my students from whom I have learned so much



# Preface

New developments and old omissions necessitated several major changes in the second edition of *An Introduction to Theories of Learning*. The publication of Bandura's book, *Social Learning Theory* in 1977 stimulated considerable interest and helped to make social learning theory extremely popular today. We, therefore, added an entire chapter on Bandura's theory. In recent years, there has been growing recognition of the limits that an organism's biological make-up can place on the extent to which learning principles can be used in modifying its behavior. To demonstrate the biological influences on learning we added sections on the "Misbehavior of Organisms" and on "Autoshaping" to the chapter on Skinner's theory and a section on the development of taste aversions to the chapter on Pavlov's theory. A section on systematic desensitization was also added to the Pavlov chapter to show a practical application of classical conditioning. Spence's elaboration and revision of Hull's work was added to the chapter on Hull's theory. A summary of Wertheimer's work on productive thinking was added to the chapter on Gestalt theory. The chapter in the first edition that sampled research within the neurophysiological paradigm was revised to focus on the work of Donald Hebb, thus making that chapter more compatible with the format used throughout the book. In addition to these major changes, several relatively minor additions and deletions were made within each chapter.

I would like to thank John Isley of Prentice-Hall who nurtured the second edition into existence and then supported its development. I would also like to thank Joyce Turner of Prentice-Hall who was responsible for dealing with the many tasks that arise when a book enters production. Joyce was both efficient and friendly. For their reactions to various parts of the second edition I would like to thank the following individuals: Robert J.

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Any author with borderline typing skills knows the value of an outstanding typist. Being such an author, I am deeply indebted to Madelon Cassavant. Through the years Madelon has developed the ability to translate what I give her into legible English and for this I am very grateful.

B. R. Hergenhahn  
St. Paul, Minnesota

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# INTRODUCTION TO LEARNING



# 1

## What Is Learning?

Learning is one of the most important areas in present day psychology and yet it is an extremely difficult concept to define. The *American Heritage Dictionary* defines learning as follows: "To gain knowledge, comprehension, or mastery through experience or study." Most psychologists, however, would find this definition unacceptable because of the nebulous terms it contains, such as knowledge, comprehension, and mastery. Instead, the trend in recent years is to accept a definition of learning that refers to changes in observable behavior. The most popular of these definitions is the one suggested by Kimble (1961, p. 6), which defines learning as a *relatively permanent change in behavioral potentiality that occurs as a result of reinforced practice*. Although popular, this definition is far from universally accepted. Before reviewing sources of disagreement over Kimble's definition, let us look at it a bit more carefully.

First, learning is indexed by a change in *behavior*; in other words, the results of learning must always be translated into observable behavior. After learning, learners are capable of doing something that they could not do before learning took place. Second, this behavioral change is *relatively permanent*; that is, it is neither transitory nor fixed. Third, the change in behavior need not occur immediately following the learning experience. Although there may be a *potential* to act differently, this potential to act may not be translated into behavior immediately. Fourth, the change in behavior (or behavior potentiality) results from *experience* or practice. Fifth, the experience, or practice, must be reinforced; that is, only those responses that lead to reward will be learned. The reader may have noticed that we are using the terms reward and reinforcer synonymously since both, typically, refer to something that an organism wants. There is at least one exception to this, however. In Pavlov's work, a reinforcer is defined as any unconditioned stimulus, that is,

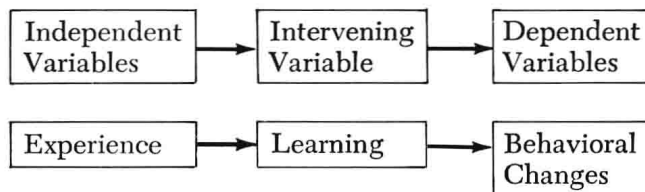
any stimulus that elicits a natural and automatic reaction from an organism. In Pavlovian research it is not uncommon for stimuli such as mild acid or electric shock to be used as unconditioned stimuli. It is accurate to call such stimuli reinforcers but they can hardly be considered rewards, if rewards are thought of as desirable. Still, with a few exceptions, it is generally acceptable to equate reinforcers and rewards.

Kimble's definition of learning provides a convenient frame of reference for discussing a number of important issues that must be confronted when attempting to define learning. We will review these issues in the following sections of this chapter.

## MUST LEARNING RESULT IN A BEHAVIORAL CHANGE?

As we shall see in Chapter 3, psychology has tended to become a *behavioral* science for good reason. A science requires an observable, measurable subject matter, and within the science of psychology, that subject matter is behavior. Thus, whatever we study in psychology must be expressed through behavior, but this does not mean that the behavior we are studying *is* learning. We study behavior so that we can make inferences concerning the process believed to be the cause of the behavioral changes we are observing. In this case, that process is learning. Most learning theorists covered in this text agree that the learning process cannot be studied directly; instead, its nature can only be inferred from changes in behavior. B. F. Skinner is the only theorist who takes exception to this contention. For Skinner, behavioral changes are learning and no further process needs to be inferred. Other theorists say that behavioral changes *result from* learning. We will have more to say about Skinner's antitheoretical point of view in Chapter 5.

Except for Skinner, then, most learning theorists look upon learning as a process that mediates behavior. For them, learning is something that occurs as the result of certain experiences and precedes changes in behavior. In such a definition, learning is given the status of an intervening variable. An intervening variable is a theoretical process that is assumed to take place between the observed stimuli and responses. The independent variables cause a change in the intervening variable (learning), which, in turn, causes a change in the dependent variable (behavior). The situation can be diagrammed as follows:





## How Permanent Is Relatively Permanent?

Here we run into at least two problems. First, how long must a behavior change last before we say learning has been demonstrated? This was originally inserted into the definition to differentiate between learning and other events that may modify behavior, such as fatigue, illness, and drugs. Clearly, these events and their effects come and go quite rapidly, whereas learning lingers until forgetting takes place over time or until new learning displaces old learning. Thus temporary states as well as learning modify behavior, but with learning the modification is relatively more permanent. However, the duration of the modification that results from either learning or temporary body states cannot be given exactly.

A related problem is more serious. Recently, a number of psychologists have turned their attention to a phenomenon called **short-term memory** (see Chapter 14). Psychologists have found that if unfamiliar information, such as a nonsense syllable, is presented to human subjects who are prevented from rehearsing the information, they will retain the material almost perfectly for about three seconds. In the following fifteen seconds, however, their retention drops to almost zero (Peterson and Peterson, 1959; Murdock, 1961). Despite the fact that the information is lost over such a short period of time, we would hesitate to say that no learning had occurred.

Accepting the qualification of “relatively permanent” in a definition of learning will also determine whether the processes of **sensitization** and **habituation** are accepted as crude examples of learning. Both sensitization and habituation are examples of behavior modification that results from experience, but both are short-lived. Sensitization is the process whereby an organism is made more responsive to certain aspects of his environment. For example, an organism that may not ordinarily respond to a certain light or sound may do so after receiving a shock. The shock, therefore, sensitized the organism, making it more responsive to its environment. Feeling “touchy” or hypersensitive following an upsetting experience is a form of sensitization that we are all familiar with.

Habituation is the process whereby an organism becomes *less* responsive to its environment. For example, there is a tendency for an organism to attend to novel stimuli as they occur in its environment. This tendency is referred to as the orienting reflex, and is exemplified when a dog turns in the direction of a sound that suddenly occurs. After attending to the sound, however, the dog will eventually ignore it (assuming that it poses no threat), and go about its business. We say, in this case, that the dog’s response to the sound has habituated. Similarly, Sharpless and Jasper (1956) found that a tone, when first presented, will arouse a sleeping cat. With repeated presentations, however, the tone loses its ability to arouse the cat. Again, we say that habituation has occurred.

## Learning and Performance

As mentioned above, what is learned may not be utilized immediately. Football players, for example, may learn how to play their position by watching films and listening to lectures during the week, but may not translate that learning into behavior until Sunday's game. In fact, some may be prevented from actually performing for a prolonged period of time because of an injury or an illness. We say, therefore, that the *potential* to act differently resulted from learning, even though behavior was not immediately affected.

This type of observation has led to the very important distinction between **learning** and **performance**, which will be considered in detail in Chapters 6, 12, and 13. Learning refers to a change in behavior potentiality; and performance refers to the translation of this potentiality into behavior.

## Why Do We Refer to Practice or Experience?

Obviously not all behavior is learned. Much simple behavior is reflexive. A **reflex** can be defined as an unlearned response in reaction to a specific stimulus. Sneezing in response to a tickling in your nose, or producing a sudden knee-jerk when your knee is tapped sharply, or instantly withdrawing your hand when it touches a hot stove are examples of reflexive behavior. Clearly, reflexive behavior is unlearned; it is a genetically determined characteristic of the organism rather than a result of experience.

Complex behavior can also be unlearned. When complex behavior patterns seem to be genetically determined, they are generally referred to as **instinctive**. Instinctive behavior includes such activities as nest building, migration, hibernation, and mating behavior.

For a while psychologists explained complex behavior patterns by referring to them as instincts. Thus, we said, birds and fish migrate because they possess a migration instinct; birds build nests because of a nest-building instinct. Because the term instinctive was offered as an *explanation* of behavior, we now tend to use the term *species-specific behavior* (Hinde and Tinbergen, 1958) because it is more descriptive. Species-specific behavior refers to complex unlearned, and relatively unmodifiable, behavior patterns engaged in by a certain species of animal under certain circumstances.

Controversy continues, however, over whether species-specific behavior is completely determined by the makeup of the organism or whether some learning is involved. Do birds fly instinctively, or do they learn to fly? Some say that the young bird learns to fly through trial and error while falling to the ground from a tree. Others say that the birds respond reflexively to falling by flapping their wings and therefore fly without learning to do so.

A few examples, however, seem to demonstrate complex behavior that is clearly not influenced by learning. For example, many species of the cuckoo

bird lay their eggs in other birds' nests and the young cuckoo is raised by its foster parents. Since each adult cuckoo behaves this way regardless of the foster parents' species, it is very difficult to imagine how such behavior could be learned.

Another example of what appears to be unlearned behavior is given by Beach (1942), who studied the copulatory behavior of 55 male rats. The rats were divided into three groups, following weaning. In Group I, each animal was maintained in isolation. Group II was segregated from females but lived together in one big cage. Group III animals were raised with females and were permitted to copulate. After about 100 days, each rat was given the opportunity to copulate with a receptive female, and the frequency and pattern of sexual behavior was observed. Results indicated that 69 percent of the isolation rats (Group I), 53 percent of the cohabitation group (Group III), and 25 percent of the segregation group (Group II) engaged in copulatory behavior when given the opportunity to do so. Note that the isolation group, which had no opportunity to learn this kind of activity, had the largest proportion of copulators. In addition, 12 of the 15 copulators in this group had normal sexual relations with a female upon their first contact with her.

Other research supports the contention that species-specific behavior is both learned and unlearned (Lorenz, 1952, 1965, 1970; Hess, 1958; Thorpe, 1963). Lorenz found, for example, that a newly hatched duckling would form an attachment to any kind of moving object and follow it as its mother, provided the object was presented at just the right moment in the duckling's life. Lorenz demonstrated attachments between ducklings and a wooden box on wheels, a human being, and a bird of a different species. The formation of an attachment between an organism and an environmental object is called **imprinting**. Imprinting was found to occur only during a **critical period**, after which it was difficult, if not impossible, to imprint the duckling on anything. With imprinting, we have a combination of learned and instinctive behavior. It appears that the animal's genetic endowment causes it to be maximally sensitive to a moving object for a short period of time, during which it can learn the strong habit of following a specific object. If the learning does not occur during that interval, however, it may never occur. Furthermore, the strong habit of following an object does not seem to be built up over time with practice. Rather, the habit seems to be learned at full strength in a single trial. We will have more to say about one-trial learning in Chapters 8 and 9.

Studies about imprinting raise a number of questions. The kind of learning, if any, involved in species-specific behavior, and to what extent it is involved must be determined by future research. The main point to emphasize, however, is that to attribute a behavioral change to learning, the change must be relatively permanent and must result from *experience*. If an organism engages in a complex behavior pattern independent of experience, that behavior cannot be referred to as learned behavior.



Konrad Lorenz and a group of ducklings that have imprinted on him.

Thomas McAvoy/Time-Life Picture Agency, © 1973.

### **Does Learning Result from a Specific Kind of Experience?**

According to Kimble's definition, learning results from reinforced practice. In other words, only rewarded behavior will be learned. On this point, there is widespread disagreement among learning theorists. Theorists not only disagree over what constitutes reinforcement (reward), but also over whether it is a necessary prerequisite for learning to take place. In a sense, this book is an attempt to review various interpretations of the nature and importance of reinforcement. This is a question, therefore, to which we will return often.

### **A Modified Definition of Learning**

It is now possible to revise Kimble's definition of learning so that it would be neutral on the matter of reinforcement, thereby making it more widely accepted: *learning is a relatively permanent change in behavior or in behavioral potentiality that results from experience and cannot be attributed to temporary body states such as those induced by illness, fatigue, or drugs.*