BEYOND PAVLOV, THORNDIKE, AND SKINNER: OTHER EARLY BEHAVIORIST THEORIES

Chapters 3 and 4 in *Human Learning* describe the work of three prominent early behaviorists: Ivan Pavlov, Edward Thorndike, and B. F. Skinner. But other theorists had a significant impact on early behaviorist thinking as well. Here we'll focus on three especially notable ones: John Watson, Edwin Guthrie, and Clark Hull.

John Watson

It was actually John Watson (1913) who introduced the term *behaviorism* and served as the most vocal advocate for the behaviorist perspective in the early part of the twentieth century. In his major writings, Watson (1914, 1916, 1919, 1925) adamantly called for the introduction of scientific objectivity and experimentation into the study of psychological phenomena. He emphasized the need for focusing scientific inquiry on observable behaviors rather than on such nonobservable phenomena as "thinking." Not only did Watson oppose the study of internal mental events, but he also denied any existence of the mind at all! Thought, he proposed, was nothing more than tiny movements of the tongue and larynx and thus was a behavior just like any other.

Greatly influenced by the work of both Pavlov and another Russian, Vladimir Bechterev (1913), Watson adopted the classically conditioned S-R **habit** as the basic unit of learning and extended it to human learning (e.g., see Watson and Rayner's study with an infant named Albert, described in Chapter 3).[1] Watson proposed two laws describing how such habits develop. First, his **law of frequency** stressed the importance of repetition:

> The more frequently a stimulus and response occur in association with each other, the stronger that S-R habit will become.

Second, Watson's **law of recency** stressed the importance of timing:

> The response that has most recently occurred after a particular stimulus is the response most likely to be associated with that stimulus.

[1] The use of the term *habit* can be traced back to the writings of an early cognitive psychologist, William James (1890). James did not conceptualize a habit as an "unthinking" stimulus-response relationship, but rather as a behavior that requires relatively little conscious control: "A strictly voluntary act has to be guided by idea, perception, and volition, throughout its whole course. In an habitual action, mere sensation is a sufficient guide, and the upper regions of brain and mind are set comparatively free" (James, 1890, pp. 115–116). Watson and several other early behaviorists adopted James's term but rejected James's proposal that other actions are more "thoughtful" in nature.

In other words, the last response that an organism has made to a stimulus is the one that is most likely to occur the next time the stimulus is presented.

Watson believed that past experience accounts for virtually all behavior. His extreme environmentalism, which denied that hereditary factors had any effect on behavior whatsoever, was reflected in the following infamous quote:

> 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. (Watson, 1925, p. 82)

Watson's influence continued to be felt long after he retired from academia in 1920. His strong advocacy of psychology as an objective and precise science and his insistence that environment plays a key role in human behavior led to a behaviorist tradition that dominated psychological research and theory in the western hemisphere until the 1960s.

Edwin Guthrie

Edwin Guthrie's **contiguity theory** (Guthrie, 1935, 1942) was similar to John Watson's perspective in that it placed S-R connections at the center of the learning process. Guthrie's basic principle of learning was as follows:

> A stimulus that is followed by a particular response will, upon its recurrence, tend to be followed by the same response again. This S-R connection gains its full strength on one trial.

In other words, if an organism responds to a particular stimulus in a particular way on one occasion, the organism will make the same response the next time it encounters the same stimulus; in this manner, a habit is formed. Guthrie contended that the critical factor in learning is the *contiguity*—the more or less simultaneous occurrence—of a stimulus and a response. Guthrie also shared Watson's belief that *recency* is critical in learning: An organism will respond to a stimulus in the way that it has most recently responded to that stimulus.

Guthrie's notion of **one-trial learning**—that an S-R connection is fully formed on one pairing—was a radical one in its time. Most other early behaviorists believed that S-R connections were acquired only gradually, primarily through practice. Guthrie explained the seemingly gradual learning of complex behaviors by proposing that such behaviors are actually composed of many tiny S-R connections; with each practice trial, more and more appropriate S-R connections are formed, thus leading to slow, incremental changes observed in overall performance.

The parsimony of Guthrie's theory—his proposal that the contiguity of stimuli and responses is the basis of all learning—is certainly appealing. Guthrie conducted little research to support his views, however, and later research has cast doubt on the notion that learning is as simple as Guthrie described it (e.g., Bower & Hilgard, 1981). Nevertheless, three techniques for breaking S-R habits that Guthrie derived from his theory continue to be used in educational and therapeutic

practice. These techniques, known as the *exhaustion, threshold,* and *incompatibility* methods, are described in Chapter 3 in *Human Learning.*

Clark Hull

It was primarily the work of Clark Hull (1943, 1951, 1952) that introduced **organismic characteristics**—characteristics unique to different individuals—into behaviorist learning theory. Like some of his predecessors, Hull maintained that learned S-R habits form the basis of behavior. He also agreed with Edward Thorndike and B. F. Skinner—two behaviorists examined in Chapter 4—that rewards are important in the learning process. However, he believed that the presence of a particular stimulus and one's past experiences with that stimulus are not the only determinants of whether a particular response will occur or how strongly it will be made. Hull proposed that a number of other factors (**intervening variables**) unique to each organism and each occasion must be considered in order to predict the likelihood and strength of a response's occurrence. Thus, Hull's ideas comprised an S-O-R theory, rather than an S-R theory, of learning.

According to Hull, one intervening variable influencing the occurrence of a response is **habit strength**, the degree to which a particular stimulus and a particular response are associated. The more often a response has previously been rewarded in the presence of the stimulus, the greater is the habit strength and the more likely the response is to occur.

A second intervening variable critical for a response to occur is the organism's **drive**, an internal state of arousal that motivates its behavior. Hull suggested that some drives (e.g., hunger and thirst) are directly related to an organism's survival. Other drives (called **acquired drives**) serve no apparent biological purpose; they develop over time when initially "unexciting" stimuli are associated with such drive-reducing stimuli as food or drink. To illustrate, one might become "driven" by a need for approval if approval has previously been associated with a candy bar. From Hull's perspective, rewards increase the strength of an S-R habit by reducing the organism's drive; for example, food reduces hunger. Chapter 15 in *Human Learning* discusses this **drive reduction** theory in more detail.

Hull proposed that intervening variables such as habit strength, drive, stimulus intensity (with an intense stimulus bringing about a stronger response than a weak stimulus), and incentive (based on the amount and immediacy of reward) all work together to increase the likelihood and relative strength of a particular response. At the same time, **inhibitory factors** (e.g., fatigue) decrease the likelihood and strength of the response.

In Hull's view, an organism might learn several different responses to the same stimulus, each with a different degree of habit strength. The combination of the various S-R habits for a given stimulus, with their respective habit strengths, is known as a **habit-family hierarchy**. When a stimulus is presented, an organism will, if possible, make the response for which the habit strength is the strongest. If the organism is somehow prevented from making that response, it will try to make the second response, or, if again foiled, the third response, and so on down the hierarchy.

Hull's concept of habit-family hierarchy, sometimes known simply as a *response hierarchy,* may sometimes play a role in problem solving. As an example, consider George, who faces a homework assignment involving the multiplication of fractions. George may first try to complete the assignment using the technique his teacher taught him for multiplying fractions. If he finds that he cannot remember the technique, he may instead ask his friend Angela if he may copy her answers. If Angela refuses his request, he may resort to a third response in his hierarchy: telling his teacher that the family dog ate his homework. For further discussion of the role that response hierarchies play in problem solving, see Chapter 13 in *Human Learning.*

Hull developed a series of mathematical formulas through which the occurrence and strength of responses might be predicted once the various intervening variables were measured and their values entered. The precision of Hull's formulas permitted a careful testing of his theory through research, and many specifics of the theory were found to be inaccurate (Bower & Hilgard, 1981; Klein, 1987). For example, learning apparently can take place in the absence of drive; as you will discover in Chapters 6 and 7 of *Human Learning,* attention to new information may ultimately be more important than motivation to learn the information. In addition, Hull proposed that a reward is a stimulus that reduces drive, yet, as Chapter 15 reveals, some rewards actually appear to *increase* drive (e.g., Olds & Milner, 1954).

Hull's theory was a predominant force in behaviorism throughout the 1940s and 1950s. Although many details of the theory did not hold up under empirical scrutiny, Hull's emphasis on intervening variables made such notions as *motivation* and *incentive* prominent concepts in learning research. And his many productive students—among them Kenneth Spence, Neil Miller, John Dollard, and O. H. Mowrer—continued to advance and modify Hullian ideas for many years.

References

Bechterev, V. M. (1913). *The psychologie objective.* Paris: Alcan.

Bower, G. H., & Hilgard, E. R. (1981). *Theories of learning* (5th ed.). Englewood Cliffs, NJ: Prentice Hall.

Guthrie, E. R. (1935). *The psychology of learning.* New York: Harper & Row.

Guthrie, E. R. (1942). Conditioning: A theory of learning in terms of stimulus, response, and association. In *The psychology of learning, 41st yearbook of the National Society for the Study of Education, Part II.* Chicago: University of Chicago Press.

Hull, C. L. (1943). *Principles of behavior: An introduction to behavior theory.* New York: Appleton-Century-Crofts.

Hull, C. L. (1951). *Essentials of behavior.* New Haven, CT: Yale University Press.

Hull, C. L. (1952). *A behavior system: An introduction to behavior theory concerning the individual organism.* New Haven, CT: Yale University Press.

James, W. (1890). *Principles of psychology.* New York: Holt.

Klein, S. B. (1987). *Learning: Principles and applications.* New York: McGraw-Hill.

Olds, J., & Milner, P. (1954). Positive reinforcement produced by electrical stimulation of septal area and other regions of rat brain. *Journal of Comparative and Physiological Psychology, 47,* 419-427.

Watson, J. B. (1913). Psychology as the behaviorist views it. *Psychological Review, 20,* 158-177.

Watson, J. B. (1914). *Behavior: An introduction to comparative psychology.* New York: Holt, Rinehart & Winston.

Watson, J. B. (1916). The place of a conditioned reflex in psychology. *Psychological Review, 23,* 89-116.

Watson, J. B. (1919). *Psychology from the standpoint of a behaviorist.* Philadelphia: J. B. Lippincott.

Watson, J. B. (1925). *Behaviorism.* New York: W. W. Norton.