B. F. Skinner
1904-1990
American psychologist and advocate of behaviorism.

B. F. (Burhus Frederic) Skinner was born in Susquehanna, Pennsylvania. As a youth, he showed talent for music and writing, as well as mechanical aptitude. He attended Hamilton College as an English major, with the goal of becoming a professional writer. After graduation, Skinner, discouraged over his literary prospects, became interested in behavioristic psychology after reading the works of John Watson and Ivan Pavlov. He entered Harvard University as a graduate student in psychology in 1928 and received his degree three years later. Skinner remained at Harvard through 1936, by which time he was a junior fellow of the prestigious Society of Fellows. While at Harvard, he laid the foundation for a new system of behavioral analysis through his research in the field of animal learning, utilizing unique experimental equipment of his own design.

His most successful and well-known apparatus, known as the Skinner Box, was a cage in which a laboratory rat could, by pressing on a bar, activate a mechanism that would drop a food pellet into the cage. Another device recorded each press of the bar, producing a permanent record of experimental results without the presence of a tester. Skinner analyzed the rats’ bar-pressing behavior by varying his patterns of reinforcement (feeding) to learn their responses to different schedules (including random ones). Using this box to study how rats “operated on” their environment led Skinner to formulate the principle of operant conditioning—applicable to a wide range of both human and animal behaviors—through which an experimenter can gradually shape the behavior of a subject by manipulating its responses through reinforcement or lack of it. In contrast to Pavlovian, or response, conditioning, which depends on an outside stimulus, Skinner’s operant conditioning depends on the subject’s responses themselves. Skinner introduced the concept of operant conditioning to the public in his first book, The Behavior of Organisms (1938).

Between 1936 and 1948 Skinner held faculty positions at the University of Minnesota and the University of Indiana, after which he returned permanently to Harvard. His ideas eventually became so influential that the American Psychological Association created a separate division of studies related to them (Division 25: “The Experimental Analysis of Behavior”), and four journals of behaviorist research were established. In the 1940s Skinner began training animals to perform complex activities by first teaching them chains of simpler ones. He was quite successful in training laboratory animals to perform apparently remarkable and complex activities. One example of this involved pigeons that learned to play table tennis.

Skinner’s observation of the effectiveness of incremental training of animals led him to formulate the principles of programmed instruction for human students, in which the concept of reward, or reinforcement, is fundamental, and complex subjects such as mathematics are broken down into simple components presented in order of increasing difficulty. Presented with a set of relatively simple questions, students receive immediate reinforcement—and thus incentive to continue—by being told that...
their answers were correct. The programmed learning movement became highly influential in the United States and abroad. Although this technique eventually came under criticism by educators advocating more holistic methods of instruction, it remains a valuable teaching tool. Courses and course materials based on it have been developed for many subjects, and at levels of difficulty ranging from kindergarten through graduate school.

Skinner’s work was also influential in the clinical treatment of mental and emotional disorders. In the late 1940s he began to develop the behavior modification method, in which subjects receive a series of small rewards for desired behavior. Considered a useful technique for psychologists and psychiatrists with deeply disturbed patients, behavior modification has also been widely used by the general population in overcoming obesity, shyness, speech defects, addiction to smoking, and other problems. Extending his ideas to the realm of philosophy, Skinner concluded that all behavior was the result of either positive or negative reinforcement, and thus the existence of free will was merely an illusion. To explore the social ramifications of his behaviorist principles, he wrote the novel Walden Two (1948), which depicted a utopian society in which all reinforcement was positive. While detractors of this controversial work regarded its vision of social control through strict positive reinforcement as totalitarian, the 1967 founding of the Twin Oaks Community in Virginia was inspired by Skinner’s ideas. Skinner elaborated further on his ideas about positive social control in his book Beyond Freedom and Dignity (1971), which critiques the notion of human autonomy, arguing that many actions ascribed to free will are performed due to necessity.

Skinner has been listed in The 100 Most Important People in the World, and in a 1975 survey he was identified as the best-known scientist in the United States. Skinner’s other books include Science and Human Behavior (1953) and Verbal Behavior (1957).

See also Behaviorism

Further Reading

Sleep
A state that suspends the voluntary exercise of bodily functions and consciousness.

A healthy adult sleeps an average of 7.5 hours each night and most people (approximately 95 percent) sleep between 6.5 and 8.5 hours. Tracking brain waves with the aid of electroencephalographs (EEGs), researchers have identified six stages of sleep (including a pre-sleep stage), each characterized by distinctive brain-wave frequencies. Stage 0 is the prelude to sleep, which is characterized by low amplitude and fast frequency alpha waves in the brain. At this stage, a person becomes relaxed, drowsy, and closes their eyes. Stages 1 through 4 are sometimes characterized as NREM (non-rapid eye movement) sleep. In Stage 1, the eyes begin to roll and rhythmic alpha waves give way to irregular theta waves that are lower in amplitude and slower in frequency as the person loses responsiveness to stimuli, experiences, fleeting thoughts, and images. In Stage 2, electroencephalogram tracings show fast frequency bursts of brain activity called sleep spindles, marked by muscle tension and accompanied by a gradual decline in heart rate, respiration, and temperature. Stages 3 and 4 normally occur 30 to 45 minutes after falling asleep. In Stage 3, there are fewer sleep spindles, but high amplitude and low frequency delta waves appear. When these begin to occur more than 50 percent of the time, the fourth stage of sleep has been entered. Delta waves demarcate the deepest levels of sleep, when heart rate, respiration, temperature, and blood flow to the brain are reduced and growth hormones are secreted. A person roused from Stage 4 sleep will be groggy and confused. Altogether, it takes about a half hour to pass through these four stages of sleep.

Rapid eye movement (REM sleep), which makes up approximately 20 percent of sleep time, is interspersed with NREM sleep every 30 to 40 minutes throughout the night. It is during REM sleep that dreams are experienced. In this state, the same fast frequency, low-amplitude beta waves that characterize waking states occur, and a person’s physiological signs—heart rate, breathing, and blood pressure—also resemble those in a waking state. However, muscle tone decreases to the point of paralysis, with sudden twitches, especially in the face and hands. REM periods may last from 15 minutes at the beginning of a sleep cycle to one hour at the end of it. Most people complete four to six complete sleep cycles each night, with each cycle lasting about 90 minutes. These cycles vary in composition, however; early in the night most of the time is spent in Stage 3 and 4 sleep, with Stage 2 and REM sleep predominating later on. Sleep patterns also vary in the course of a person’s life. On the average, an infant sleeps about 16 hours a day, in contrast to a 70-year-old who sleeps only about six hours. While REM sleep comprises about half of total sleep at birth, it eventually decreases to only 25 percent.