THREE

WHAT ARE THE BASIC CONCEPTS OF SKINNERIAN PSYCHOLOGY?

This chapter is the longest in the book. It should be, since Skinner's proposals for coping with human problems come from his basic concepts of behavior. They provide the foundation on which he builds. This material will enhance the understanding and appreciation of later chapters, especially for readers who are not familiar with the basics of Skinnerian psychology.

FUNDAMENTAL PREMISES

Boiling Skinnerian psychology down to its most fundamental premises, we have: (1) organisms, animal and human, are active—they emit behaviors of various kinds; (2) when a behavior is emitted it has consequences that may affect the future of the behavior—these consequences may either increase or decrease the likelihood that the behavior will occur again; (3) the consequences are determined by the organism's physical and social environments.

Skinner has filled in many details around these simple propositions and told us how various consequences affect our behaviors. He believes that this type of information is essential for understanding why people behave as they do. Though many students of human behavior prefer to look at "the inner person" to find answers to complex human activities, Skinner focuses on observable events in the external environment.

UNDERLYING ASSUMPTIONS

Beyond the simple premises stated above, there are a number of assumptions that Skinner has made in developing his psychology. These will be discussed briefly before moving on to his major behavioral concepts. They constitute a framework characterized by *objectivity*, *determinism*, and *a concern about practical applications*.

1. *Behavior is lawful; it is determined and controlled in systematic and consistent ways by genetic and environmental factors.*
2. *Genetic endowment determines certain aspects of behavior (for example, the basic types of behavior that we are capable of emitting); however, environmental factors determine the many details of behavior and can be observed and altered more directly.* Even though we inherit certain capabilities and potentials, it is the environmental experiences of each of us that shape and maintain the specific behaviors that characterize us as individuals. Also, environmental factors are easier to observe and to change than are genetic factors. (A distinction sometimes is made between "genetic" and "environmental" as though the former is completely separate from the latter. It must be remembered, however, that Darwin's theory of evolution suggests that genetic endowment is determined by environmental conditions. The species members who behave in ways that allow survival in their environments are the ones most likely to produce offspring, thereby perpetuating their particular genetic—and behavioral—characteristics. Skinner points out the importance of past environments in selecting behaviors by referring to "contingencies of survival.")
3. *The role of psychology is to discover the "cause-and-effect" relationships between environmental factors and behavior.* (To be precise, cause-and-effect connections in scientific

studies are commonly referred to as "functional relations." Though scientists may reveal the effect that one event has on another, they are cautious about implying that they know *how* the event causes its effect. Therefore, Skinner considers the phrase "functional relations" to be appropriate. He suggests, however, that the terms "cause" and "effect" can be used informally.) The field of psychology has the special task of investigating the effects of environmental factors on behavior. Other scientists, such as those involved in studying physiology, eventually may be able to tell us specifically what occurs inside the body when we behave. This will be valuable information. However, since knowledge of the relationships between environmental factors and behavior always will be crucial, psychologists should vigorously pursue their own speciality.

4. *The best method for determining critical relationships is to control specific environmental conditions ("causes") and observe the resulting behavioral outcomes ("effects").* This is the "experimental method," and is quite different from the kinds of observations that we make in everyday life (which are usually "uncontrolled" observations, meaning that all sorts of unknown factors can be affecting the behaviors we are looking at, thereby making it difficult or impossible to determine the critical factors). Using the experimental method, specific conditions can be arranged deliberately and the resulting changes in behavior can be observed.

5. *Studies of lower animals are useful in determining basic behavioral concepts that can then be tested out at the human level.* The main advantages of studying rats, pigeons, and other lower animals is that they are simpler than humans, their past histories and present circumstances can be controlled more easily, and they can be studied over longer periods of time under specified conditions. Though humans obviously are different from lower animals, there is no reason to reject the possibility that the same behavioral concepts

apply to both. (In fact, considerable evidence indicates that various concepts *do* apply to both.)

6. *Behavioral concepts derived from the experimental study of relationships between environmental factors and behaviors can be applied to human problems.* Findings from both animal and human studies can be used to improve human conditions. They can be brought out from psychologists' laboratories into the real world, applied to real-life situations, and monitored carefully to determine their effectiveness. (This approach has been used effectively in many cases.)

7. *It is unnecessary and misleading to speculate about feelings, thoughts, or other "inner states" as causes of behavior.* Such states certainly do occur, but these internal (bodily) conditions do not control behavior. Environmental conditions (for example, reinforcement or punishment) influence these inner responses as well as overt behaviors. In other words, they can be considered effects rather than causes. (This is perhaps the hardest aspect of Skinnerian psychology to accept, since we are so used to attributing our actions to our feelings and thoughts.)

OPERANT BEHAVIOR

Skinner is interested primarily in behaviors that have effects on the physical and social environments within which we live. He sees humans as active organisms, capable of emitting a wide variety of such behaviors. Behaviors that "operate" or act on the environment to produce consequences, and are in turn affected by these consequences, are called *operants*. The consequences determine whether we do the same thing (or something similar) again, or try something else. Certain outcomes strengthen the types of behavior that precede them while others do not. The multitude of consequences that we experience during our lifetimes shapes us into what we are at any given point in time. To

use a non-Skinnerian word, these outcomes determine an individual's own unique "personality." The study of operant behavior is at the core of Skinnerian psychology, so much so that often it is referred to as "operant behaviorism." Skinner's operant behaviorism should be distinguished from earlier forms of behaviorism, such as that of John B. Watson, who is generally considered the first behaviorist in the field of psychology (his writings on the subject began to appear in 1913). Watson paid considerable attention to the findings of Ivan Pavlov, the famous Russian physiologist who gave us Pavlovian conditioning.

It is not unusual to read or hear comments which equate Skinner's and Pavlov's interests. However, they are very different. The work for which Pavlov is famous concentrated on the study of relatively simple, reflexive type responses. For example, many people have heard of the studies in which he trained dogs to salivate to the sound of a tone. After being paired repeatedly with the presentation of food, the tone by itself elicited salivation. Thus, an initially neutral stimulus (a tone) became a conditioned stimulus. The dog was relatively passive in this conditioning process. It was strapped into a harness-type apparatus, and the salivation reflex was elicited by presenting food slightly after the tone was sounded. In Skinner's studies, as you will see, more active responding is required for conditioning to occur.

The conditioning of a reflexive response (such as salivation) to an initially neutral stimulus (such as a tone) has important implications. Watson believed, and demonstrated in a very dramatic study, that emotional responses such as irrational fears can be explained by Pavlovian conditioning.[1] By pairing the presence of a white rat (an initially neutral stimulus) with a loud noise (a frightening stimulus), he conditioned an infant to fear the rat. Before it had been paired with the loud noise, the animal elicited no fear responses from the infant. (Though Watson's findings, published in 1920, are important, serious questions remain about the ethics of having conducted such research.)

[1]John B. Watson and Rosalie Rayner, "Conditioned Emotional Reactions," *Journal of Experimental Psychology*, 3, (February 1920), 1–14.

Skinner acknowledges the significance of Pavlovian conditioning (he calls it "respondent conditioning") in explaining various reflexive type responses to initially neutral stimuli, but his main interest is in the more active, voluntary type responses that organisms make. He believes that these are more important, since they make up most of the activities that we engage in, such as reading, studying, writing, playing sports, working, developing hobbies, talking to each other, and so on—none of these are primarily reflexive actions, but rather consist of *operants*. In this emphasis, Skinner differs from Watson's earlier focus on Pavlovian conditioning.

THE SKINNER BOX

To pursue his interest in operant behavior, Skinner built a small, soundproof chamber that provides an experimental space within which an animal can be studied. This type of device is commonly referred to as a *Skinner box*, though Skinner himself avoids calling it that. In this chamber an animal can be isolated from interfering influences and subjected to specific conditions created by the experimenter. The operant behaviors that typically are studied are lever pressing by a rat or the pecking of a small disk (called a "key") by a pigeon. When sufficient pressure is applied to the lever or the key, a food dispenser is triggered and a food pellet or grain (which serves as a reinforcer for lever pressing or key pecking) is made available. The animal's presses or pecks are recorded electromechanically over a space of time, with the rate of response being the datum that is of primary interest.

Various environmental conditions can be produced by an experimenter to see how each condition affects the animal's response rate. For example, how frequently does a rat press the lever if a food pellet is delivered after each response, when compared with a condition in which food appears after every 15 responses? In simple terms, such studies indicate how hard an animal will work under different conditions of reinforcement.

Another question might be, "If an animal has been trained to respond at a high rate by reinforcing its responses, how long will it take for the animal to stop responding when reinforcers are no longer available?" This can be studied by establishing a period of time during which food pellets are delivered when a rat presses or a pigeon pecks, and then cutting off the food supply until the animal "gives up" on that response. By doing innumerable studies of this kind, in which conditions are varied in specific detail, Skinner and his colleagues have collected a vast amount of data on how environmental factors affect the frequency of behaviors.

Important questions often arise when Skinner-box studies are discussed: "What do they have to do with *our* behavior?" "How can lever pressing and key pecking be related to the behaviors that *humans* engage in?" These questions can be answered in at least two ways. *First,* Skinner has looked for basic behavioral concepts, and these concepts can be discovered in their purest forms by studying organisms that are relatively simple and easy to control experimentally. The relative isolation provided by the Skinner box helps keep the situation itself simple, by ruling out all sorts of possible interfering influences on the animal's behavior. *Second,* the concepts that are discovered by studying lower animals can be tested at the human level. In other words, Skinner doesn't suggest that rats and pigeons are exactly the same as people. Rather, he believes that there are certain *similarities* among living organisms and that behavioral processes found at one level may well apply at other levels.

Once a process is known to occur with rats or pigeons in a Skinner box, we are in a position to move to more complex levels and check on its validity in the world populated by people. In fact, this is what has happened with Skinnerian procedures. Many studies have shown that they can be applied effectively in education, industry, business, government, prisons, mental institutions, and family settings. They don't always work easily or perfectly, but often they can be tailored to fit particular situations so that substantial benefits are obtained, such as increases in efficiency

and productivity, better interpersonal relationships, and decreases in undesirable behaviors.

What Skinner and his colleagues have done is similar to what goes on in other sciences, such as physics, chemistry, biology, and medicine. Researchers in these fields often study phenomena in the artificial environments of their laboratories, hoping to produce findings that will apply under real-world conditions. Medical researchers, for example, often use lower animals to test drugs or procedures before applying them to humans.

A comment needs to be made regarding the use of *rates of response* as the basic data collected by Skinner and other behaviorists who have followed in his footsteps. In Skinner-box studies (as well as in studies of human behavior in real-life settings) these data allow comparisons to be made of the effects of different conditions. The actual behaviors that are counted electromechanically in the Skinner box, that is, pressing or pecking, are used simply because they are convenient to measure and they occur reliably. There is nothing especially significant about these particular responses as far as Skinnerian psychology is concerned—other responses with similar characteristics could be used. The *rate* of response, however, is more critical. Given some thought, it becomes clear that many assumptions made about both animals and people are based on the frequency with which specific behaviors occur. For example, our assumptions about someone's attitudes, interests, habits, or preferences are often based on how frequently we observe that individual do certain things. Isn't it important, then, to understand the various conditions that cause increases or decreases in what organisms do? This is what Skinner has studied.

REINFORCEMENT

The most important of Skinner's behavioral concepts is *reinforcement.* The term indicates a *strengthening effect* that occurs when operant behaviors have certain consequences. Behavior

increases in probability (that is, the likelihood of its occurrence under similar circumstances increases) when its outcomes are reinforcing. A food-deprived rat, whose lever pressing in a Skinner box is reinforced with food pellets, presses the lever again and again.

Though it is common practice to substitute the term "reward" for "reinforcement," the two are *not* the same. Rewards may or may not strengthen behavior. For example, a teenager may behave contrary to his parents' wishes, despite the fact that they heap rewards (a car, money, freedom, etc.) on him. These parents are giving rewards to their son, but they aren't *reinforcing* his desirable behaviors. By Skinner's definition, reinforcement does strengthen behavior, so if whatever is being done doesn't have that effect, reinforcement cannot be said to be occurring. Although giving so-called "rewards" *may* be reinforcing, the important point is that they do not *necessarily* strengthen the behaviors they follow.

Sometimes people fault Skinner's reinforcement procedure by saying "I've tried it and it doesn't work!" The problem in such cases may relate to what has just been said: Reward, but not reinforcement, may have been used. You can't always find a "reinforcer" easily. Though money, gifts, praise, and so on, often do work as reinforcers, in some cases they do not. Something else may be necessary. For example, a parent may find that simply listening carefully to a son or daughter, or spending some leisure time together, reinforces desirable behaviors to a greater extent than does the giving of rewards. You can't always be sure what will be reinforcing, since differences sometimes exist from person to person, from behavior to behavior, and from situation to situation. You can only be sure that reinforcement is being used when the relevant behavior is being strengthened; in other words, the effects must be observed to determine whether or not reinforcement is occurring.

Getting back to the relatively simple situation of the lever-pressing rat in a Skinner box, at first glance this might seem only to provide a mildly interesting demonstration of how an animal's

behavior can be controlled by reinforcing it. However, for Skinner and his followers, this simple form of operant conditioning is an elementary example of a behavioral process that applies across species and has tremendous significance for explaining human behavior. Skinner's early studies of rats provided him with findings that he guessed would apply at the human level, and subsequent research by many behavioral psychologists has given considerable support to the idea that the behavior of people, as well as pigeons and rats, is controlled by the consequences of their actions. Although we usually don't receive food pellets, our behaviors are dramatically affected by other reinforcers such as money, compliments, sex, public attention, and approval from others. Our actions also are often reinforced by the direct environmental changes they produce: Reaching for an object produces contact with it, approaching something brings us closer to it, turning toward someone makes him or her visible, and so on. Of course, the complexity of situations, behaviors, and reinforcers among humans is extremely different from that existing in a Skinner box. Nevertheless, the Skinnerian assumption (which is supported by a large amount of evidence) is that some of the most basic behavioral concepts (such as reinforcement) are the same.

An outstanding illustration of the effects of reinforcement on human behavior has been provided by the well-known writer, Isaac Asimov:

> Most people seem to fear and resent behaviorist notions. They seem to think it denies man freedom of will and makes of him merely a machine. I heard William Buckley discuss *Beyond Freedom and Dignity*, a book by B. F. Skinner, and he referred to Skinner's theories as implying "a dehumanization" of man. But does behaviorism dehumanize a man or merely *describe* a man?
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> Frankly, I tend to accept behaviorist notions. I find the behavior of people quite predictable; and the better I know them, the more predictable I find their behavior. People sometimes surprise me, I admit, but I have the feeling that this is because I don't know enough about them and not because they are capable of free will.
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> And, of course, my own behavior is most predictable of all; at least, to me. For instance, I respond favorably to praise. It has an extraordinary reinforcing effect on me. All my publishers and editors find this out at

once. It is their profession, of course, to study the weaknesses of writers and use those weaknesses to manipulate those writers. So they carefully begin to praise the quickness with which I complete my work; the speed with which I read galleys and prepare indexes; the cooperativeness with which I make (reasonable) revisions, and so on and so on.

All this I lap up with avidity; no one has ever handed out praise in larger servings than I can swallow. What's more, in order to get still more of it, I complete my work more quickly than ever, read galleys and do indexes with still greater speed, make *reasonable* revisions with at least a trace of a smile, and the result is that over the last six years I have averaged nine books a year.

Came the time when I was supposed to work on the introductions to these chapters. I was in New York; the editorial staff was in California. I sent off some introductions and heard nothing. Whereupon I grew sad and sulky and found that I didn't feel like doing any more. When I was nudged very politely by the editors, I wrote a long letter, saying that unless I knew that they liked those I had already written, I could do no further work. Whereupon the staff, suddenly enlightened, promptly sent me a letter telling me that my introductions were great and that everybody loved them. At once I sat down to write more. Periodically, they sent me kind words and I sent more introductions. It was very neat and efficient.

But does that mean I'm just a robot? That I have buttons that need pushing? That I point them out, that they push them, and that all is well? Well, I guess so. I like to be praised and that's what I work for. Maybe we all have our buttons, and maybe we all know where they are, and maybe we all do our best to get them pushed.

Could the behaviorists be saying that it's love that makes the world go round?[2]

The effects of reinforcement during our lifetimes molds our behaviors along certain lines. When we learn how to swim, ride a bike, throw a ball, sew, sweep a floor, drive a car, and so on, the successful (reinforced) responses are the ones we continue to make. The unsuccessful responses tend to drop away. The same process holds true for our social behaviors at work, school, and home. For example, speaking and dressing in acceptable ways brings approval from employers, teachers, parents, peers, and others. Approval, and other important social reinforcers, are very significant influences. Whether we consider physical or social activities, the effects of reinforcement are critical.

[2]CRM Staff, *Psychology Today: An Introduction*, 3rd ed., (New York: CRM/Random House, 1975), p. 68.

POSITIVE REINFORCEMENT AND NEGATIVE REINFORCEMENT

In operant conditioning there actually are two types of reinforcement. So far, we have been discussing *positive reinforcement:* A response is strengthened by the *addition* of something to the situation. The "something" that is added is called a *positive reinforcer.* A rat pressing a lever for food pellets, a worker doing a job for money, a student studying to get good grades, a child "being good" to earn parental approval, and even a person pulling on a doorknob to open a door are all examples of the effects of positive reinforcement. The positive reinforcers are, respectively, food pellets, money, good grades, parental approval and an open door.

Behaviors are strengthened not only by positive reinforcers, however. Many actions that allow us to escape or avoid negative consequences also become part of our typical behavior patterns. When this happens, we are being conditioned by *negative reinforcement:* A response is strengthened by the *removal* of something from the situation. In such cases, the "something" that is removed is referred to as a *negative reinforcer* or *aversive stimulus* (these two phrases are synonymous). We already have seen that a hungry rat's lever-pressing can be strengthened by positively reinforcing that response with food pellets. We could also accomplish this by using negative reinforcement. If lever pressing removes a painful electrical charge (which can be a negative reinforcer or aversive stimulus), it is very likely that the rat will soon be conditioned to make that response whenever it receives a shock through the floor grid of the Skinner box.

The phrase "negative reinforcement" can be confusing, so it pays to consider it carefully. Remember, it refers to a process whereby behavior is *strengthened,* not weakened. Often it is confused with "punishment," which will be discussed shortly. Whereas negative reinforcement results in an *increase* in the probability of behavior, punishment typically acts to *suppress* behavior; this is a very important distinction.

Skinner suggests that negative reinforcement is a very influential determinant of behavior. Many examples exist: the child who does his chores to stop his parents' nagging, the parent who gives in to his child's demands in order to stop temper tantrums, the student who cuts classes to avoid a teacher's reprimands for poor performance, the wife who escapes her husband's tirades by going into the bedroom and locking the door, the driver who obeys speed limits to avoid being ticketed, the person who gets drunk to escape from stressful life situations, the person who takes aspirin to stop a headache, and so on. Nagging, temper tantrums, reprimands, tirades, speeding tickets, stressful situations, and headaches are *negative reinforcers* or *aversive stimuli* in these examples. Their removal is reinforcing, and therefore the behaviors that remove them tend to become conditioned.

In Skinner's opinion, it is unfortunate that so much of our social behavior is influenced by *negative* reinforcement. In an improved society we would be controlled more by *positive* reinforcement. In other words, instead of escaping and avoiding aversive stimuli, it would be better to be positively reinforced more of the time. A couple of examples illustrate the point. Schools have often relied on threats of failure or disciplinary actions to spur slow students to study hard, rather than teaching the subject matter clearly and in sufficiently small steps so that making progress could be reinforced. Employers have often counted on the fact that their employees will work in order to escape the negative consequences of unemployment, poverty, and deprivation, rather than attempting to provide conditions and jobs that are positively reinforcing.

A sign of an inefficient and poorly planned society, according to Skinner, is a heavy reliance on negative reinforcers to control behavior. The emphasis should be on positive reinforcement. One major reason for this is that the outcomes of positive reinforcement are more predictable than those of negative reinforcement. Undesirable behavior often gets strengthened by negative reinforcement. For example, a teacher might attempt to get a student to study harder by continually criticizing him, and the student

might respond by doing more studying. If this stops the teacher's criticisms, studying will be negatively reinforced and the teacher's goal will have been achieved (the student's studying behavior is strengthened because it removes the aversive stimulus of criticism). However, less desirable outcomes are quite possible. The student might escape and avoid the teacher's criticisms by becoming a truant, rather than by studying. Another possibility is that the student might become very withdrawn and spend a lot of time daydreaming in order to cut himself off from the full impact of the criticism.

The main point of these examples is that using *negative* reinforcers such as criticism to control behavior may result in the reinforcement of unwanted behaviors. On the other hand, using *positive* reinforcers is more likely to give the desired result. There is nothing to escape or avoid in a positive-reinforcement situation. Therefore, alternative behaviors that are undesirable are less likely to be emitted and reinforced.

To summarize briefly, there are two different types of reinforcement: positive and negative. In both types, behavior is strengthened. In positive reinforcement, the consequence of behavior is the *addition* of something (a positive reinforcer) that increases the probability of the behavior. In negative reinforcement, the consequence of behavior is the *removal* of something (a negative reinforcer or aversive stimulus) that increases the probability of the behavior. Skinner advocates using positive, rather than negative, reinforcement to control behavior.

PRIMARY REINFORCERS AND CONDITIONED REINFORCERS

Some positive reinforcers, such as food, water, and sexual contact are related to our basic biological functioning. These are called *primary reinforcers*. There also are negative reinforcers that are considered primary: electrical shocks, pin pricks, hard blows,

extreme cold or heat, and so on. Both positive and negative primary reinforcers have a significant effect on how we behave. However, to understand Skinner's suggestion that a whole array of complex human behaviors can be controlled by reinforcement, it is necessary to consider *conditioned reinforcers.*

A conditioned reinforcer is a stimulus that is originally neutral but gains the power to reinforce through its pairing with one or more primary reinforcers. Let's look at a Skinner-box example. Suppose when a rat presses the lever, a light is rigged to go on when the pellet of food (a primary reinforcer) drops into the food tray. The pairing of the light with food occurs 50 to 100 times. Next, the situation is changed so that neither the light nor food appears when the lever is pressed, and gradually the rat's responses decline to a very low frequency (this process is called *extinction*). At this point, it is arranged for the light to go on again when the pressing response is made, but for the food pellets to remain undelivered. What will happen to the response rate? Will the light by itself serve as a reinforcer, causing the lever pressing to increase again? As it turns out, the lever-pressing response in such a situation does increase in frequency, showing that the originally neutral light stimulus has become a positive reinforcer—more accurately, a positive *conditioned* reinforcer. In cases when the light has not been previously paired with food, it does not have the effect of increasing the response rate.

At the human level there are innumerable examples of conditioned reinforcers. Perhaps the most dramatic is money. Money is associated with many necessities (primary reinforcers) and therefore serves as a reinforcer itself in a multitude of situations. Think of all the behaviors that are controlled by these pieces of paper or metal—there is little doubt about money's reinforcing characteristics.

Signs of affection, approval, or attention from others—which involve certain statements, facial expressions, and body movements—also provide examples of powerful conditioned reinforcers (however, the possibility exists that certain of these signs may

be primary reinforcers, due to their evolutionary significance). These signs have a great influence on us, deriving from their many associations with primary reinforcers. Starting at birth, certain verbal and physical behaviors by parents consistently accompany the giving of basics such as food, liquids, warmth, and cuddling. In later life, signs of approval, affection, and attention continue to be associated with primary reinforcers, including sexual contacts. Conditioned reinforcers that are associated with more than one primary reinforcer are referred to by Skinner as *generalized reinforcers*.

Perhaps the most significant point about conditioned reinforcers, especially those that are generalized reinforcers, is that they eventually function independently in a variety of situations to control behavior. We often behave in ways that will yield money or signs of acceptance, approval, or attention from others, even when primary reinforcers are not immediately available. We often work long and hard, or change our behaviors dramatically, to keep these conditioned reinforcers coming. The miser is an extreme example; his behavior is almost completely controlled by money, even though he seldom uses it to buy primary reinforcers.

There also are *negative* conditioned reinforcers. For example, an academic grade of "F," the facial expression that we call a frown, the verbal statement "I don't like you," or the sight of a dentist's drill, may be stimuli that are aversive because of their past associations with basic deprivations or pain. We tend to behave in ways that allow escape from or avoidance of these aversive conditioned stimuli.

A discussion of reinforcers must include what Skinner believes to be another important influence on human behavior: the positive reinforcement of successfully manipulating the environment, that is, "being effective" or "being right." He has suggested that this type of reinforcement is very basic, perhaps related to the genetic makeup of the species. It seems reasonable to assume that those of our ancestors who were most effective in coping with their environments were also the most likely to survive and pass

on their characteristics to later generations. Through evolution, then, members of the human species are perhaps inherently reinforced by their effective behaviors. This idea is very significant, since it suggests that much of what we do may occur partly because we simply are producing environmental changes. In other words, perhaps there doesn't have to be any direct or obvious gain in what we do, but rather our behavior may be positively reinforced by simply producing an effect. (Skinner gives the example of a baby who persistently shakes a rattle, with little to be gained except producing a small environmental change.) This may, in part, explain activities such as planting flowers, certain artistic pursuits, and sporting activities such as bowling and billiards, which we often say we are doing "just for the fun of it."

A final point to be made in this section is that it can be dangerous to assume too much about the ability of various stimuli to reinforce the behaviors of different individuals. Although certain reinforcers—such as money, words of praise, or a smile—tend to have a great deal of generality, what is reinforcing to one person may not be reinforcing to another, a reinforcer that works in one situation may not work in another, and different behaviors may require different reinforcers. Skinner indicates that a stimulus, to be considered a positive or negative reinforcer in a particular case, should be tested and its effects observed. In other words, does the stimulus actually serve to increase the frequency of the behavior that either *produces* it (in the case of positive reinforcement) or *removes* it (in the case of negative reinforcement)?

In practical applications, for example in trying to change the behavior of a child, a student, an employee, a spouse, a friend, an acquaintance, or anyone else, it is essential that the process include stimuli that are actually reinforcing, not stimuli that are simply thought to be reinforcing. If you try to reinforce a vegetarian with a steak dinner, an extremely active child with the opportunity to read a book, a beer drinker with a glass of expensive wine, or a solitary person with an invitation to a big party, you are not likely to produce the effect that you intend.

SUPERSTITIOUS BEHAVIOR

Typically, operant conditioning involves the strengthening of behavior when reinforcement is dependent on that behavior. There is an "actual" connection between response and reinforcer. Suppose, however, that an *accidental* connection occurs; that is, a reinforcer follows a response but is not dependent on that response. This also results in operant conditioning; the behavior that is strengthened by this process is referred to by Skinner as *superstitious behavior*. He believes that many human actions are "superstitious."

Using pigeons as subjects, Skinner has demonstrated the basic processes involved in the conditioning of superstitious behavior. A food-deprived bird is put into the Skinner box. The food dispenser is set to deliver food every 15 seconds, regardless of what the pigeon is doing. Notice that the delivery of food is not dependent on a particular type of behavior. Whatever the animal is doing at the time the reinforcer (food) arrives will be reinforced and therefore will be more likely to be occurring when the next reinforcer comes. In this way, a certain response pattern is built up. With this procedure Skinner has conditioned pigeons to regularly turn in circles, thrust their heads high into an upper corner of the cage, and show other unusual movements.

What do humans do that can be traced to processes similar to "accidental" reinforcement in the Skinner box? Rain dances are a classic example. The occasional accidental connection between the dancing and the occurrence of rain provides sufficient reinforcement to keep the practice going. As another example, it has been said that some ancient peoples had a special ritual to deal with eclipses, which apparently they viewed as a giant dragon's attempt to devour the sun. By creating as much noise as they possibly could, they would cause the dragon to release the sun. Assuming that this story is true, it would be an example of accidental *negative* reinforcement—the dragon's threat was an aversive stimulus that was removed (supposedly) by the response of making lots of noise.

In modern society there also are plenty of superstitions. When an athlete prepares for a performance, all sorts of peculiar movements are apt to occur regularly. Each baseball player, for example, has his own special routine when he comes to the plate: tapping the plate with the bat, hitching his pants up several times, touching the peak of the batting helmet in a certain way, and so on. Presumably the player's movements have been developed over time as they have been followed by the reinforcement of getting a hit. Recently, I noticed that a player with a good hitting streak came to bat with someone else's protective helmet. He stood fidgeting in the batter's box, stepped in to hit, stepped out again, took off the helmet several times to check it, and finally was rescued by the bat boy who had found the player's own helmet. Comforted, he smashed a solid hit to the outfield—another reinforcement for wearing that particular hat!

Many of us have superstitious ways of dealing with machines. Elaborate routines for starting our cars sometimes develop, despite the likelihood that only a couple of the things we do are really effective. We may go through the same routine regularly because these responses, at one time or another, have been accidently reinforced. Now we continue them, because "the car starts, doesn't it?" The same kind of thing can be seen in the ways we deal with finicky typewriters, TV sets, radios, door locks, electrical switches, and so on. If some behavior "works," even if it really isn't what is producing the reinforcing outcome, we tend to do it again.

Superstitious behaviors can develop in social situations too. A person who puts on a particular type of clothing or rearranges his or her hairstyle, and then has a good time at a party or other social occasion, may continue to do these things, even though other people were not reacting at all to these particular aspects of the person. Certain physical gestures and ways of speaking also can become conditioned behaviors when they are followed by reinforcing attention from others, regardless of whether or not the attention is actually produced by these specific behaviors.

Skinner has suggested that even when full-blown superstitions do not result from accidental connections between behaviors and reinforcers, we can be affected in less dramatic ways by these events. He uses the example of finding a ten-dollar bill in the park. Walking in the park and looking down did not actually produce the money, and it certainly isn't likely that money would be found there again even if the individual went to that spot every day. Nevertheless, if money is a reinforcer for that person, it is now more likely that he or she will stroll that way and look downward exactly as was done when the money was found. The person's behavior has been changed, at least slightly.

It can be difficult at times to determine whether or not a behavior is superstitious. I have two acquaintances who respond in opposite ways to minor illnesses, aches, and pains. One of them goes to a doctor immediately and often receives some medication or medical advice that is followed by recovery. The other person does not go to the doctor, takes no medication, and does nothing special, but she also recovers shortly. Perhaps it would be unfair to call the first person superstitious, since going to the doctor is an acceptable and encouraged practice in our society (what people commonly consider superstitious depends heavily on cultural patterns). Also, it might be that going to the doctor actually is advisable for this particular individual's problems.

An area of contemporary life that is very touchy in discussions of superstitious behavior is religion. Are various religious beliefs and practices superstitious? A common response to this question probably is something like: "Yes, all except mine!" Obviously, Skinnerian psychology cannot provide a final answer here, since considerations of ultimate purposes and supreme powers take place at a different level of discourse.

OPERANT EXTINCTION

To this point, we have been discussing the strengthening of operant behaviors, that is, the ways in which responses are increased in frequency. Now we will discuss how operant behav-

iors are weakened, or decreased in frequency. Suppose that, repeatedly, nothing happens after a response is made. What then? In operant-conditioning terms, *extinction* occurs: the response decreases in frequency.

Consider a case in which behavior has been strengthened through reinforcement, and then reinforcement is no longer available. For example, the lever-pressing rat in a Skinner box has been conditioned because positive reinforcement (receiving food pellets) has been a consequence of its behavior. If the reinforcement no longer exists (the food dispenser is disconnected), the rat's lever pressing will eventually stop (or almost stop); that is, it will *extinguish*.

Extinction is another important concept for understanding human behavior. The often-asked questions, "Why doesn't she do that anymore?" or "Why has he stopped doing that?" often could be answered if changes in the consequences of the person's behaviors were known. The hard-working executive is likely to become "lazy" if his or her efforts no longer bring praise, promotions, or pay increases; your friendly, good-natured neighbor may no longer give you a warm smile and a big hello if you have been too busy in recent weeks to be friendly in return; you may find that you stop trying to call an acquaintance who never seems to be home to answer the phone. Each of these instances involves a lack of reinforcement for behavior, with the result that the behavior decreases in frequency. Often, the decrease occurs very slowly and it takes a long time before the behavior completely ceases. More will be said about extinction shortly.

PUNISHMENT

Another possible consequence of behavior is *punishment*. "Negative reinforcement" and "punishment" often are confused, but these two concepts are very different. Whereas negative reinforcement strengthens behavior, punishment typically sup-

presses behavior. Skinner suggests two ways in which a response can be punished: by *removing a positive reinforcer* or by *presenting a negative reinforcer* (aversive stimulus) as a consequence of the response.

Here is an example of how negative reinforcement and punishment differ, using electrical shock as the negative reinforcer or aversive stimulus. If a rat presses a lever to *remove* the shock, lever pressing is negatively reinforced and is strengthened. On the other hand, if pressing the lever *produces* the shock, lever pressing is punished and is likely to be suppressed. In both situations the shock is a negative reinforcer, but in the case of negative reinforcement it is *removed* and in the case of punishment it is *presented*. Some common examples of punishment in which a negative reinforcer is added as a consequence of behavior are: a child who is scolded for swearing, an employee who is reprimanded for arriving late for work, and a driver who is ticketed for illegal parking. Sometimes the physical environment provides punishment for behavior: the infant who touches a hot stove, the bicyclist who takes a painful fall for "showing off," and the jogger who tries to run too fast and pulls a muscle are all experiencing "natural" negative reinforcers, rather than social ones.

As mentioned previously, another type of punishment involves the *removal of positive reinforcers*. Children who have their allowances taken away for bad behavior, employees who have their pay reduced for arriving late, and drivers who have their licenses suspended for speeding are examples. Positive reinforcers—allowance, pay, and the right to drive—are taken away as a consequence of certain behaviors.

An interesting point about the term "punishment," as it commonly is used in our society, is that so-called punishments often do *not* suppress the undesirable behaviors at which they are aimed. Ticketed speeders often continue to speed, jailed criminals often continue their antisocial behaviors, reprimanded students often continue doing poorly, and spanked children often continue misbehaving. We deceive ourselves in many such instances by

thinking that "punishing" the offenders is effective. A stricter definition of punishment would focus attention on the effects of the punishing actions. In other words, do these actions *actually* suppress undesirable behaviors? If not, does it pay to continue their use?

Skinner's view of using punishment to control behavior has been uncompromising. He has been consistently and strongly opposed to it. He believes that punishment does not have a permanent effect (unless it is extremely severe, in which case it also commonly disrupts or stops desirable, as well as undesirable, behaviors and causes fear, high anxiety, resentment, or other problems). Although punishing someone may temporarily cause him or her to stop behaving in an undesirable way, the behavior is likely to reappear, especially when the punishment is withdrawn. Therefore, it is ineffective in the long run and is an inefficient way to get rid of unwanted behaviors.

Other objections to using punishment are: (1) rather than simply stopping the undesirable behavior, punishment may result in other behaviors that are equally undesirable, such as "running away," counterattacking, or bitter complaining; (2) emotional by-products, such as fear, guilt, or shame may be produced, and these emotions may be felt whenever the person is around the punisher or the situation in which he or she was punished—for example, the harshly punished student may experience emotional distress whenever he or she is in the classroom, and this isn't conducive to learning; (3) punishment indicates only what a person should *not* do and doesn't give information about what should be done.

If there are so many negative aspects of punishment, why is it used so frequently? Skinner suggests that punishment often gives immediate, if not long-lasting, results. In other words, using punishment is likely to be reinforcing to the *punisher*. Physical or verbal abuse directed at someone who displeases us often causes their displeasing behavior to stop, even if only for a brief time. This is especially true if the person is in a subordinate position to us. Therefore, using punishment is often negatively reinforced

(something aversive to the punisher is removed). To sum up, using punishment is dangerous because it's habit-forming for the punisher, is not a long-range solution, and has undesirable side effects.

AVERSIVE CONTROL

Along with his condemnation of punishment, Skinner also is against what he calls *aversive control*. Whereas punishment is designed to stop behavior, aversive control involves getting someone to do something by threatening, explicitly or implicitly, that aversive consequences will occur if he or she doesn't do as requested. In simple language, this is a case of "Do it, or else!" (The effectiveness of aversive control actually depends on negative reinforcement; the person does what is requested in order to escape or avoid the aversive stimulus of threat. However, as will be seen below, behaviors other than going along with what is expected may get reinforced.)

Skinner believes that this type of control should be avoided for some of the same reasons as punishment: Its outcomes are not as predictable as those of positive reinforcement and by-products such as hostility, apathy, anxiety, or stubbornness may develop. The spouse who is threatened with verbal or physical abuse unless he or she stays in line may remain away from home because of the negative reinforcement involved in getting away from the threats (or, if able, may launch a verbal or physical counterattack); the employee who is harassed by a tough supervisor may find it reinforcing to stay home "sick" or to get back at the supervisor by using sabotage techniques; the child who knows that any misbehavior at home will result in severe consequences may run away because of the reinforcement involved in escaping the constant threat of punishment; many more examples could be given. Instead of producing the expected behaviors—being a "good" husband or wife, working hard on the job, behaving properly at home, or whatever—attempts to use aversive control may back-

fire. Even when the purpose of getting someone to behave a certain way is accomplished, the person subjected to threats is apt to show negative emotional reactions, and this may be an outcome that the controller will not be pleased with for long.

Despite all the possible things that can go wrong when aversive control is used, it occurs frequently at all levels of society, from interpersonal relationships to governmental regulations. Skinner explains this disturbing fact: As with punishment, aversive control is often effective immediately. If the person or institution using it is powerful, it will usually work—*at least temporarily*—before the ill effects begin to show.

Skinner favors a shift toward greater use of positive reinforcement for long-range benefits. If a person's behavior is reinforced, he or she will do more of it without the necessity of direct or subtle threats. To go back to our previous examples, spouses are less likely to stray if at home they find enjoyable recreational activities, attention and affection, and satisfying sex; employees are likely to work harder if their efforts are given quick and direct recognition; and children are likely to behave better if their good behaviors are given attention and approval by parents. In these reinforcing ways, behaviors can be controlled more effectively than by using aversive control which relies on threats to get people to do what is expected of them. The effects of positive reinforcement may not be as immediate or as dramatic as those of either punishment or aversive control, but they are more likely to be long-lasting and less likely to generate undesirable actions and negative emotional states.

CONTROLLING PROBLEM BEHAVIORS

If Skinner opposes punishment as a way of stopping behaviors, what does he suggest? One possibility is extinction. This procedure involves ignoring unwanted behaviors. For example, a parent may simply not pay attention to a child's whining or outbursts of

temper. The basic idea is to avoid providing any reinforcement for such actions. If no reinforcement is available, extinction should occur.

According to Skinner the effects of extinction are more permanent than those of punishment. Though sometimes there may be a brief recurrence (called "spontaneous recovery") of a behavior that has undergone extinction, extinguished behavior tends to remain at a low level of frequency. Unfortunately, however, the extinction process itself may produce emotional responses such as aggression or frustration. Before extinction has finally occurred, there may be vivid displays of these or other problem behaviors. (As will be indicated shortly, it pays to reinforce desirable behaviors while extinguishing undesirable ones.)

There are other difficulties as well. Skinner warns that the process may take a long time. Therefore, the undesirable behavior may have to be endured beyond the limits of the controller's patience while extinction is taking place. For example, having to put up with a number of temper tantrums (while simultaneously trying to ignore their existence) can be very difficult, even if they are gradually decreasing in frequency. Another problem is that there may be an increase in the undesirable behavior for a time immediately following the start of the extinction procedure. If a child typically has had his whining behavior reinforced by his parents' attention, when they no longer provide that attention he is apt to intensify his whining. Commonly, this will eventually taper off and the whining will then extinguish, but the temporarily intensified demands may be hard for the parents to put up with and they may be very tempted to give in.

Another disadvantage of extinction is that it cannot be applied easily when undesirable behavior results in harm to the person himself or to others. For example, extremely aggressive behavior cannot simply be ignored; something must be done to prevent it from occurring. Further, there must be sufficient control over the entire situation to prevent other persons from reinforcing the behavior that you are trying to extinguish. To use

the example of the whining child again, an extinction procedure won't be effective if a relative, neighbor, or friend continues to respond to the child's unpleasant behavior.

Skinner admits that he doesn't have all the answers about how to cope with annoying, dangerous, destructive, or otherwise harmful activities. However, he does have a suggestion that can be applied in cases when simple extinction is not likely to be effective. He advises using a method that reinforces *incompatible* behavior. If a behavior that is incompatible with the problem behavior can be conditioned through the use of positive reinforcement, it is likely to replace the problem behavior. For example, in addition to trying to ignore a child's whining and temper tantrums, the parents should make sure that they pay attention to the child whenever he is more reasonable in his demands. In this way, they may be able to shape up more polite and cooperative behaviors. If they are successful, these more desirable responses will become the typical behaviors of the child, replacing the whining and temper tantrums.

This method of extinction combined with reinforcement of incompatible behaviors is an important procedure for use in prisons, delinquent homes, and other institutions to which serious offenders are sent for rehabilitation. Though good programs presently are in extreme shortage, this method has strong possibilities. The basic idea is to set up the situation so that no reinforcements are available for the criminal or delinquent activities that have become typical response patterns for the offenders, while providing positive reinforcement for constructive behaviors such as learning job skills, studying, and communicating better with others.

Implementing such programs is much easier said than done. One of the obvious difficulties is getting rid of the possibilities of reinforcement for undesirable behaviors such as fighting, the use and selling of drugs, and sexual attacks. Unless there is sufficient control over the total situation, such activities are likely to continue. On the other hand, complete control may be oppressive and defeat the rehabilitation process. In any case, it seems essential

that opportunities for genuinely useful and constructive activities be available, so that offenders can be reinforced for applying themselves in socially desirable ways. In many cases, presently existing programs don't provide sufficient opportunities for reinforcement of alternative productive behaviors that actually will be useful in the world outside of the institution.

Skinner strongly advises that we look for good alternatives to punishment as ways of controlling behavior throughout society. He cautions that punishment is too often the easy way out. It often gives immediate results, and therefore we are deceived into believing that it is effective. At best, it is only a temporary answer, giving relief to the punisher as long as he or she is able to hold a threat of more punishment over the head of the violator. When the punisher or the threat is absent, the unwanted behavior is likely to recur, sometimes with a vengeance. The beaten child, the jailed criminal, the reprimanded employee, the severely disciplined student—there are many examples among such individuals of punished behavior that is repeated, sometimes in extreme fashion, when the chance arrives. According to Skinner, it is far better to find ways of applying positive reinforcement for "good" behaviors rather than waiting until "bad" behaviors occur and then relying on punishment. In his opinion, all social institutions should be structured so that persons systematically receive positive reinforcement for desirable behaviors. This would alleviate the need for the widespread use of punishment, because people would be conditioned to behave in individually and socially beneficial ways.

Considering three major concepts of Skinnerian psychology that have been discussed so far—reinforcement, punishment, and extinction—where do we stand in trying to explain human behavior? If we think of a person's life from birth to adulthood, we realize that the number and variety of behaviors emitted is tremendous. However, each person develops a unique set of behaviors that become common for him or her, and which in

large part determine the individual's "personality." How do these particular behaviors get selected as the typical ways of responding, when so many other behavior patterns would have been possible? Skinner provides us with an answer. Some of the things we do are *reinforced* (either positively or negatively) and we continue them. Other behaviors have been *punished* and tend to be suppressed, at least under certain conditions. Still other behaviors have been *extinguished* and appear seldom or never. What gets reinforced, punished, or extinguished differs in various social settings. For example, aggressiveness may be reinforced in one society or family and punished in another. This helps to account for cultural and individual differences in behavior patterns.

Basically, this is the kind of broad analysis that Skinnerian psychology provides. In this form, the analysis is still somewhat crude and may not satisfy someone interested in understanding the finer points of human behavior. Some of the more subtle details need to be introduced, and this is the next objective.

GENERALIZATION AND DISCRIMINATION

If *generalization* (or *induction*, as Skinner often calls it) didn't occur, we would have to learn each time how to respond in every new situation that we encounter. Obviously, we don't have to do this. We are able to deal with a variety of similar situations on the basis of our learning in particular situations. A person who learns how to drive one car also can drive other cars. A child who learns how to behave appropriately at the family dinner table also can behave properly at other dinner tables. Many situations have similar stimuli, and it is in the presence of these stimuli that we respond in ways that have been reinforced in the past. Generalization provides the advantage of "ready-made" responses in a variety of settings.

Skinner has used the following simple example to demonstrate generalization: If a pigeon is conditioned to peck a red spot,

it will then also peck (at lower rates) an orange spot or a yellow spot, and spots with some variation in shape and size. (If the color were sufficiently different, for example green, then the pigeon would not be likely to peck.) A *generalization gradient* operates: responding tends to decrease in frequency as the stimuli become increasingly different from the initial stimulus (in this case, the red spot).

Despite its advantages, generalization isn't always a good thing. Though driving other cars is possible once one car has been mastered, transfer of similar responses may be disadvantageous if one car has an automatic transmission and the other has a manual transmission. Here is where *discrimination* saves the day, if this process occurs before an accident happens. We learn to distinguish different aspects of similar situations and our responses become more finely tuned to these subtle differences. This occurs when making similar responses is not reinforced. Trying to shift a manual transmission in the same way as an automatic won't work. Since that particular set of movements isn't reinforced, they eventually extinguish and are replaced by the appropriate manual transmission responses that are reinforced. In brief, then, discrimination refers to making different responses in various stimulus situations, and is basically the opposite side of the coin from generalization. Both processes are important in everyday life.

Skinner has demonstrated discrimination at a simple level by extending the pigeon example given above. As mentioned, once the bird has been conditioned to peck a red spot, the pecking generalizes to an orange spot. However, if reinforcement is changed so that it occurs *only* when the red spot is pecked, and never in the presence of orange, the pigeon eventually stops responding to the orange spot—discrimination has resulted. To give another example: If lever pressing by a rat is reinforced with food pellets when a light is on, but not when it's off, the lever eventually will be pressed only when the light is on.

In these examples, the red spot and the light have become *discriminative stimuli*. In their presence, responding has been

reinforced. Discriminative stimuli exert considerable control over human behavior. Phones are answered only when they are ringing, strangers are approached more often when they are smiling than when they are frowning, and we drive through intersections only when the traffic light is green. The phone's ring, the stranger's smile, and the green light are discriminative stimuli—making the appropriate responses when these stimuli are present has been reinforced (someone usually has been on the line, strangers generally have been friendly, and we have moved through many intersections easily and safely).

The powerful influences that discriminative stimuli have on our lives is difficult to grasp unless some thought is given to it. Stop for a moment and think about how often your behavior is controlled by particular conditions that are present (often we are so predictably controlled that we call our behaviors "habits"). Skinnerian psychology maintains that the environment is a major determinant of our behavior and that we do not "choose" or "decide" to act in certain ways on the basis of some inner knowledge. Rather, the environment *selects* certain responses. Though we may feel that we are "freely deciding," for example, to approach a smiling stranger, Skinner maintains that both the decision and the approach are affected by the environmental conditions that we have experienced. In other words, the fact that approaching smiling strangers typically has been reinforced with returned friendliness is what determines *both* our decision and the approach behavior. It is not the decision that controls whether or not we will approach the person.

SHAPING

Most of the things we are able to do aren't learned by a one-shot process. Rather they are learned through the process of *shaping*. Eating with utensils, using tools properly, playing sports skillfully, reading, writing, and speaking a language, and many other abilities, develop in steps. Each bit of progress made toward the

final behavioral goal is reinforced, but we have to keep moving toward that goal in order to keep the reinforcers coming. For example, very young children are praised for simply picking up a fork or spoon, but shortly they have to pick up food with it to gain their parents' attention. Next they have to hold it correctly, and finally they have to be able to get the food neatly into their mouths to receive approval. Step-by-step this process goes on, with reinforcement being given for progress and then being held back until more progress is shown.

Skinner suggests that language is learned in this way also. Utterances that vaguely resemble words are given attention and praise at first, and then progressively improving performance is required for further reinforcement. In this way, the child's verbal behavior is *shaped* until the language can be spoken in an acceptable way.

Endless examples of the shaping of constructive human behaviors could be given, but one more will suffice for now. Consider the skilled craftsman and the way in which his or her highly refined techniques develop. As an apprentice, small improvements in skill are reinforced, perhaps both by the comments of a master craftsman and the actual physical effect that the correct behaviors have on the materials being worked with. As time goes on, more and more improvements in technique have to be made in order to produce the desired effect and to earn the recognition of others, until finally the behaviors are very skilled.

Unfortunately, shaping also can have undesirable outcomes. For example, we may unknowingly shape annoying behaviors in others by ignoring (extinguishing) reasonable behaviors and reinforcing louder, more insistent actions with our attention. The parent who doesn't pay attention to the child's quiet requests, and then begins listening when the demands are intensified, may be paving the road toward loud, disturbing behavior. This kind of process happens in many different situations and is suggested by the common expression "the squeaky wheel gets the grease."

Violent, destructive behaviors can also be the result of shaping. For example, if a disadvantaged or oppressed group's rea-

sonable demands are ignored by those in power, more intense demands are likely to result. These may bring some reinforcement in the form of concessions by the authorities. When this level of action no longer is attended to, the group may again escalate its efforts and thereby gain further advantages. If this step-by-step process continues, the end result may be violence, because that is what the group finally has to do to keep the attention of the authorities. This is similar to what happened in the 1960s as blacks and students escalated their methods of protest. Those in positions of authority would seem well advised to respond to moderate, reasonable requests for the correction of injustices, rather than waiting until they find themselves in the position of having to reinforce violent or disruptive actions.

As with other Skinnerian principles, shaping can be demonstrated in the relatively simple confines of a Skinner box. The lever-pressing rat and the key-pecking pigeon usually do not begin these behaviors suddenly. In other words, they don't simply go over and begin working on the lever or the key. They are led to these behaviors through shaping. For example, reinforcers (food pellets) may be given at first to the rat when it simply is at the end of the Skinner box where the lever is located. Then reinforcement is given only when the rat gets closer to the lever, and so on. When the animal is in the immediate vicinity of the lever (because that is where reinforcement has led it), it will sooner or later make a movement that involves touching the lever, and that response is then reinforced. Next, only responses that put pressure on the lever are reinforced, and so on, until actual pressing occurs and is reinforced a number of times.

By reinforcing behavior that is in the direction of the desired response (pressing the lever) and then withholding reinforcement until an even closer approximation of the desired response is made, the rat is led gradually toward lever pressing. After this operant-conditioning process has taken place, on later occasions the food-deprived animal will press the lever very soon after being placed into the Skinner box. A new operant behavior has been conditioned by using a shaping procedure.

In real life, shaping processes do not necessarily work smoothly to produce the best final behavioral products. Earlier, examples were given of children learning to use eating utensils and to speak a language, and of the process that leads to skilled craftsmanship. However, since many of our behaviors are shaped in unplanned and unsystematic ways by parents, teachers, peers, work supervisors, and others, the results frequently are less than desired. Several things can go wrong: (1) if a relatively crude response receives too much reinforcement, it may become so strong that more advanced responses do not occur—for example, parents may give so much attention to a child's early social behaviors that the child fails to develop more mature social responses (the child is "spoiled"); (2) if too rapid progress is attempted (the step to the next behavior required for reinforcement is too large), existing behavior may be extinguished before more advanced responses are emitted, thereby undoing the shaping that has taken place already—for example, a teacher may "expect too much" from a student and withhold approval for such a long time that the student's academic behaviors begin to decline rather than improve; (3) reinforcement for an advanced behavior may come too slowly, allowing other behaviors to occur in the meantime—the reinforcement may then strengthen these behaviors instead of the desired one (in other words, the wrong behaviors get reinforced)—for example, recognition that a worker gets long after completing an excellent job actually may reinforce poorer performances that have occurred in the meantime. Given the delicacy of the perfect shaping process, is it any wonder that we're so imperfect?

PROGRAMMED MATERIAL AND TEACHING MACHINES

Skinner has given considerable attention to the development of better techniques for shaping behavior. He suggests that many types of learning can be improved by the systematic application of

good shaping procedures, and he has been instrumental in planning the use of *programmed material* and *teaching machines*. Constructing a "program" involves breaking down the subject matter into small units. This ensures that the learner will be able to make progress and not get stuck at a particular level because the next step is too hard. In small sequential steps, the learner moves toward better and better mastery of the material (mathematics, science, specific job-related information, or whatever). Each effective step in learning the material is reinforcing.

There currently are many programmed textbooks that present material in small progressive steps. Also, various *teaching machines* are in use. These devices present programmed material in mechanically or electronically controlled ways. A unit of material is displayed, the learner is required to make a response that shows understanding of the material, and feedback is given regarding the correctness of the response (if the program being used is a good one, the learner almost always will respond correctly). A teaching machine can provide the advantages of: (1) keeping the learner busy—there are no long delays during which the learner must sit and wait for more information; (2) allowing the learner to move along at his or her own pace; (3) complete mastery of each unit before the next one is presented; and (4) immediate reinforcement of correct responses by letting the learner know he or she is correct. Skinner suggests that there are strong similarities between teaching machines and the private tutor who makes sure that the student understands the material thoroughly, presents material for which the student is prepared, and provides quick reinforcement for correct responses. A good teaching machine and a good tutor are both effective shapers of behavior.

In addition to these advantages, Skinner indicates that teaching machines relieve teachers from the role of "drillmasters," remove the need for aversive control (for example, students do not have to be threatened with low grades), and reduce needless competition among students. It is his belief that tremendous potential exists in the use of techniques based on

programmed instruction. One of the difficult problems is designing good programs, that is, breaking down various complex subjects into small, yet meaningful, units. This often is a tough job.

SCHEDULES OF REINFORCEMENT

Once a behavior has been shaped, it can be maintained by various patterns of reinforcement. Depending on the particular schedule, we may respond slowly or rapidly, show long pauses between responses, persistently respond despite the fact that we haven't been reinforced in a long time, and display other variations in behavior.

The two broad categories of schedules are *continuous* and *intermittent*. With the former, each response of a particular type is reinforced; in the Skinner box each time the rat presses the lever it gets a food pellet. With the latter, reinforcement occurs less than each time; for example, every fifth lever press is reinforced.

Regarding human behavior, the physical environment is much more likely to provide a schedule of continuous reinforcement than is the social environment. The outcomes of turning water faucets and pushing doors, and more complex behaviors such as bicycle riding, swimming, hitting a golf ball properly, or hand-weaving a rug, are all activities that deal with physical objects and have predictable outcomes. If these behaviors are performed in particular ways, reinforcement will occur each time. Although social situations are less likely to provide continuous reinforcement, there are exceptions. An acquaintance may always respond in a friendly way to your greetings, certain relatives might always be there when you need them, a certain person may always be fun to be with, and so on. Often, however, there is less consistency than this in our interactions with other people, and our social behaviors don't get reinforced every time.

Interestingly, when continuous reinforcement is interrupted, we often feel that something strange, disturbing, or perhaps

humorous is going on. Skinner has used the example of the "house of mirrors" in an amusement park. The usual feedback is changed and we find it funny. Also, we may wonder or say something like "Isn't that odd?" if someone who has always been friendly suddenly ignores us. More seriously, we may experience severe "self-doubts" if we have been effective consistently in our efforts at school, on the job, or elsewhere, and suddenly some effort is not reinforced. In this situation, the person who is used to "ups and downs" (intermittent reinforcement) is not as apt to feel as discouraged as someone whose behavior has been reinforced continuously.

Extinction tends to occur relatively quickly if a behavior that has received continuous reinforcement is no longer reinforced. Assume that you are used to having a light come on every time you throw a switch. If it doesn't come on one day, you are more likely to give up sooner than if you are accustomed to a finicky switch that sometimes works and sometimes doesn't. In other words, continuous reinforcement leads to faster extinction than does intermittent reinforcement. This holds in social situations too. The person who has a long history of successes mixed with failures in forming friendships is apt to continue trying to relate to people even after a series of unsuccessful attempts. On the other hand, someone who always has made friends easily may give up if a few recent attempts have met with failure. One explanation for the differences in the behaviors of these two persons might emphasize inner qualities such as the greater "diligence" or "persistence" of the first individual. However, Skinner would say that the different reactions actually result from different schedules of reinforcement.

The fact that behaviors that have been maintained on a continuous schedule extinguish more rapidly than those on an intermittent schedule can be demonstrated vividly in the Skinner box. A pigeon may peck the key 50 to 100 times after reinforcement has been cut off, if it previously was on a schedule of continuous reinforcement. After some types of intermittent reinforcement, the bird will peck from 4000 to 10,000 times before

extinguishing. Anyone who has tried to extinguish some human behavior after having reinforced it intermittently may have experienced these long-lasting effects. For example, parents who decide to extinguish their child's temper tantrums may find it frustrating and exhausting, especially if in the past they sometimes gave in to the child and sometimes resisted. For extinction purposes, at least theoretically, it would have been better if they had always given in, rather than just sometimes.

A few examples of human activities maintained by intermittent reinforcement are: writers who continue to produce even though their works are published infrequently; fishermen who go fishing time after time, but who catch fish only once every several times; gamblers who continue to play games of chance despite only occasional winnings; moviegoers who see film after film, but only once in awhile see a good one; and friends who continue seeing each other despite the fact that it isn't always reinforcing to be together. Lots of behaviors persist simply because they are reinforced occasionally.

Technically, there are two major types of schedules of intermittent reinforcement: *interval schedules* are based on passage of time and *ratio schedules* are based on number of responses. On an *interval schedule*, the first response made after an interval of time has passed is reinforced. Responses made before that go unreinforced. For example, you must wait an interval of time for water to boil before your response of pouring it on instant coffee will be reinforced. Also, checking your mailbox will not be reinforced with letters unless you wait an interval of time since the last mail delivery.

Intervals between reinforcement can be *fixed* or *variable*, and this is an important distinction. Our behavior will usually differ on these two types of interval schedules. On *fixed-interval* (FI) schedules, we tend to wait until the time when reinforcement will occur, and then begin our responses. If you always use the same pot, the same amount of water, and the same intensity of flame to boil the water, you have created a fixed-interval schedule. You probably will go calmly to the stove once, after the fixed interval

has passed, and find water that's ready to be used. On the other hand, if you use different pots, different amounts of water, and turn the flame on carelessly, you will have a *variable-interval* (VI) schedule. Each time you boil water, you are likely to be running back and forth to the stove, checking the water.

Another good example of how FI and VI schedules can make us behave differently is this: Suppose that you are driven to work by a fellow employee who consistently arrives in front of your house at 7:30 A.M. (for our purposes this can be considered a fixed-interval schedule—the interval is exactly 24 hours long). Would your behavior differ from a situation in which your ride arrived sometimes at 7:30, sometimes at 7:39, other times at 7:21, and so on? Probably it would. On this variable-interval schedule, you would probably go to the window a number of times, checking to see if the person had arrived. Someone watching you would probably say that you were nervous, restless, or fidgety, but Skinner would say that your behavior was being affected by the variable-interval reinforcement schedule.

In the laboratory different results from fixed-interval versus variable-interval reinforcement schedules can be shown dramatically. For example, a pigeon on FI tends to pause after being reinforced, and then accelerates its pecking as the interval draws to an end and reinforcement again becomes available. On VI, the pigeon tends to maintain a constant rate of pecking, with little pausing. Skinner has given the example of birds on a VI schedule with an average interval of five minutes (the intervals varied around the five-minute mark, sometimes shorter, sometimes longer). They pecked for up to 15 hours, two or three times per second, with almost no pauses except to consume their reinforcers.

Ratio schedules yield reinforcers on the basis of number of responses made. Time is not a factor. These schedules also can be *fixed* (FR) or *variable* (VR). A rat working on FR might have to press the lever 20 times to get each food pellet, while on VR the number of presses would vary. For example, the *average* might be 20, but sometimes it would be 16, sometimes 24, and so on. Response patterns again differ on these two types of schedules. On

FR schedules, typically there are short pauses after reinforcement, followed by rapid responding. (With large ratios, there may be a significant period of slow responding after reinforcement. If the ratio is very large, there may be a long period of no response after reinforcement. Skinner has used the example of a student who finds it difficult to start work on the next assignment after finishing a term paper.) On VR schedules, the pauses are eliminated and responding is consistent. Generally, the response rates on *ratio* schedules are higher than on *interval* schedules.

The classic example of a *fixed-ratio schedule* at the human level is piecework: The worker gets paid a certain amount for each unit of work completed. Skinner says that this is a dangerous schedule because it can cause workers to push themselves to exhaustion. He suggests that it is too hard on salespersons, for example, to work solely on commission (which is a type of piecework). They should have some salary to supplement their commission, otherwise they may push themselves too much. The response pattern seen with animals in the Skinner box can also be seen among humans who are on strict FR schedules. They pause briefly after being reinforced (for example, after making a sale) and then work hard again until the next reinforcer.

Variable-ratio schedules also result in a high rate of activity, and pauses tend to disappear. Skinner has indicated that pigeons will peck for hours at a rate of five times per second on this type of schedule. An example frequently used by him to illustrate the dramatic effects that a VR schedule can have on human behavior is that of pathological gamblers. They make bet after bet, any of which might pay off. The outcome of any particular bet is unpredictable, but eventually they win (unfortunately, this occasional reward keeps the gambler going, even when the overall outcome is disastrous). Variable ratio schedules abound in our lives: calling our friends, watching TV, working hard at school or on the job, and a multitude of other behaviors, are not usually reinforced according to a fixed schedule. We may have successes two or three times in a row, then not get reinforced for the next several efforts, and so on.

The effects of schedules of reinforcement in our lives are not

as neat and predictable as the effects seen in Skinner boxes. There are more complicating factors operating in real life. However, that doesn't negate the importance of such schedules in controlling our behaviors. It simply makes it much more difficult to specify exactly what is going on. We have only touched on the possible patterns of reinforcement that can operate. Skinner and a colleague, C. B. Ferster, published a book in 1957 titled *Schedules of Reinforcement*, in which they present the details of intermittent schedules on the basis of years of research. Two of the more complicated arrangements are *multiple schedules* (two or more schedules alternating randomly) and *concurrent schedules* (two or more independent schedules operating at the same time). There is much to consider regarding schedules of reinforcement. They make it clear that Skinnerian psychology can, at least theoretically, account for very complex human situations.

As a final example in this section, let's consider how different reinforcement schedules might affect sexual activity. Suppose that you are on a *variable-ratio schedule*. In other words, there is always the chance that the next approach to your lover will be reinforced with sexual activity. Isn't it likely that your approaches will be much more frequent and constant than if a pattern has been established by which your sexual advances are reinforced only after a week-long interval has passed? This latter schedule is a *fixed-interval schedule*, and would very likely result in long pauses followed by increased seductive approaches around the end of the week.

CHAINING

Chaining helps explain how we carry out smooth sequences of behavior. Sometimes it is difficult to understand how the reinforcement of specific responses can lead to activities such as playing the piano, walking to a restaurant through a maze of city streets, telling a long story, or going through the process of getting ready for school or work in the morning. In Skinner's view, these complex behavior patterns are made up of separate responses

joined together in chains. Each response in a chain generates consequences that affect the next response. For example, a piano player's behavior is reinforced when he or she strikes the correct chord. Additionally, however, that chord provides the stimulus for the striking of the next chord, and so on, until the entire piece of music has been played.

The critical factor in chains of behavior is that *discriminative stimuli* can function as *conditioned reinforcers*. Discriminative stimuli indicate that a particular type of behavior, if emitted, is likely to be reinforced. Each response in a chain produces consequences that serve as discriminative stimuli for the next response, and which also reinforce the response just made. For example, walking into the kitchen puts one near the refrigerator; this may serve not only as the discriminative stimulus for opening its door but also may reinforce the response of "walking into the kitchen" (assuming that one is hungry). Each behavioral consequence in a chain can be analyzed in this way to show that it functions as *both* a discriminative stimulus and a conditioned reinforcer.

The final reinforcing event that maintains a chain of behavior may involve a primary reinforcer (for example, food). The food-deprived person gets *primary* reinforcement from eating and digesting food, but generally there are many responses that precede the actual act of eating. These responses are reinforced by conditioned reinforcers. Opening the refrigerator door is reinforced by the sight of food, reaching for the food is reinforced by holding the food, putting the food in the oven is reinforced by the smell of it cooking, and so on, until the food is finally eaten (primary reinforcement). The sight of food, the feel of food, and the smell of cooking are all conditioned reinforcers; each is also a discriminative stimulus for the response that follows it in the chain of behavior. They have acquired their reinforcing characteristics by being associated with the primary reinforcement derived from eating.

Typical non-Skinnerian explanations of sequences of behavior usually involve a lot of "decisions." To get something to eat, to go to bed, to visit a friend, to go to the movies, and so on, are commonly thought to involve conscious and deliberate choices.

Skinner's explanation removes the element of decision making or free choice, and focuses on the effects of stimuli and consequences on our behaviors.

Skinner and his colleagues have investigated the relationships between various environmental conditions and behavior. They have focused greatest attention on "contingencies of reinforcement"; this is a phrase often used by Skinner to refer to (1) behavior itself, (2) the conditions under which it occurs, and (3) its reinforcing consequences. Starting out with studies of rats and pigeons, they have formulated a number of basic behavioral concepts. Moving to the human level, many of their procedures have been applied effectively in a wide variety of situations with many different types of persons. Therefore, there now exists a substantial amount of evidence that Skinnerian psychology is applicable to human behavior.

In this chapter, many of Skinner's basic concepts were discussed. Some of the most important points were that (1) operant behavior can be strengthened through positive or negative reinforcement, (2) reinforcers can be either primary or conditioned, (3) some behaviors are "superstitious," that is, there is only an accidental connection between them and reinforcement, (4) operant behaviors that are not reinforced tend to extinguish, (5) punishment typically suppresses behavior but doesn't necessarily do so permanently, (6) responses that are reinforced in particular situations tend to generalize to similar situations, but discrimination develops if reinforcement occurs only in particular situations and not in others, (7) complex behaviors are shaped through the differential reinforcement of closer and closer approximations to the final behaviors, (8) different schedules of reinforcement yield different response rates, patterns of responding, and resistances to extinction, and (9) ongoing sequences of behavior can be considered as "chains" in which discriminative stimuli also serve as conditioned reinforcers.