Chapter 5

E. R. GUTHRIE: PRACTICAL BEHAVIORISM

BIOGRAPHY

Edwin R. Guthrie was born in Lincoln, Nebraska in 1886 and graduated with a degree in mathematics and philosophy from the University of Nebraska (see Figure 5.1). After three years of teaching high school mathematics, he attended graduate school at the University of Pennsylvania, where his doctoral thesis was concerned with philosophical paradoxes. In 1959, the year of his death, he said that his early experience with Bertrand Russell's philosophy and the difficulties encountered by Russell and Whitehead in the *Principia Mathematica* had convinced him that the search for absolutely valid knowledge would be fruitless. As he expressed it, these men had spent 400 pages of tenuous logic in an effort to establish that one plus one equals two, with each step of logic potentially refutable.

Guthrie's first and last job was at the University of Washington, where he was Professor of Psychology and, for a time, Dean of the Graduate School. His theory of learning is the simplest conceivable, consisting of only one main principle. But that principle in his hands was powerful indeed, which you will find if you examine Guthrie's main published works:

General Psychology in Terms of Behavior, 1921 (with S. Smith)

The Psychology of Learning, 1952 (published originally in 1935)

The Psychology of Human Conflict, 1938

Cats in a Puzzle Box, 1946 (with G. P. Horton)

What is most amazing about Guthrie is that he remains current at all. He proposed the ultimately simple theory of learning, which merely holds that we will do in a given situation whatever it is that we did when last in that situation. He conducted virtually no research and his total published work is a small fraction of the output of other major theorists. (Thorndike, for example,

FIGURE 5.1 Edwin R. Guthrie, 1886–1959.
Photo courtesy of Bettman Archive

published roughly 27 times the number of items that Guthrie published.) He had no real followers, in the sense that other major theorists did, aside from Virginia Voeks and Fred Sheffield, who may not even view themselves as real Guthrians. Yet, he is current and it is an unusual learning textbook that does not devote some space to discussing his views, often more space than is given Thorndike and virtually always more than is allowed Pavlov and Watson.

The reason for Guthrie's continued presence and timeliness lies in the great virtues of his theory, simple though it is, in accounting for a wide variety of behavior. His account of reward and punishment may be more useful than Thorndike's, and his homely advice for changing our own behavior incorporates most of the basic methods now used in behavior therapy. Despite such virtues, he never rendered the theory in precise enough form to really make it testable. Depending on one's point of view, Guthrie's theory is either the only one we need or it is no theory at all.

INTRODUCTION

Section 1 considers the two aspects of Guthrie's theory that made it significant at the time. First, he was one of the very few psychologists to propose that learning did not necessarily mean improvement. This led him to oppose the common emphasis on goal-directed behavior and to make some unique predictions about everyday matters, which the other theories neglected. His concern was to make predictions about things that he considered worth knowing, and he criticized the efforts of the other theorists to be as precise as possible: A precise explanation of uninteresting things, Guthrie believed, is not worth much.

Section 2 describes what there is of this theory: In any situation we simply do whatever it was that we did last in that situation! To appreciate his point, we consider eleven examples of applications of the theory to daily life. Then we see how it applies to traditional categories in psychology, such as the effects of practice, reward and punishment, thought, motivation, and so on. We will see that he had some interesting opinions and a real knack for applying his theory to the common problems of life.

How may we change our habits? Guthrie supplied the main methods now in use by behavior therapists, although they seldom give him credit. He tried to show the importance of stereotypy (that is, doing what we last did in the same situation) in a piece of research with cats, published in 1946. The situation was similar to Thorndike's problem boxes, but his interpretation was quite different; unlike Thorndike, Guthrie carefully watched everything done by the cats in their attempts to escape.

In Section 3 we look at the common criticisms of Guthrie's theory. You might think that there would be many criticisms, given the simplicity of the theory. But the criticisms point more to the incompleteness and vagueness of the theory, rather than to any basic flaws. Section 4 examines this alleged vagueness and incompleteness and finds that Guthrie's view does suffer from these deficiencies. Yet, for practicality, Guthrie's theory cannot be beaten; his basic priniciple comes from the popular psychology of the nineteenth century, and that worked, as does Guthrie's psychology. Whether one likes Guthrie depends upon whether one wants to understand the ultimate nature of our workings in detail or simply to have a practical understanding. Guthrie would disagree with this assessment, but it seems clear that his theory is restricted to practical purposes. Most of us would not consider such practicality a fatal drawback, although we might admit that any theory concerned only with practical matters leaves out a great deal.

1. GUTHRIE'S SIGNIFICANCE DURING HIS OWN TIME

The Basics of Behaviorism: Is All Behavior Goal Directed?

Learning theories were extremely popular in the 1930s and 1940s, signaling, it seemed, the long-awaited independence of psychology from philosophy and the beginning of a real and practical understanding of human behavior and experience. Thorndike and Watson had cast out the methods of the introspectionists, and their essential message had been heard and accepted by a great many psychologists. Their basic views, that the subject matter of psychology was behavior and that behavior was determined by discoverable antecedents, was being shown to be a profitable way of viewing things. There was little concern with either the analysis of consciousness or with the problems of the old philosophies that had led to the introspectionists' version of psychology. To a great many psychologists the only problem remaining was the working out of the details of the learning process.

Unfortunately, at least in Guthrie's view, most psychologists were making premature simplifying assumptions in their rush to establish a definitive general theory of learning. This was especially true in the common assumption that learning meant improvement. Improvement means that activity is evaluated with respect to some goal and that it consists of errors and successes (trials). This seems a reasonable enough assumption, of course, and it may seem odd to challenge it. Isn't all of our behavior goal directed? If asked what we are trying to do at any time during the day, could we not more or less quickly provide a reasonable answer? All of our activity, it seems, is inherently purposive. This was Thorndike's conclusion, apparently, since his theories stressed the consequences of action. And it is Watson's conclusion, too, since he defined learning as adjustment. It is difficult to cite many psychologists who did not or do not emphasize the essential purposiveness of behavior. Even Pavlov, were he a psychologist, would point out the obviously adaptive function of the conditioned response. Only Edwin Guthrie questioned the virtue of stressing goals, of emphasizing purpose, and of thereby restricting our consideration to goal-directed behavior.

Guthrie felt that the overemphasis on goals left out a lot of what we do. There are meaningless acts, awkwardness, maladaptive and foolish acts, and it is unwise to treat them merely as failures in the course of otherwise reasonable goal-directed activity. In addition, the emphasis on purpose leads to an unwarranted stress on the consequences of action, with the result being the treatment of rewards and punishers as basic determiners of action. A good deal of behavior is goal directed, and there is no question that rewards and punishers are effective in modifying behavior. But stress on purpose and on the importance of rewards and punishers in general will not help us explain all of the behavior of individ-

uals in particular. How does the individual progress or fail to progress toward what the onlooker views as a goal? What determines whether a reward will act as such for individual student X at time Y in place Z? What factors determine when reinforcers and punishers will or will not work?

Back to British Empirism: The Blank Form

Guthrie was not ready for the specific mechanisms proposed by others and sought instead the most general possible principle, the "blank form," which would include all of the specific mechanisms of other theorists as subprinciples. He found his blank form in old *British empiricism*, the school of philosophy represented by Locke and James Mill, both of whom stressed the importance of *contiguity* in space and time as the essential ingredient in the association of ideas. Although the empiricists held that our ideas follow the course they do because they are following the course they did in the past, Guthrie argued that we do what we do because that is what we did in the past. Is this a theory of learning? Guthrie's continued influence suggests that there is something to it.

2. THE BASICS OF GUTHRIE'S THEORY

What Is a Theory of Learning?

In Guthrie's view, learning exemplifies what we mean by *mind*, and the study of learning is therefore the study of mind. An organism that grows, reproduces, and defends itself may thereby show evidence of life, but unless its behavior changes as a function of past behavior it does not show evidence of mind. Having mind, or the ability to learn, means having the ability to respond differently to a situation because of past responses to the situation. But *respond differently* does not mean "improve." We learn bad habits as easily as we learn good ones. Goals and the implied successes and errors are often only in the eye of the onlooker, not the learner.

The goal of a theory of learning is to explain, which is to state the rule of which an event is an instance. For example, an act of aggression by one child toward another may be explained as a manifestation of the working of an aggression center in the brain, as the consequence of frustration, as the effect of previous rewards for aggression, or as the will of God. These and other possible explanations (and there are many) may be more or less successful, but all suffer from a major shortcoming. Each of them refers to the act of an agent—the aggression center, frustration, reward, and God—and this lessens their usefulness as explanations. For Guthrie, an explanation must above all be useful. Explanations that depend upon agents are useful only insofar as we know the ways of the agent. We know little of the workings of an aggression center and less about the ways of God. We do not really understand the factors that produce frustration and under what circumstances frustration produces aggression. Rewards do affect behavior, but often they seem to be ineffective; do we really know the ways of even that agent?

Guthrie's Principle

Explanations that refer to such agents may sometimes be useful, but Guthrie was interested in explanations that are always useful. The one most general rule, which refers to no agent, is "A combination of stimuli which has accompanied a movement will on its recurrence tend to be followed by that movement" (Guthrie, 1952).

"What kind of a theory of learning is that?" you might ask. This is a common reaction by readers and students who first encounter Guthrie's theory. Guthrie appears to be saying that *stereotypy* is the basic feature of learning—that in any situation we do what we did the last time we were in that situation. Not only does that seem untrue, but if it were true it would mean that

learning would never take place, since any definition of learning refers to a change in behavior in a given situation! Guthrie's background in philosophy and mathematics seem to have reduced him to a player of verbal tricks, not a person to be taken seriously!

Not only is stereotypy the basic rule of learning, according to Guthrie. But repetition of the combination of stimuli does not increase its tendency to evoke the movement. Practice does not strengthen the connection between situation and behavior. The connection is made in one trial.

How can such a theory explain anything? It appears to say that I will always do what I did last in a situation and that when I am in a new situation whatever I happen to do (reflexively? due to instinct?) will be what I will do in that situation until my dying day. The theory becomes more intelligible once we realize that (of course) we are never in the same situation twice; even if the external setting is largely unchanged, we are not. We are older, our stomachs are more or less full than the last time, and so on. But before going further into this, it is helpful to consider some of Guthrie's examples of applications of his theory. He was a master at application and most of these instances come from his 1952 book.

Guthrie's One-Trial Contiguity Learning

One-trial contiguity learning means that learning consists of associations between stimuli and movements that occur close in time (are contiguous) and that the association is at full strength with the first pairing. (Repetition does not strengthen the connection.) Consider the following examples. You should note that Guthrie's examples assume some things that may not always be the case. Try to identify these assumptions and you will understand his point of view more clearly.

Training a Dog to Come One way to train a dog to come on signal is to hold a piece of food and call the dog's name. If the dog does not come when the signal is first given (for example, by calling its name) then giving further calls is unwise; the signal becomes the occasion for not coming. This effect is the reason for the military adage that holds that a commander should never give an order that he does not expect will be obeyed. A skilled animal trainer does not give the cue or call the name until he or she sees that the desired response is about to occur on its own. Wait until the dog happens to move toward you and then call its name, so the name becomes attached to the movement.

A piece of food may prompt the dog to come on signal, but it is not the only way to accomplish this. Anything that makes the dog come will do the trick. Given that the dog is not too large or vicious, a long rope attached to the dog and pulled by you will teach it to come.

Training a Dog to Stop Killing Chickens Tying a dead chicken around a dog's neck serves as a strong agent for learning. The dog will attempt to get the chicken off, and, if the chicken is skillfully attached, this can require some time and some extreme effort on the dog's part. When the dog has succeeded in getting rid of the chicken, it will have become an educated dog: The last thing the dog did was try to get the chicken away from it and to get itself away from the chicken. The sight of a chicken in future will reinstate the last behavior done in the presence of a chicken: getting away.

Walking on Ice Situations are always compounds of groups of stimuli encountered in the past. Sometimes the compound is reducible to only two general classes, as is the case when we walk on ice. There are the normal movements involved in walking, called out by the stimuli that regularly accompany such movements. But there is another class of stimuli that has been paired in the past with falling, not walking. This group of stimuli evokes the movements that it accompanied in the past, protective movements, such as holding out the arms to break a fall. This was the

last thing we did on a prior occasion when we fell. "Walking on ice" is the compound produced by stimuli attached to walking and those attached to falling.

Overcorrection The *overcorrection* procedure (Stoltz, Wienkowski, & Brown, 1975) requires no more than forcing the author of a misdeed to atone for it by undoing whatever damage was done (that is, to correct it) and to repeatedly perform the correct behavior (overcorrect). For example, a mental patient who tears up a bed will remake it and make twenty other beds. A child who throws food will clean it up a few times.

Such a practice ensures that the last act performed in a situation is one that is desired by society. How the learner is coerced into doing the overcorrecting is up to whatever agent of society is in control. It is only important that it be done.

Reading in Noise Guthrie (1952) described the example of a young woman who lived in an apartment near some noisy neighbors who annoyed her with their loud radio. She was unable to study because of the noise, until an acquaintance suggested that she practice reading mystery novels in the noise. The novels held her attention sufficiently so she was able to read despite the noise and was able to study in noise within a week.

Reading While Fatigued We are always learning, and when we read while very tired or while distracted we learn something new. We learn to read without following, as we will discover when we next try to read while tired or refreshed.

Imitative Laughing It is difficult to refrain from laughing when in the presence of others who are laughing. The pressure to imitate is strongest when a large number of others around us are laughing. Guthrie felt that this behavior was less the product of an instinct to imitate than it was a case of simple stereotypy. We are in a situation in which we hear loud laughter nearby. In the past, such stimulation occurred when we ourselves were laughing. What were you doing the last time you heard loud laughter? You were laughing, so that is what you do when you hear others laugh.

Changing Thoughts in Bed When awakened by a nightmare, we may get up and walk around, turn on the light and read, or simply turn over. But there is one thing that we do not do—we do not remain in the same position and go back to sleep. The stimuli that accompany a body position are a part of the stimulus complex present during the bad dream. If you maintain that posture and go back to sleep, you stand a good chance of doing what you did the last time you were in that situation, which was dreaming the bad dream.

Remembering Names We do what we did last in a situation and it is helpful if the cues are salient so that more of them are effective. (Guthrie later stressed the importance of stimulus salience and attention in his 1959 final statement of his position.) Thus, if we wish to remember the names of a group of new acquaintances at a party, we may ensure our success by walking up to each of them, asking the name, and shouting it back to the person. In doing this we attach the cues that we want associated with the name (the appearance of the individual) with an exaggerated response on our part. Guthrie doesn't mention it, but this method would guarantee that everyone would remember your name as well.

Negative Practice Guthrie suggested (after Knight Dunlap) that we may often improve our skills by practicing mistakes, an odd suggestion given his theory. This is called *negative practice*. For example, suppose we make the common error of typing *the* as *hte*. We may rectify this by repeatedly typing *hte* and then practicing *the*. This strategy works because our original error came from a failure to note the cues associated with typing *the* and *hte*. Once we concentrate on the way it feels to type the error we can adjust to a forthcoming error in the future. Such a method may be useful in other areas, such as curing facial tics.

Improvement with Practice: One-Trial Learning?

Daily experience tells us in many ways that Guthrie is wrong; we do improve with practice. (Isn't that the usual definition of learning?) The suggestion that only one trial is necessary could only apply to the exceptional case, and exceptions aren't that interesting.

Guthrie did indeed believe that learning requires only one trial, which sometimes is the case. Voeks (1948), Estes (1964), and others have shown that a change from chance performance to perfect performance can occur on one trial if the task is simple. Learning either occurs gradually, as in the building up of the strength of an S-R bond, or it occurs on one trial. Given that there are instances in which it happens in one trial, can Guthrie's "all or none" theory explain the cases in which improvement is gradual? Similarly, can a theory that holds that learning is gradual explain the cases when it is complete on one trial?

Guthrie's theory works better in accounting for improvement with practice than does the opposing theory in accounting for sudden improvement. The key to understanding Guthrie's position here is the word *improvement*. This word refers to a goal or purpose, more specifically to progress toward that goal. For example, suppose I repeatedly throw a baseball through an old tire hanging from a rope. With time, my aim will improve, and the ball more often will fly through the center as it should.

However, Guthrie did not accept goal direction as the defining characteristic of what is learned. What is learned is what is done, and what is done in this case is a lot of movements. Throwing the ball is an act made up of thousands of individual habits, corresponding to the individual muscle movements required. When I first throw, my movement is awkward; it includes irrelevant responses to irrelevant stimuli. With practice, the irrelevant movements drop out, since the stimuli that produce them are apt to vary from trial to trial, whereas stimuli connected with smooth movement of the arm are there trial after trial and remain connected to individual movements. Other acts, such as smoking and eating, are made up of thousands of habits, which accounts for the difficulty we encounter in breaking such habits. In fact, they are constellations of habits.

Both Voeks (1954) and Estes (1956) have pointed to the misleading nature of learning curves averaged over great numbers of subjects. For example, suppose we plot the percentage of correct answers for students listing the first ten presidents of the United States. We find that with successive trials, performance improves, indicating that the number of presidents correctly named increases gradually with repeated trials. A similar plot could show the increase in correct turns made by a group of rats learning a maze. Such averaged data may give a false impression of the nature of learning. Suppose that on the first trial, one of 30 students can name all ten presidents and the other 29 students can name none. Suppose that on the second trial two of the 29 students can name all ten, leaving 27 who can name none. Suppose that on each succeeding trial, one or two or three or more new subjects go from naming none to naming all ten presidents. With more and more trials the likelihood of perfect performance increases.

The averaged data for the students in this case, or for the rats learning the maze, lead one to believe that improvement was gradual—and it was, for the entire group. But each individual learner could have gone from some correct to all correct on a given trial and remained at that level of perfect performance over the remaining trials.

Guthrie liked to believe that things happened or they didn't; there is simply no need to posit a gradual learning process. "We should probably say, if we are to be exact, not that practice makes perfect but that perfection is seldom approached without practice" (Guthrie, 1952).

One must bear in mind that Guthrie did not mean that every instance of learning occurs in such a fashion; often we are concerned with the learning of what he called acts. These are compound behaviors, such as learning a good back-

stroke or memorizing a poem. Such things are learned gradually, although each individual element (habit) may be learned on one trial. In a sense, Guthrie's definition of *habit* could be phrased "that which is learned in one trial." This definition includes more than other theorists suspected.

Rewards and Punishers: When Do They Work?

To understand Guthrie's position on the law of effect, you must remember that he was interested in truly general principles, not in special cases. For most other psychologists it was clear that behavior is goal directed and that rewards and punishers are thus basic determinants of action. Guthrie disputed this, of course, pointing out that a lot of what we do is not purposive, but aimless, useless, and even maladaptive.

No one denies that rewards and punishers are obvious determinants of our behavior and the behavior of animals. What Guthrie denied was the assumption that rewards and punishments are basic, primitive, unanalyzable events. Rewards do not always work, and punishers may even actually backfire and increase the frequency of the behavior that produces them. Rewards may decrease the frequency of the behavior that produces them. Why? In what circumstances? How may we know in advance of its application that a putative reward will do what we expect it to do? Since we are not all pleased and pained by the same things, and since the same event may at one time produce pleasure and at another time produce pain, we still have no way of predicting what will act as a reward for a given person at any given time.

Guthrie pointed out that we apply rewards and punishers in very specific ways and that we may understand their workings if we carefully consider the ways in which they are successfully and unsuccessfully applied. For example, when we use food to reward a dog for coming to us when called, we do not throw the food to the side. Doing so would leave us with a dog who approached us and then turned aside. When we reward a rat for turning right in a T-maze, we do not leave the rat in the maze to wander around after it has eaten the food. In both cases, the reward is applied in such a way as to end the sequence of behavior leading up to it and thus leave that behavior as the last thing done in that situation. The rat turns right in the maze and comes in contact with the food. Prior to that, the rat was moving through the maze. That activity stopped when the rat reached the food; the rat forgets the sight and smell of the alley for the moment, and the association between "right turn" and "choice point" remains the last thing done.

Reward may be interpreted as a stimulus change that leaves some behavior as the last thing done in the old situation. For example, the question, "What is the capital of New Jersey?" may be followed by the responses, "Elizabeth," "Rahway," "Camden," "Jersey City," and so on. Each answer is followed by "no," and the original situation remains unchanged—the question is still being asked. At last, the answer "Trenton" is given, followed by "right." The situation is now changed—the question is no longer being posed and the last response in the old situation is attached to the old question.

Motives or Drives

This interpretation of reward as situation change especially applies to situations within us. After going without food for a number of hours, my body tells me that my blood sugar is low; I am hungry. The feeling of hunger (or of thirst, or any other "drive") acts as a disturber, which produces movements. You may verify the movement-producing action of bodily states by holding your breath for several minutes and noting the movements of your body after the first few minutes.

The stimuli of hunger, thirst, and so on produce movement and maintain that movement; this is Guthrie's theory of motivation, and these stimuli are called *maintaining stimuli*. A *motive* is

anything that produces activity. As we know, activity means learning. The stimuli of hunger keep me active, with each new behavior becoming associated with the cues present outside of me and the stimuli of hunger within. As a new behavior is attached, the preceding one is displaced. Finally, some behavior ends the series by eliminating the disturber; I find food and consume it, and the behavior that accomplished that is the last thing done. The next time the situation recurs and the hunger stimuli reappear, I will do whatever it was I did last in the former situation. If the situation is precisely as it was last time, so that my feeling of hunger is identical, I am in the same room, wearing the same clothes, and thinking the same thoughts, then I will do precisely what I did on that occasion. If that act doesn't change the situation this time (that is, end the disturber) then I will do something else that does change the situation and that will become the last thing done.

Although it is customary to think of drives as biological things, such as hunger and thirst, Guthrie's view was not that restricted. Biological drives are only instances of the general class of drives, defined as any instigators of action. When we are asked a question or we are bored or startled or bothered by noise or in any situation that makes us act, we are in a drive state.

Tests of Guthrie's Theory of Reinforcement

All possible cases of reward thus become special cases of the general law of stereotypy; we do in a situation what was last done in that situation. When a so-called reward doesn't work, it is because the behavior that we expected to be rewarded was not the last thing done in that situation. Consider the evidence against Guthrie cited by many authors, who allege that Guthrie is proven wrong if it can be shown that not all cases of changing the situation act as a reward.

For example, a rat runs down the alley and falls through a trap door into a black bag; this is an event that surely changes the situation (Seward, 1942). Yet, the rat does not run more rapidly (if it runs at all) on the next trial. So it appears that Guthrie is wrong! There is no doubt that other changes in the stimulus situation would also prove ineffective. We could pour pancake syrup on the rat, slug it with a ball-peen hammer, pull its whiskers, set fire to the alley, shock it with a cattle prod, scream obscenities at it, put itching powder on its back, pick it up by the tail, and do countless other things that change the situation but that do not act as rewards. But what is it that these events actually do? They change the situation and make the rat do something new. Rather than leave the last movement down the alley as the last thing done, each of these events leaves strong new behaviors that are incompatible with movement toward the goal as the last behaviors done. Itching, flinching, squeaking, struggling, or whatever was the last thing done will be what is done when the situation recurs. Will the rat back in the start box see the cues of the alley and run? Don't be silly. What is learned is what is done and the last thing done was not movement from start box to goal; it was violent and incompatible behavior evoked by our "reward." A stimulus that produces strong new behaviors incompatible with what was last done in that situation is what we mean by a punisher.

Punishment

We sit on tacks that someone has placed on the chair. We train a dog to jump through a hoop using electric shock. A schoolgirl enters her home and throws her coat on the floor; her mother's scolding finally leads her to hang it up. An experimenter is puzzled because he finds it difficult to train a pigeon to peck a plastic disk to avoid electric shock. In all of these cases the effect of an event, whether we call it a punisher or not, lies in what it causes the organism involved to do. *Punishment*, like reward, is a moral term that reflects the intentions of the applier; the effect on behavior depends upon what it leads the recipient to do.

Guthrie noted that when a dog is trained to jump through a hoop using electric shock, it is

important at which end of the dog the shock is applied! What is punished or rewarded in such a procedure? One could say that the shock to the dog's derriere punishes standing still, but Guthrie would say that it encourages movement forward. When we sit on tacks, it is not really punishment for sitting; rather the tacks encourage other behavior. Punishers are stimuli that are effective in producing new behaviors. The next time we sit in the chair, we will do what we did the last time in that situation. If the tacks no longer are present, we sit. But the slight recoil, flinch, hesitation, or concerned glance at the seat is part of what we did the last time, when the tacks were there.

Guthrie described the schoolgirl who entered her home and threw her coat on the floor. Each day the girl's mother would tell her to hang it up, but she persisted in the initial throwing to the floor. The problem was that the mother had become a cue for hanging up the coat, since the act had only occurred in her presence. The sequence always ran: cues in the entryway of house, throw the coat on the floor; cues presented by the scolding mother, hang up the coat. Guthrie advised that the girl be forced to go outside and re-enter the house and hang up the coat without the mother's scolding presence. After a few trials of that corrective procedure, the problem would be solved. Of course, the somewhat perceptive reader may note that alternative explanations are possible for this case; the embarrassment of being forced outside may have acted as a punisher for throwing the coat down, so subsequent improved behavior may amount to avoidance of the annoying and embarrassing consequence of not hanging up the coat. Guthrie stressed the effect of any operation on what is done. Initially, the scolding of the mother punished nothing; it simply became a cue for coat hanging. But the coat hanging did not occur in the context required—upon entering the house. Reward and punishment really have nothing to do with this instance: Causing the behavior we want in the context we want is all that is necessary.

Species-Specific Defense Reactions

Perhaps the greatest support for Guthrie's interpretation of punishment comes from research in avoidance learning. For reasons that are at the moment irrelevant, a lot of psychologists have felt that avoidance learning was an area crucially important to our understanding of learning in general. The problem of interest here was the difficulty encountered in training a rat to press a bar or a pigeon to peck a lighted disk to avoid shock. Why should this be difficult to train?

Imagine that you are in a small featureless room and that every ten seconds an extremely powerful and painful shock is administered through your bare feet from the metal grid floor of the room. On the wall near you is a bar, roughly the size of a baseball bat, sticking out. If you push on the bar you receive no shocks for 60 seconds. How long would it take you to learn that the painful shocks you are getting every ten seconds may be completely eliminated if you press on the lever once a minute? Yet, rats and (especially) pigeons were terrible learners in such a situation. It was not their stupidity, since the same animals could quickly learn to press or peck to get food.

Some psychologists felt that the pigeons were not really feeling the shock, since it was administered through the floor and the scaly feet of a bird might act as insulation. Thus, shock harnesses were invented to ensure that they felt the shock; one device amounted to a bathtub stopper chain passed under the bird's "wingpits" to deliver the shock. Despite these efforts, pigeons were still rotten learners.

Finally, Robert Bolles (1970) suggested that the reason for the trouble lay in what the shock led the subjects to do. Rats, pigeons, and other animals are products of evolution, which means they tend to behave in predictable ways, generally, in specific important kinds of situations. For example, in the presence of food, rats manipulate things with their paws and pigeons peck. In the presence of danger, they do other things. Bolles

suggested that strong electric shock directly evokes behavior appropriate in life-threatening situations. In the rat, this amounts to running or "freezing." If the animal cannot outrun its predator, it remains still, in the hope that the predator won't see it.

In the typical avoidance learning situation, rats were required to press a bar and pigeons had to peck a key. Both behaviors are more appropriate as food-getting behaviors, and it is not surprising that rats and pigeons rapidly learn such behaviors when they bring food. But what happened in the course of evolution to those rats and pigeons who exhibited food-getting behavior in the presence of life-threatening danger? Did they live to reproduce similar maladaptive organisms? No, the animals that ran, flew, or froze lived to reproduce, and most subjects reflect that selection process. If an experiment requires a rat to run several feet to press a lever to avoid shock, the rat will quickly learn to do it; if you place the rat in front of the bar, it won't learn (Fantino, Sharp, & Cole, 1966).

Bolles called the behaviors elicited by shock or other danger *species-specific defense reactions*, or SSDRs. If we want efficient avoidance learning, the required response should be an SSDR. In Guthrie's terms, the effects of a putative punisher depend upon what it makes the recipient do. Calling it a reward or a punisher tells us only what the administrator of the event has in mind; the effect will depend on the actions it produces.

Intentions

Precurrent responses amount to a readiness for the consequences of past experience; in the past, hunger was the cue for searching, grasping, and eating. Part of that stimulus complex, the hunger feelings, is now present. Hence, part of the behavior that last occurred during hunger appears; I think of food, salivate, lick my chops, and so on.

Such behavior is precisely like Thorndike's readiness; a present cue, such as the sight of prey, attracts my attention and (in Thorndike's terms) sensitizes the conduction units for chasing, seizing, and eating. For Guthrie, conduction units are unnecessary. I see the prey; when I last saw it I was eating it. I cannot actually eat it now, since it is at a distance; but I can begin eating it, so to speak, through my anticipatory behaviors evoked.

Guthrie believed that intentions, readinesses, and expectancies were all fractional parts of complete reactions evoked because part of a stimulus complex was now present. Such readinesses are of great practical importance to us. For example, note the difference in our reading when it is done for pleasure and when it is done in preparation for an examination an hour away. If we are called on to recite, is it not easier when we expect it than when we are taken by surprise? Part of the reason for this difference lies in the fact that in the former case we are already partially reciting, in the form of insignificant body movements, when we are called upon.

Whether a crime is committed intentionally may have great bearing on the sentence meted out, and Guthrie suggests that *intention* may have many meanings. In an often-quoted example, Guthrie cites the case of a man who plans a murder and waits for his victim to come through a door. As the man waits with his finger on the trigger, he thinks over the foul deed he intends and changes his mind. He no longer intends to shoot his adversary. But the door opens unexpectedly, the adversary comes through it and the man pulls the trigger. Was this done unintentionally? Would a judge or jury believe that someone obviously laying in wait with a loaded gun did not intend to shoot the person?

An intention is a readiness to act, and the assailant's verbal change in intention was not effective in altering the bodily readiness, which was, in effect, already committing the crime. Perhaps if more time had been allowed the new intention would have led to new bodily postures and muscular readinesses and the shot would not have been fired.

Guthrie suggested that such readinesses were the basis for the psychological factor in sports. Ideally, the opponent's moves act as maintaining stimuli, keeping us active and producing appropriate readinesses, or partial reactions. Defeatism comes when such cues lose their effect on us and we are controlled by more and more remote cues; our mind is no longer on the match.

Perception and Thought

For Guthrie, percepts are habits. They are always evoked by some present cue and they are specific reactions. Recall the example of "squp" from Chapter 1; the word means little when read, although in spoken form, and in an appropriate context, it is readily recognized. Likewise, "LFMNX" may be meaningful if we hear it said in a restaurant specializing in ham-and-egg breakfasts.

Percepts result from *redintegration*, which is simply Guthrie's word for conditioning by contiguity. Redintegration refers to the ability of a cue that is part of a stimulus complex to call up the rest of that complex. For example, I walk with a friend through a park and then don't see him or the park for several years. One day, while walking through the park, the thought of the friend strikes me; the cues of the park redintegrate the complex present when I was last there, and that complex includes the friend (cf. Chapter 1).

Perception, imagery, memory, fantasy, and dreaming all depend upon present cues and upon redintegration. In thought, we have sequences of redintegrated stimuli. On occasion, competition may arise between sets of stimuli that would lead to different and incompatible actions. Under such conditions we pause . . . cues may lead to furtive movements in one or another direction, until finally the balance is tipped and one action system wins. Such a progression may describe the bulk of our mental life, and movement is an important ingredient.

Is it possible that thinking, perceiving, hearing, and hoping are all reducible to bodily movements? Could Guthrie have believed this? Is thought purely muscle movement and bodily secretions? Guthrie doesn't sound like that is what he means, but it is hard to find an explicit denial of such a view and easy to find an emphasis on the importance of movement in determining mental life.

Guthrie believed that thought usually does involve action: When we picture something, there are detectable eye movements; when we think seriously, there is a lot of verbal (talking) content. But is all of experience reducible to movement? Guthrie did not insist that it was; though much of our thinking does involve action, Guthrie admitted that "The arguments cited are not compelling and involve some speculation" (1952).

Evidence for the importance of bodily activity in determining mental activity is really unnecessary; you may see for yourself just how important the relation is. Find a swift river just wider than you are typically capable of swimming and swim it. (As an alternative, do 500 sit-ups, run a marathon, or fight off a pack of wild dogs.) When you reach the opposite bank of the river and you drop down on it you will note a conspicuous absence of thought. Why should this be? While the muscles are exhausted and relaxed it should be possible to think more clearly, since there is no interference from the body, which is tired. The body may be tired, but should that prevent thought? It does. Think about that.

Changing Habits

Guthrie's theory is most directly concerned with changing behavior, and his methods are used in current *behavior therapy*, although the therapist rarely knows from whence came the methods. The secret to breaking habits is to cause a new behavior in an old situation. If we wish to stop smoking we must substitute some other behavior—even if that other behavior is nothing more than "not smoking" in all the situations in which we habitually smoke. Smoking is thousands of habits, of course, and it is therefore difficult to break all of them. Many a quitter has been surprised to find himself holding a cigarette; a situa-

tion previously tied with smoking evokes the old behavior before we know what has happened.

The same account applies to forgetting; this is not the product of memories simply fading away with time; the memories are replaced by new ones. For example, I have a set of movements that allow me to play tennis. If I do not play for a prolonged time I lose my skill; those movements are used in a host of other activities and thus become attached to new cues. I also play chess, but that activity is less easily forgotten. The movements involved there are shared by fewer other activities and thus are less likely to become attached to new cues.

Guthrie's view of forgetting as replacement has received a mass of empirical support (see especially Barnes & Underwood, 1959). Guthrie's replacement theory is the theory of associative interference, the view that forgetting amounts to the interfering influence of new material on that already learned, or vice versa.

Guthrie's Methods for Changing Habits

Sidetracking The method of *sidetracking* consists of identifying the cues for a bad habit (smoking, eating, and so on) and then beginning the movements of the bad habit, followed by emphatic rejection. "Practice the beginning of the act with rejection instead of acceptance," Guthrie suggested in 1952. Hence, I take out a cigarette or a piece of food, bring it near my mouth and then toss it away vigorously while exclaiming "no!" The result of this behavior is the substitution of a new habit for the bad old one in the tempting situation. The disadvantage of this method is that the sidetracked habit still remains as an integrated set of actions and the cues that normally produce smoking or eating still do. A better procedure is to dismantle the habit itself using one of the other methods.

Toleration How may we eliminate a child's fear of the dark or a phobia connected with spiders? We want to change the behavior in the presence of the feared cues, but we are hampered by the violent reactions of the individual when the cues are present. We change behavior here as we accustom a horse to a saddle—gradually. With the horse, we begin with a saddle blanket on its back and add progressively heavier weights until we approximate the weight of a rider and saddle. We do it in gradual steps, and if the horse reacts strongly, we go back to a lighter weight. So with the child or the phobic; we introduce darkness or spiders gradually, so that their presence is tolerated, and slowly increase the strength of the stimulus. This is the method of graded stimulus presentation later popularized by Wolpe (1958).

Kimble and Kendall (1953) provided an early animal analog of the process. Their rat subjects learned to turn a small wheel to turn off a warning stimulus and avoid an electric shock. After such training, subjects typically continue responding for a very long time after the shock is disconnected; the avoidance response is apparently maintained because it turns off the fear-producing warning stimulus. The fear-producing effect of that stimulus may be comparable to the effect of the spider on the phobic patient and, in both cases, we may ask what is the best method to stop the avoidance behavior (whether wheel turning or phobic reaction).

Kimble and Kendall found that wheel turning diminished faster when the warning light was gradually introduced than when it was presented suddenly at full strength. They interpreted this as evidence that Guthrie's toleration method was more effective than the exhaustion method described next.

Exhaustion The method of *exhaustion* is akin to a different method for training horses—the bronco-busting method. In this case, a rider mounts the horse, which bucks for however long it takes to throw the rider or to become exhausted. The exhausted horse no longer bucks; it walks or stands with a rider and has learned a new habit to replace the old habit of bucking when weight is placed on its back.

The application to human behavior is straightforward. Place the child in darkness and the pho-

bic in a spider cage. Eventually the violent reactions will cease and the last thing done will be something other than fearful and agitated behavior. This technique is called *emotional flooding* today. Such treatments have their drawbacks, of course. Overly strong agitation could produce a heart attack or stroke, for example, and it is also possible that the patient may lose a spider phobia only to gain a fear of meeting therapists! In addition, Guthrie would point out that any changes in behavior produced in this way are certain to be situation specific. Thus, the loss of fear when in a room full of spiders may not mean that a single spider encountered in one's kitchen will not produce fear.

Another application of exhaustion is less harsh. Suppose a person wishes to stop smoking very quickly and finds that sidetracking doesn't work. The person could seal him or herself in a small room and chain smoke for a period long enough to exhaust the desire for cigarettes. Part of what would happen is that the person would become nauseated, leading to behavior incompatible with smoking. This brings us to the last of the methods, the method of incompatible stimuli.

Incompatible Stimuli Suppose I pair the cues of smoking with other stimuli that produce nausea, as above, or I cure my smoking habits by eating constantly, leaving me with a new habit to break. I pet a feared spider while shot full of muscle relaxants. In all three of these cases a reaction is produced by stimuli that we manipulate and that is incompatible with the reaction we want changed. This is the method of *incompatible stimuli*. This, in combination with the fading in of stimuli (the tolerance method) is what is done in systematic desensitization, although Wolpe (1958) attributed his inspiration to a different source.

The Guthrie and Horton Experiment

In the 1930s, Guthrie and a colleague, G. P. Horton, carried out the now-famous observations published in 1946 as *Cats in a Puzzle Box*. Thorndike had used an essentially similar apparatus in his research more than 40 years before, but his aims were very different from those of Guthrie. Thorndike was concerned with showing that ideas are not necessary for the mediation of what appears to be purposeful behavior—escape from a problem box. What Guthrie and Horton wanted to determine was whether the details of such behavior are as predictable as the end result. Their concern was by no means restricted to any improvement in the cat's ability to get out of the box.

The box they used had a large glass front and either a pole mounted vertically on the floor or a tube hanging from the ceiling. The cat was inserted into the rear of the box by means of a smaller box, so that it would not have to be touched by hand. After a wait of from ten seconds to a minute in the entry box, the cat was released into the large box. For the first three trials the glass front door was open and the cat could leave the box and eat from a saucer of salmon. After that it was up to the cat to get out of the box on its own. To open the door, the cat would have to apply pressure to the pole (or the tube). More than 50 cats made over 800 escapes and Guthrie and Horton watched, recording the escapes with movie cameras when they could afford film.

After an average of fifteen minutes of exploration, the cat typically hit the post and the glass door was raised. Usually the post was the last feature of the box to be examined; the cat first spent a lot of time examining the barrier and the periphery of the box. After its escape, the cat was replaced in the box until it escaped again, at which time it was placed back in the box, and so on. With repeated trials the time required for the escape decreased, a finding that would be of no surprise to anyone.

What is surprising (and difficult to convey to the reader, in Guthrie's opinion) was the tremendous amount of stereotypy shown during the entire time that the cat was in the box. Each cat showed a "startling repetition of movements"

during its whole stay in the box; stereotypy was not restricted to the movements that operated the escape mechanism. For example, it was common for a cat to repeat a triple tour of the periphery, including numerous stops, in detail from one trial to the next. Further, the unsuccessful movements, those that did not aid in escaping from the box, did not fade. Often, they were as frequent at the end of training as at the beginning!

No one had ever looked very closely at behavior in the puzzle box (or the maze or the Skinner box). And when they did look, they were looking only for improvement, defined as a decrease in wasteful movements that postpone the attaining of whatever we think of as the goal in that situation. What should happen in a reasonable world filled with adapting organisms is what Thorndike seemed to find: Successful behaviors are stamped in and unsuccessful behaviors are stamped out. But did Thorndike ever look that closely, or was he just keeping track of the escape times?

Typically, a cat had several escape routines, of which the final series of movements led to escape. With sufficient training, most cats settled pretty much on one of these, but this outcome was obviously not the product of any gradual "stamping in." And these final movements, which were so predictable for a given cat, were not just the momentary responses that operated the door. There was stereotypy in "the long series of movements which took the cat into a position from which the releasing movement could be made" (Guthrie & Horton, 1946). This sequence of behaviors was as "characteristic as a signature" for a given cat.

Guthrie's findings have been briefly described in most learning texts since 1946, but the real meaning of the data has not gotten through. The reader is usually given the impression that Guthrie and Horton found that a given cat operated the escape pole pretty much the same way trial after trial and that this is the stereotypy that Guthrie showed. This account is usually followed by criticisms concerning the paucity of objects in the box, which means that there is not a lot that the cats could do and so of course their behavior is stereotyped.

These objections are really beside the point. The repetition of behaviors and of sequences of behaviors was not restricted to the final escape series. What Guthrie stressed was not the stereotypy in the final movements, but the repetitiveness seen throughout the cats' stays in the box. How does one communicate such findings? One way would be to publish detailed descriptions of the 800 cases of observed escapes. But Guthrie correctly noted that this would be a waste of time, since no one would read the descriptions. We are left with only Guthrie's word that stereotypy was the striking feature of the cats' behavior during successive episodes in the box.

Actually, it is not necessary that we see the original data for Guthrie's purpose to be served. All we need do is look for the stereotypy that must be daily evidenced in our own behavior as well as in the actions of the beasts and humans around us. If we and the beasts are like his cats, then we should soon be able to do what he could do. Guthrie could not predict the behavior of a given cat on the first trial, but, as he wrote, "after watching the cat through one trial we can bet rather heavy odds that the second trial will repeat most of the routines of the first." If we examine our behavior and that of others can we find as much stereotypy as Guthrie described? I believe that we all would be surprised at the extent to which we did find it!

Support for Guthrie's Theory

The literature reviewed by Morgan (1974) and Mackintosh (1983) provide strong support for Guthrie's theory. These data show that behavior that was originally established and maintained by food or water rewards often persists, even when the reward is no longer of value to the subject. As Guthrie would say, behavior may become stereotyped, or attached to the cues of the training situation. This has important implications for what we call "hunger" and "satiation."

Sated Subjects Work Skinner (1938) gave rats food for lever presses during a first stimulus and not during a second. He then allowed the rats to eat their fill in the presence of the second stimulus; needless to say, pressing did not occur. Yet, when the first stimulus was presented again, they pressed. As Guthrie would point out, satiation is stimulus specific; the rats were not sated when the first stimulus first had been presented and what they did then was to press the lever. That is what they did when the first stimulus returned.

Many others have found similar effects, often classified as the contrafreeloading effect. For example, Davidson (1971) trained four rats to press a lever ten times for each food pellet received. After training, the subjects were given all the food they wanted for eight days and then were placed back in the lever box, with free food present. The free food was ignored and all four subjects pressed the lever and ate the resulting food rewards.

Satiation Cues It is easy for us to believe that we eat until we are satisfied and that the amount eaten may depend upon taste, nutritive value, and so on. But satiation depends on more than that. Kimble (1951) allowed rats to feed on wet mash for twenty minutes a day and found that they normally stopped eating after about fifteen minutes. One might think that fifteen minutes of eating produced satiation, and it did in a sense. But, when a rat was briefly removed from the eating area and then replaced, it began feeding again. As Guthrie believed, hunger and satiation are partly dependent on cues accompanying feeding. "Entering the feeding area" means "hunger," since eating had always occurred immediately after entering. These and other data suggest, as Mackintosh (1983) concluded, that reinforced behavior may become independent (stereotyped) and thus persist even when the reinforcer is no longer relevant. Hunt, Matarazzo, Weiss, & Gentry (1979) described similar effects in human patients and noted the relevance of Guthrie's theory to such data.

3. CRITICISMS OF GUTHRIE'S THEORY

Guthrie's Opposition to the Law of Effect

A frequent misunderstanding of Guthrie's theory lies in the assumption that he was denying the effectiveness of reinforcers and punishers. This mistake is common among undergraduate students first exposed to Guthrie, although it is probably also true of more sophisticated critics. Needless to say, Guthrie did not deny the effectiveness of rewards and punishers; he simply denied that the law of effect was a basic principle. When do the so-called rewards and punishers work? We find that the effect of an event, whether as a reward, a punisher, or neither, depends upon what it makes the subject do. If it makes the subject stop what he or she was doing and effectively changes the situation (as when a question, having been answered, is no longer asked), then it acts as a reward because it stops action and changes the situation. If the event leads to strong new behaviors in the old situation, it is a punisher. What is basic is not the law of effect, but the principle of stereotypy.

Another misunderstanding arises regarding Guthrie's explanation of reward and punishment. Reward works by changing the situation and preserving what was last done. If this is so, why doesn't the rat that has run the alley and received food at the end learn to stand still and make eating movements when next placed in the alley; wasn't that the last thing done? This criticism neglects the fact that the rat will do what it last did in that *specific situation*. If we place the rat at the end of the alley in front of the goal box and food, it will stand still and make eating movements. If we place it at the other end of the alley, it will do what it last did there, which was run.

If we remove food from the goal box, why does the rat stop running, instead of continuing to do what it did in the past? Again, it depends on what is last done in the situation. If we remove the rat from the alley after each run, it may continue

running, as we will see later in Chapter 7. But if we leave the rat free to explore, its new movements will become attached to the stimuli of the alley and we will say that running to the goal box was extinguished. As in all cases of extinction, Guthrie believed that the behavior changed because something new replaced it.

Other Theories Can Handle Guthrie's Data

If we recall any of the examples Guthrie loved to cite in support of his theory, we find that it is possible to explain each of them in terms of other theories. For example, the dog who comes because we have pulled him toward us with a rope simply may be showing the effects of negative reinforcement. In the past, when we pulled and he did not come, the rope hurt his neck. To stop or avoid that pain, the creature now moves toward us. Similarly, motivation may be understood in terms of drives, and many rewards seem to work by reducing drives, as when food reduces hunger. Who needs Guthrie when the terms of Thorndike, Skinner, and Hull (as we will see) seem enough?

The fact is that any individual phenomenon may be explained in a variety of ways. We may refer to rewards and punishers, actualizing tendencies, cognitive dissonance, conservation of energy, frustration, self-efficacy, expectancies, fractional antedating goal responses, developmental stages, information-processing mechanisms, and heaven knows what else as explanations for one or another phenomenon. Guthrie accounts for everything that they do, although his generality comes at a price, as we shall see.

All Stimulus Change Does Not Act as Reward

Rewards are effective when they change a situation, leaving the last response to occur in that situation connected to the cues of that situation. This applies even to situations in which we ordinarily do not identify conspicuous rewards. The rat that learns a sequence of eight turns to reach the end of a maze receives the food we identify as the reward, but that is only the last in a series of stimulus changes. The food stops the rat's running and produces eating, leaving running as the last behavior in the maze. But each turn at a choice point also produces stimulus change. The last thing done in the presence of the cues of the choice point was the turn that was made. There is stimulus change throughout the maze, not just at the end. A stimulus change that produces strong new behaviors in the old situation is a punisher. Many demonstrations of the effects of stimulus change per se have amounted to this. Bower and Hilgard are somewhat insincere when they seriously consider this criticism of Guthrie's theory, citing cases in which rats fell through trap doors, are shaken up in black bags, and the like. They conclude that not all changes in stimulation act as rewards, "although psychologists have predicted that they should" (Bower & Hilgard, 1981).

Guthrie's Generality

According to his critics, Guthrie is slippery and vague; the power of his theory is illusory, since in explaining everything, the theory explains nothing specifically. There is a lot of truth in this. Guthrie was interested only in the most general possible principles, and his examples were never predictions, but just "postdictions," made after the fact. The past is much easier to predict than the future. Guthrie's theory does require thought before it can be applied to new problems, which is a great disadvantage compared with the opponent theories, such as Thorndike's, which seem easy to apply. This is the real flaw in Guthrie's account.

One way of appreciating this problem is to consider seriously what is meant by a situation. Guthrie's whole theory depends on situation change or the lack of it. But it is very difficult to identify situation change before the fact. For

example, my alarm awakened me this morning and it will do so tomorrow, as long as the two mornings are the same situation in essential respects. How can I tell whether they are? I must see whether I behave the same on successive mornings.

Guthrie was originally a mathematician and philosopher, which may account for his lack of interest in research and in prediction and hypothesis testing. When Estes (e.g., 1950) tried to render Guthrie's theory more precise, Guthrie (1959) reacted skeptically. As was true of James Mill, Guthrie could explain almost anything, although he wasn't likely to provide a precise explanation before the fact.

4. OTHER ASPECTS OF GUTHRIE'S THEORY

Comparison with Watson's Theory

It may seem that what Guthrie was saying was no more than a restatement of Watson's theory. (Watson was out of academics and if not for that no one would have paid any attention to Guthrie!) There is some truth in this suspicion; both were true behaviorists and both opposed the reliance of others on the law of effect. Both were concerned with subjective experience and dealt with it in essentially the same way, as activity largely dependent on bodily muscular and glandular reactions. How was Guthrie's theory an improvement over Watson's? Although they agreed on most points, their positions on goal direction were a bit different, and their views of the effects of practice and of the importance of behavior as movement were dissimilar.

First, although both disputed the basic importance of reinforcers and punishers, Watson nonetheless stressed the basic adaptive nature of behavior. His favorite term for learning was *adjustment*, and we see throughout his writings (e.g., 1919) an emphasis on the importance of adaptation, or successful adjustment. Watson always spoke of maladaptive behavior as maladjustment, whereas Guthrie stressed that learning is always occurring and that goal seeking is usually something inferred by the observer. Watson's functionalist background and his faith in Darwin was always present in his writing. Guthrie's subjects learned maladaptive, stupid behaviors as easily as they learned beneficial ones.

Secondly, Watson stressed the importance of repetition in the formation of habits, from the simplest to the most complex. For Guthrie, practice was often necessary to build up the habits that, taken together, constituted an act such as tying one's shoes, but each of those habits was learned in one trial. Many habits, such as withdrawing one's hands from a painful flame, are learned in one trial, and no amount of practice can strengthen such a habit. The fears that may arise from a single unique experience and that may last a lifetime testify to the fact that one trial learning is common.

Finally, Watson did view behavior as the movement of muscles or the secretion of glands. His psychology was a psychology of the body as a machine. Guthrie largely shared this view and repeatedly pointed out the importance of bodily activity in determining one's mental life. But he was not fixed on the sufficiency of this view, as was Watson. That is, although Guthrie emphasized the importance of bodily activities, he did not insist that all experience depends on bodily movement or glandular secretions. Watson did, and this insistence led to a lot of difficulties for behaviorists, which have persisted to this day.

Emphasis on Practical Matters

The area in which Guthrie and Watson's theories are similar is their emphasis on the solution of problems of practical interest; neither man was concerned with problems that were solely of theoretical interest. Of course, people want to understand humanity's predicament here on earth, and people want to understand why things happen. These are legitimate and important problems, but they are problems mainly for philoso-

phy, which can afford to dally with metaphysics. Metaphysics is the study of the ultimate truths; what is the origin and nature of reality? What is really and verifiably true? Does God exist? These are important but (to say the least) difficult questions, and psychology is helpless in answering them. Leave them to philosophy and religion, where they properly belong, and let psychology do what it can.

What can psychology do? It can predict and influence what we do (including what we think and feel) if it is given the chance and if it concentrates its energies in that direction. Guthrie believed that he was supplying the means to accomplish this goal. His *Psychology of Learning* is a manual filled with examples of what can be done. Whether we are guided by an actualizing tendency or directed by intrapsychic forces is beside the point. It is what is done that is ultimately important, and it is that with which Guthrie dealt. His success in doing so is the reason that his theory is still current.

SUMMARY

Unlike virtually all other psychological theories, Guthrie did not take for granted the purposiveness of behavior. Although much of our activity is goal directed, much of it is not. A theory that deals only with purposive activity leaves out a lot of what we do.

Guthrie sought the most general possible principle to account for activity and found it in the old principle of association by contiguity in time. Actions occurring in specific situations will recur if the specific situations recur. Further, practice is not necessary, since the maximum strength of an association between situation and movement occurs on the first pairing. Learning goes on constantly and does not necessarily constitute improvement. What is learned is what is done and includes awkwardness and errors as well as beneficial actions.

Reward and punishment do not have a special place as first principles; the law of effect just represents a special case of one trial contiguity learning. If an event changes a situation, leaving the last behavior attached to the old situation, we have a reward, and all rewards do their work in this way. If, on the other hand, an event produces strong behaviors that compete with the last behavior produced in a situation, punishment occurs. In both cases, the important factor is not the nature of the putative reward or punisher, but what it makes the recipient do. It follows that virtually any event can thus work as a reward or as a punisher, given the proper conditions.

Guthrie was able to include motivation, intention and purpose, perception, and thinking in his theory: All constitute habit phenomena and all obey the same principles. Despite charges that his theory is too general and vague to be useful, it is likely that his view best characterized many of the procedures currently found useful in behavior therapy. Additional evidence for the usefulness of his theory lies in the fact that he is routinely given detailed treatment in learning textbooks along with Skinner and Thorndike, although, unlike them, he did little research during his life and had few if any real followers.

The one major piece of research he did do showed an amazing degree of stereotypy in the behavior of cats escaping from a puzzle box. Although his choice of escape lever has recently brought the criticism that he was stacking the deck for stereotypy, his data show that one-trial contiguity learning can account for long segments of behavior in cats and probably in humans.

GLOSSARY

Behavior therapy Method of dealing with psychological problems by treating them essentially as behavior problems. For example, anxiety may be a serious problem for an individual. A behavior therapist would seek the conditions that now produce anxiety, such as specific situations or relations with other people. Therapy would aim to eliminate the

anxiety reaction to whatever now produces it, perhaps through desensitization. Other therapies, especially the older ones such as psychoanalysis, are less concerned with the current causes of problems and treat afflictions such as anxiety as symptoms of some underlying psychic disturbance. They attempt to treat this "underlying cause," a process that can take years and is often unsuccessful.

British empiricism School of British philosophy represented by Locke, Berkeley, Hume, and later by James Mill and his son John Stuart Mill. Most British empiricists stressed the importance of the association of ideas that occur in close spatial and temporal contiguity (see Chapter 1).

Contiguity Nearness. Spatial and temporal contiguity refer to closeness of events in space and time, respectively. Guthrie's theory emphasizes the importance of temporal contiguity of stimuli and responses.

Exhaustion One of Guthrie's methods for changing habits. The behavior to be eliminated is repeatedly evoked in the presence of the cues that usually accompany it. Eventually, the behavior is "exhausted" and whatever behavior then occurs replaces it. For example, an individual with a strong fear of automobile travel might continuously ride in a car until the fearful reactions subside, or a smoker might smoke cigarette after cigarette until the sight and smell of cigarettes produces a new reaction. *Emotional flooding* is the name currently given to this method. Here, it is ordinarily a phobic stimulus, such as a spider, or the description of other emotion-producing situations that is repeatedly presented until the strong reaction usually produced fades.

Incompatible stimuli Guthrie's method of changing behavior by introducing stimuli that produce a reaction incompatible with the reaction to another set of stimuli. For example, one might treat cigarette smoking by encouraging the patient to eat apples when the urge to smoke arises. It is difficult, though not impossible, to simultaneously eat apples and smoke. In another example, strong anxiety reactions to feared situations could be countered by muscle relaxation training. In both cases, the aim is to somehow produce a desired reaction (nonsmoking or relaxation) in the presence of cues that usually lead to the undesired reaction (smoking or anxiety).

Maintaining stimuli Guthrie's term for stimuli that lead us to action which persists until these disturbers are removed. Others called such stimuli *drives*, referring to hunger, thirst, and so on. But Guthrie included other motivating stimuli, such as those produced when we are asked a question that must be answered.

Motive For Guthrie, an instigator to action. Hunger, a question, a shiny object, and a challenge are all motives. Motives may be viewed as a set of maintaining stimuli, which produce action until removed.

Negative practice Conquering a bad habit by repeatedly performing it in the presence of the cues that normally produce it. For example, we might practice a bad tennis backhand so that we notice the cues that produce it. Then we can practice the correct movements in the presence of those cues.

Overcorrection Changing a bad habit by repeatedly practicing the correct behavior in the situation in which we wish it to occur. For example, when a mistake is made, we stop and repeatedly perform the correct behavior (that is, we overcorrect).

Punishment For Guthrie, a change in behavior produced by stimuli that lead to new behavior in the presence of the old cues. What is learned is what is done, and punishment works when it leads to a new behavior incompatible with previous, recent behavior. For example, electric shock may be used to train a dog to jump through a hoop, providing that the shock is applied to the rear end of the dog.

Redintegration The calling up of a stimulus complex by one or more members of the complex. For example, the smell of roast beef may bring to mind the sight and taste of the roast beef present when last we experienced the smell. The principle of redintegration is really the essence of Guthrie's theory, and he proposed that redintegration was a better term to describe his theory than was conditioning.

Reward For Guthrie, a special case of association by contiguity. A reward is simply a change in stimulus that acts to preserve the association between a set of stimuli and whatever actions last occurred in the presence of those stimuli. If the change produces strong new reactions that are incompatible with the last actions in the presence of the old cues, the effect is punishment.

Sidetracking A method of changing habits, which consists of beginning the movements that constitute the habit, followed by movements incompatible with the habit. One may counter a cookie-eating habit by raising a cookie to the mouth and then throwing it away. This is not a very good method, since the

habit to be broken remains intact, with only the initial movements altered. Guthrie stressed his other methods, which amount to dismantling the habit.

Species-specific defense reactions Name given by Robert Bolles (1970) to the reactions naturally called out by danger. Bolles suggested that avoidance learning is aided when the avoidance response is one of the reactions that normally occur when a member of the species in question is threatened. Thus, it is easy to train a rat to avoid shock when the avoidance response is running (an SSDR), but it is difficult when the rat must press a lever to avoid shock. Lever pressing, which involves manipulation with the forelimbs, normally occurs in eating, not in the reaction to danger.

Stereotypy For Guthrie, the repetition of a movement or a series of movements in precisely the form that occurred when the individual was last in the same situation. Much of our comings and goings, our thoughts and our moods, occur in a stereotyped manner. Stereotypy is what Guthrie and Horton found in their famous experiments with cats in the puzzle box and it is the only major principle of Guthrie's theory.

Toleration One of Guthrie's major methods for changing habits. Cues that ordinarily produce unwanted reactions are presented in graded steps while another activity is occurring. If done properly, the unwanted reaction never occurs, since it is replaced by the competing behavior. For example, we may use the method of toleration to train a shy speaker to speak easily before large groups, by first exposing the speaker to an imaginary group, while relaxed, and then introducing an audience one by one. If we maintain the speaker's relaxation through this process, we may finish with him or her facing a large audience with no qualms. Graded presentation of feared stimuli in this fashion is typical of Wolpe's desensitization procedure.

RECOMMENDED READINGS

Guthrie, E. R. (1952). *The psychology of learning* (rev. ed.). New York: Harper & Row.

Guthrie is known for his charming writing style and commonsense interpretations. This book shows why and provides many examples of applications of his theory to everyday situations.

Guthrie, E. R. (1959). Association by contiguity. In S. Koch (Ed.), *Psychology: A study of a science* (Vol. 5). New York: McGraw-Hill.

For the more serious student, this final statement by Guthrie includes his opinion of the adaptations of his theory by Estes and his last thoughts on a variety of issues.

Hunt, W. A., Matarazzo, J. D., Weiss, S. M., & Gentry, W. D. (1979). Associative learning, habit, and health behavior. *Journal of Behavioral Medicine, 2*, 111–124.

These authors are leading authorities in clinical psychology and behavioral medicine. In this paper, they stress the importance of stereotypy of maladaptive behavior, frequently quoting and referring to Guthrie.

Malone, J. C., Jr. (1978). Beyond the operant analysis of behavior. *Behavior Therapy, 9*, 584–591.

This paper discusses Guthrie's theory and current methods used in behavior therapy. It appears that Guthrie's theory, and not Skinner's, best describes current practices.