VERBAL BEHAVIOR

B. F. Skinner

CONTENTS

Verbal Behavior

Part I

A PROGRAM

Chapter 1

A Functional Analysis of Verbal Behavior

MEN ACT upon the world, and change it, and are changed in turn by the consequences of their action. Certain processes, which the human organism shares with other species, alter behavior so that it achieves a safer and more useful interchange with a particular environment. When appropriate behavior has been established, its consequences work through similar processes to keep it in force. If by chance the environment changes, old forms of behavior disappear, while new consequences build new forms.

Behavior alters the environment through mechanical action, and its properties or dimensions are often related in a simple way to the effects produced. When a man walks toward an object, he usually finds himself closer to it; if he reaches for it, physical contact is likely to follow; and if he grasps and lifts it, or pushes or pulls it, the object frequently changes position in appropriate directions. All this follows from simple geometrical and mechanical principles.

Much of the time, however, a man acts only indirectly upon the environment from which the ultimate consequences of his behavior emerge. His first effect is upon other men. Instead of going to a drinking fountain, a thirsty man may simply "ask for a glass of water"—that is, may engage in behavior which produces a certain pattern of sounds which in turn induces someone to bring him a glass of water. The sounds themselves are easy to describe in physical terms; but the glass of water reaches the speaker only as the result of a complex series of events including the behavior of a listener. The ultimate consequence, the receipt of water, bears no useful geometrical or mechanical relation to the form of the behavior of "asking for water." Indeed, it is characteristic of such behavior that it is impotent against the physical world. Rarely do we shout down the walls of a Jericho or successfully command the sun to stop

or the waves to be still. Names do not break bones. The consequences of such behavior are mediated by a train of events no less physical or inevitable than direct mechanical action, but clearly more difficult to describe.

Behavior which is effective only through the mediation of other persons has so many distinguishing dynamic and topographical properties that a special treatment is justified and, indeed, demanded. Problems raised by this special mode of action are usually assigned to the field of speech or language. Unfortunately, the term "speech" emphasizes vocal behavior and is only awkwardly applied to instances in which the mediating person is affected visually, as in writing a note. "Language" is now satisfactorily remote from its original commitment to vocal behavior, but it has come to refer to the practices of a linguistic community rather than the behavior of any one member. The adjective "linguistic" suffers from the same disadvantage. The term "verbal behavior" has much to recommend it. Its etymological sanction is not too powerful, but it emphasizes the individual speaker and, whether recognized by the user or not, specifies behavior shaped and maintained by mediated consequences. It also has the advantage of being relatively unfamiliar in traditional modes of explanation.

A definition of verbal behavior as behavior reinforced through the mediation of other persons needs, as we shall see, certain refinements. Moreover, it does not say much about the behavior of the listener, even though there would be little verbal behavior to consider if someone had not already acquired special responses to the patterns of energy generated by the speaker. This omission can be justified, for the behavior of the listener in mediating the consequences of the behavior of the speaker is not necessarily verbal in any special sense. It cannot, in fact, be distinguished from behavior in general, and an adequate account of verbal behavior need cover only as much of the behavior of the listener as is needed to explain the behavior of the speaker. The behaviors of speaker and listener taken together compose what may be called a total verbal episode. There is nothing in such an episode which is more than the combined behavior of two or more individuals. Nothing "emerges" in the social unit. The speaker can be studied while assuming a listener, and the listener while assuming a speaker. The separate accounts which result exhaust the episode in which both participate.

It would be foolish to underestimate the difficulty of this subject matter, but recent advances in the analysis of behavior permit us to approach it with a certain optimism. New experimental techniques and fresh formulations have revealed a new level of order and precision. The basic processes and relations which give verbal behavior its special characteristics are now fairly well understood. Much of the experimental work responsible for this advance has been carried out on other species, but the results have proved to be surprisingly free of species restrictions. Recent work has shown that the methods can be extended to human behavior without serious modification. Quite apart from the possibility of extrapolating specific experimental findings, the formulation provides a fruitful new approach to human behavior in general, and enables us to deal more effectively with that subdivision called verbal.

The "understanding" of verbal behavior is something more than the use of a consistent vocabulary with which specific instances may be described. It is not to be confused with the confirmation of any set of theoretical principles. The criteria are more demanding than that. The extent to which we understand verbal behavior in a "causal" analysis is to be assessed from the extent to which we can predict the occurrence of specific instances and, eventually, from the extent to which we can produce or control such behavior by altering the conditions under which it occurs. In representing such a goal it is helpful to keep certain specific engineering tasks in mind. How can the teacher establish the specific verbal repertoires which are the principal end-products of education? How can the therapist uncover latent verbal behavior in a therapeutic interview? How can the writer evoke his own verbal behavior in the act of composition? How can the scientist, mathematician, or logician manipulate his verbal behavior in productive thinking? Practical problems of this sort are, of course, endless. To solve them is not the immediate goal of a scientific analysis, but they underline the kinds of processes and relationships which such an analysis must consider.

TRADITIONAL FORMULATIONS

A science of behavior does not arrive at this special field to find it unoccupied. Elaborate systems of terms describing verbal behavior have been developed. The lay vocabulary abounds in them. Classical rhetoric, grammar, logic, scientific methodology,

linguistics, literary criticism, speech pathology, semantics, and many other disciplines have contributed technical terms and principles. In general, however, the subject here at issue has not been clearly identified, nor have appropriate methods for studying it been devised. Linguistics, for example, has recorded and analyzed speech sounds and semantic and syntactical practices, but comparisons of different languages and the tracing of historical changes have taken precedence over the study of the individual speaker. Logic, mathematics, and scientific methodology have recognized the limitations which linguistic practices impose on human thought, but have usually remained content with a formal analysis; in any case, they have not developed the techniques necessary for a causal analysis of the behavior of man thinking. Classical rhetoric was responsible for an elaborate system of terms describing the characteristics of literary works of art, applicable as well to everyday speech. It also gave some attention to effects upon the listener. But the early promise of a science of verbal behavior was never fulfilled. Modern literary criticism, except for some use of the technical vocabulary of psychoanalysis, seldom goes beyond the terms of the intelligent layman. An effective frontal attack, a formulation appropriate to all special fields, has never emerged under the auspices of any one of these disciplines.

Perhaps this fact is responsible for the rise of semantics as a general account of verbal behavior. The technical study of meaning was already under way as a peripheral field of linguistics when, in 1923, Ogden and Richards[1] demonstrated the need for a broader science of symbolism. This was to be a general analysis of linguistic processes applicable to any field and under the domination of no special interest. Attempts have been made to carry out the recommendation, but an adequate science of verbal behavior has not been achieved. There are several current brands of semantics, and they represent the same special interests and employ the same special techniques as heretofore. The original method of Ogden and Richards was philosophical, with psychological leanings. Some of the more rigorous systems are frankly logical. In linguistics, semantics continues to be a question of how meanings are expressed and how they change. Some semanticists deal mainly with the verbal machinery of society, particularly propaganda. Others are essentially therapists who hold that many of the troubles of the

world are linguistic error. The currency of the term "semantics" shows the need for a science of verbal behavior which will be divorced from special interests and helpful wherever language is used, but the science itself has not emerged under this aegis.

The final responsibility must rest with the behaviorial sciences, and particularly with psychology. What happens when a man speaks or responds to speech is clearly a question about human behavior and hence a question to be answered with the concepts and techniques of psychology as an experimental science of behavior. At first blush, it may not seem to be a particularly difficult question. Except on the score of simplicity, verbal behavior has many favorable characteristics as an object of study. It is usually easily observed (if it were not, it would be ineffective as verbal behavior); there has never been any shortage of material (men talk and listen a great deal); the facts are substantial (careful observers will generally agree as to what is said in any given instance); and the development of the practical art of writing has provided a ready-made system of notation for reporting verbal behavior which is more convenient and precise than any available in the nonverbal field. What is lacking is a satisfactory causal or functional treatment. Together with other disciplines concerned with verbal behavior, psychology has collected facts and sometimes put them in convenient order, but in this welter of material it has failed to demonstrate the significant relations which are the heart of a scientific account. For reasons which, in retrospect, are not too difficult to discover, it has been led to neglect some of the events needed in a functional or causal analysis. It has done this because the place of such events has been occupied by certain fictional causes which psychology has been slow in disavowing. In examining some of these causes more closely, we may find an explanation of why a science of verbal behavior has been so long delayed.

It has generally been assumed that to explain behavior, or any aspect of it, one must attribute it to events taking place inside the organism. In the field of verbal behavior this practice was once represented by the doctrine of the expression of ideas. An utterance was felt to be explained by setting forth the ideas which it expressed. If the speaker had had a different idea, he would have uttered different words or words in a different arrangement. If his utterance was unusual, it was because of the novelty or originality of his ideas. If it seemed

empty, he must have lacked ideas or have been unable to put them into words. If he could not keep silent, it was because of the force of his ideas. If he spoke haltingly, it was because his ideas came slowly or were badly organized. And so on. All properties of verbal behavior seem to be thus accounted for.

Such a practice obviously has the same goal as a causal analysis, but it has by no means the same results. The difficulty is that the ideas for which sounds are said to stand as signs cannot be independently observed. If we ask for evidence of their existence, we are likely to be given a restatement in other words; but a restatement is no closer to the idea than the original utterance. Restatement merely shows that the idea is not identified with a single expression. It is, in fact, often defined as something common to two or more expressions. But we shall not arrive at this "something" even though we express an idea in every conceivable way.

Another common answer is to appeal to images. The idea is said to be what passes through the speaker's mind, what the speaker sees and hears and feels when he is "having" the idea. Explorations of the thought processes underlying verbal behavior have been attempted by asking thinkers to describe experiences of this nature. But although selected examples are sometimes convincing, only a small part of the ideas said to be expressed in words can be identified with the kind of sensory event upon which the notion of image rests. A book on physics is much more than a description of the images in the minds of physicists.

There is obviously something suspicious in the ease with which we discover in a set of ideas precisely those properties needed to account for the behavior which expresses them. We evidently construct the ideas at will from the behavior to be explained. There is, of course, no real explanation. When we say that a remark is confusing because the idea is unclear, we seem to be talking about two levels of observation although there is, in fact, only one. It is the *remark* which is unclear. The practice may have been defensible when inquiries into verbal processes were philosophical rather than scientific, and when a science of ideas could be imagined which would some day put the matter in better order; but it stands in a different light today. It is the function of an explanatory fiction to allay curiosity and to bring inquiry to an end. The doctrine of ideas has had this effect by appearing to assign important problems of verbal

behavior to a psychology of ideas. The problems have then seemed to pass beyond the range of the techniques of the student of language, or to have become too obscure to make further study profitable.

Perhaps no one today is deceived by an "idea" as an explanatory fiction. Idioms and expressions which seem to explain verbal behavior in term of ideas are so common in our language that it is impossible to avoid them, but they may be little more than moribund figures of speech. The basic formulation, however, has been preserved. The immediate successor to "idea" was "meaning," and the place of the latter is in danger of being usurped by a newcomer, "information." These terms all have the same effect of discouraging a functional analysis and of supporting, instead, some of the practices first associated with the doctrine of ideas.

One unfortunate consequence is the belief that speech has an independent existence apart from the behavior of the speaker. Words are regarded as tools or instruments, analogous to the tokens, counters, or signal flags sometimes employed for verbal purposes. It is true that verbal behavior usually produces objective entities. The sound-stream of vocal speech, the words on a page, the signals transmitted on a telephone or telegraph wire—these are records left by verbal behavior. As objective facts, they may all be studied, as they have been from time to time in linguistics, communication engineering, literary criticism, and so on. But although the formal properties of the records of utterances are interesting, we must preserve the distinction between an activity and its traces. In particular we must avoid the unnatural formulation of verbal behavior as the "use of words." We have no more reason to say that a man "uses the word *water*" in asking for a drink than to say that he "uses a reach" in taking the offered glass. In the arts, crafts, and sports, especially where instruction is verbal, acts are sometimes named. We say that a tennis player uses a drop stroke, or a swimmer a crawl. No one is likely to be misled when drop strokes or crawls are referred to as things, but words are a different matter. Misunderstanding has been common, and often disastrous.

A complementary practice has been to assign an independent existence to meanings. "Meaning," like "idea," is said to be something expressed or communicated by an utterance. A meaning explains the occurrence of a particular set

of words in the sense that if there had been a different meaning to be expressed, a different set of words would have been used. An utterance will be affected according to whether a meaning is clear or vague, and so on. The concept has certain advantages. Where "ideas" (like "feelings" and "desires," which are also said to be expressed by words) must be inside the organism, there is a promising possibility that meanings may be kept outside the skin. In this sense, they are as observable as any part of physics.

But can we identify the meaning of an utterance in an objective way? A fair argument may be made in the case of proper nouns, and some common nouns, verbs, adjectives, and adverbs—roughly the words with respect to which the doctrine of ideas could be supported by the appeal to images. But what about words like *atom* or *gene* or *minus one* or *the spirit of the times* where corresponding nonverbal entities are not easily discovered? And for words like *nevertheless, although*, and *ouch!* it has seemed necessary to look inside the organism for the speaker's intention, attitude, sentiment, or some other psychological condition.

Even the words which seem to fit an externalized semantic framework are not without their problems. It may be true that proper nouns stand in a one-to-one correspondence with things, provided everything has its own proper name, but what about common nouns? What is the meaning of *cat?* Is it some one cat, or the physical totality of all cats, or the class of all cats? Or must we fall back upon the idea of cat? Even in the case of the proper noun, a difficulty remains. Assuming that there is only one man named Doe, is Doe himself the meaning of *Doe?* Certainly *he* is not conveyed or communicated when the word is used.

The existence of meanings becomes even more doubtful when we advance from single words to those collocations which "say something." What is said by a sentence is something more than what the words in it mean. Sentences do not merely refer to trees and skies and rain, they say something about them. This something is sometimes called a "proposition"—a somewhat more respectable precursor of speech but very similar to the "idea" which would have been said to be expressed by the same sentence under the older doctrine. To define a proposition as "something which may be said in any language" does not tell us where propositions are, or of what stuff they are

made. Nor is the problem solved by defining a proposition as all the sentences which have the same meaning as some one sentence, since we cannot identify a sentence as a member of this class without knowing its meaning—at which point we find ourselves facing our original problem.

It has been tempting to try to establish the separate existence of words and meanings because a fairly elegant solution of certain problems then becomes available. Theories of meaning usually deal with corresponding arrays of words and things. How do the linguistic entities on one side correspond with the things or events which are their meanings on the other side, and what is the nature of the relation between them called "reference"? Dictionaries seem, at first blush, to support the notion of such arrays. But dictionaries do not give meanings; at best they give words having the same meanings. The semantic scheme, as usually conceived, has interesting properties. Mathematicians, logicians, and information theorists have explored possible modes of correspondence at length. For example, to what extent can the dimensions of the thing communicated be represented in the dimensions of the communicating medium? But it remains to be shown that such constructions bear any close resemblance to the products of genuine linguistic activities.

In any case the practice neglects many important properties of the original behavior, and raises other problems. We cannot successfully supplement a framework of semantic reference by appealing to the "intention of the speaker" until a satisfactory psychological account of intention can be given. If "connotative meaning" is to supplement a deficient denotation, study of the associative process is required. When some meanings are classed as "emotive," another difficult and relatively undeveloped psychological field is invaded. These are all efforts to preserve the logical representation by setting up additional categories for exceptional words. They are a sort of patchwork which succeeds mainly in showing how threadbare the basic notion is. When we attempt to supply the additional material needed in this representation of verbal behavior, we find that our task has been set in awkward if not impossible terms. The observable data have been preempted, and the student of behavior is left with vaguely identified "thought processes."

The impulse to explicate a meaning is easily understood. We ask, "What do you mean?" because the answer is frequently

helpful. Clarifications of meaning in this sense have an important place in every sort of intellectual endeavor. For the purposes of effective discourse the method of paraphrase usually suffices; we may not need extraverbal referents. But the explication of verbal behavior should not be allowed to generate a sense of scientific achievement. One has not *accounted for* a remark by paraphrasing "what it means."

We could no doubt define ideas, meanings, and so on, so that they would be scientifically acceptable and even useful in describing verbal behavior. But such an effort to retain traditional terms would be costly. It is the general formulation which is wrong. We seek "causes" of behavior which have an acceptable scientific status and which, with luck, will be susceptible to measurement and manipulation. To say that these are "all that is meant by" ideas or meanings is to misrepresent the traditional *practice*. We must find the functional relations which govern the verbal behavior to be explained; to call such relations "expression" or "communication" is to run the danger of introducing extraneous and misleading properties and events. The only solution is to reject the traditional formulation of verbal behavior in terms of meaning.

A NEW FORMULATION

The direction to be taken in an alternative approach is dictated by the task itself. Our first responsibility is simple *description:* what is the topography of this subdivision of human behavior? Once that question has been answered in at least a preliminary fashion we may advance to the stage called *explanation:* what conditions are relevant to the occurrence of the behavior—what are the variables of which it is a function? Once these have been identified, we can account for the dynamic characteristics of verbal behavior within a framework appropriate to human behavior as a whole. At the same time, of course, we must consider the behavior of the listener. In relating this to the behavior of the speaker, we complete our account of the verbal episode.

But this is only the beginning. Once a repertoire of verbal behavior has been set up, a host of new problems arise from the interaction of its parts. Verbal behavior is usually the effect of *multiple causes*. Separate variables combine to extend their functional control, and new forms of behavior emerge from the recombination of old fragments. All of this has appropriate

effects upon the listener, whose behavior then calls for analysis.

Still another set of problems arises from the fact, often pointed out, that a speaker is normally also a listener. He reacts to his own behavior in several important ways. Part of what he says is under the control of other parts of his verbal behavior. We refer to this interaction when we say that the speaker qualifies, orders, or elaborates his behavior at the moment it is produced. The mere emission of responses is an incomplete characterization when behavior is *composed*. As another consequence of the fact that the speaker is also a listener, some of the behavior of listening resembles the behavior of speaking, particularly when the listener "understands" what is said.

The speaker and listener within the same skin engage in activities which are traditionally described as "thinking." The speaker manipulates his behavior; he reviews it, and may reject it or emit it in modified form. The extent to which he does so varies over a wide range, determined in part by the extent to which he serves as his own listener. The skillful speaker learns to tease out weak behavior and to manipulate variables which will generate and strengthen new responses in his repertoire. Such behavior is commonly observed in the verbal practices of literature as well as of science and logic. An analysis of these activities, together with their effects upon the listener, leads us in the end to the role of verbal behavior in the problem of knowledge.

The present book sets forth the principal features of an analysis from this point of view. Part II sketches the topography of verbal behavior in relation to its controlling variables and Part III some of the consequences of the interaction of variables. Part IV describes the manipulation of verbal behavior in the act of composition, while Part V considers the activities involved in editing and in the creative production of behavior which are usually called verbal thinking. No assumption is made of any uniquely verbal characteristic, and the principles and methods employed are adapted to the study of human behavior as a whole. An extensive treatment of human behavior in general from the same point of view may be found elsewhere.[2] The present account is self-contained.

One important feature of the analysis is that it is directed to the behavior of the individual speaker and listener; no appeal is made to statistical concepts based upon data derived from

groups. Even with respect to the individual speaker or listener, little use is made of specific experimental results. The basic facts to be analyzed are well known to every educated person and do not need to be substantiated statistically or experimentally at the level of rigor here attempted. No effort has been made to survey the relevant "literature." The emphasis is upon an orderly arrangement of well-known facts, in accordance with a formulation of behavior derived from an experimental analysis of a more rigorous sort. The present extension to verbal behavior is thus an exercise in interpretation rather than a quantitative extrapolation of rigorous experimental results.

The lack of quantitative rigor is to some extent offset by an insistence that the conditions appealed to in the analysis be, so far as possible, accessible and manipulable. The formulation is inherently practical and suggests immediate technological applications at almost every step. Although the emphasis is not upon experimental or statistical facts, the book is not theoretical in the usual sense. It makes no appeal to hypothetical explanatory entities. The ultimate aim is the prediction and control of verbal behavior.

Chapter 2

General Problems

VERBAL BEHAVIOR AS A DEPENDENT VARIABLE

OUR SUBJECT matter is verbal behavior, and we must accept this in the crude form in which it is observed. In studying speech, we have to account for a series of complex muscular activities which produce noises. In studying writing or gesturing, we deal with other sorts of muscular responses. It has long been recognized that this is the stuff of which languages are made, but the acknowledgement has usually been qualified in such a way as to destroy the main point. As Jespersen[1] said many years ago, "The only unimpeachable definition of a word is that it is a human habit." Unfortunately, he felt it necessary to add, "an habitual act on the part of one human individual which has, or may have, the effect of evoking some idea in the mind of another individual." Similarly, Bertrand Russell[2] asserts that "just as jumping is one class of movement … so the word 'dog' is [another] class," but he adds that words differ from other classes of bodily movements because they have "meaning." In both cases something has been added to an objective description.

It is usually argued that the addition is necessary, even when behavior is not verbal. Any effort to deal with behavior as a movement of the parts of an organism meets at once the objection that it cannot be mere movement which is important but rather what the movement means, either to the behaving organism or to the observer. It is usually asserted that we can *see* meaning or purpose in behavior and should not omit it from our account. But meaning is not a property of behavior as such but of the conditions under which behavior occurs. Technically, meanings are to be found among the independent variables in a functional account, rather than as properties of the dependent variable. When someone says that he can see the meaning of a response, he means that he can infer some of the variables of which the response is usually a function. The issue

is particularly important in the field of verbal behavior where the concept of meaning enjoys unusual prestige.

In defining verbal behavior as behavior reinforced through the mediation of other persons we do not, and cannot, specify any one form, mode, or medium. Any movement capable of affecting another organism may be verbal. We are likely to single out vocal behavior, not only because it is commonest, but because it has little effect upon the physical environment and hence is almost necessarily verbal. But there are extensive written languages, sign languages, and languages in which the "speaker" stimulates the skin of the "listener." Audible behavior which is not vocal (for example, clapping the hands for a servant, or blowing a bugle) and gestures are verbal, although they may not compose an organized language. The skilled telegraphist behaves verbally by moving his wrist. Some of these forms normally arise only after vocal behavior has been established, but this is not necessarily so. Writing and typing may be either primordially verbal or transcriptions of a prior vocal form. Pointing to words is verbal—as, indeed, is all pointing, since it is effective only when it alters the behavior of someone. The definition also covers manipulations of physical objects which are undertaken because of the effect upon people, as in the use of ceremonial trappings. In the case of any *medium*, the behavior is both verbal and nonverbal at once—nonverbal in the effect upon the medium—verbal in the ultimate effect upon the observer. Ceremonial languages, and the languages of flowers, gems, and so on, are of little interest, because they have small vocabularies and little or no grammar, but they are nevertheless verbal under the terms of the definition. Because vocal verbal behavior is the commonest form, we may deal with it as representative. Where necessary or helpful, parallel problems in other forms may be considered.

VOCAL BEHAVIOR

Vocal verbal behavior is executed by an extensive musculature—the diaphragm, the vocal cords, the false vocal cords, the epiglottis, the soft palate, the tongue, the cheek, the lips, and the jaw. The most complete record of a single instance of an utterance would be an electrical or mechanical report of the action of all the muscles involved. At the moment this is of theoretical interest only, since nothing like it has ever been made. Fortunately, a science of verbal behavior need not wait.

The complex muscular responses of vocal behavior affect the verbal environment by producing audible "speech." This is a much more accessible datum.

The acoustic product of vocal verbal behavior may be recorded phonographically. The record may be converted into visible form and analyzed for greater convenience into pitch-intensity spectra. The acoustic report is less accurate than a report of muscular action because different muscular patterns presumably produce the same sounds, but it is at least feasible. It is also more convenient because it uses fewer terms or dimensions. Probably nothing of importance is lost, because the scientist stands in essentially the same position as the listener and for many purposes may ignore any property of verbal behavior which does not produce a difference in the sound-stream. Even so, an acoustic report tells us more than we usually want to know, except when acoustic details are to be specially emphasized, and it soon becomes awkward.

Another kind of record was made possible by the discovery that speech could be broken into constituent sounds and by the invention of a phonetic alphabet to represent these sounds. (Both of these advances, of course, antedated scientific study.) A sample of verbal behavior can be recorded by placing appropriate symbols in a corresponding order, as is done, however inexactly, in writing with the English alphabet. So far as we are concerned here, such a record simply makes it possible to identify some of the acoustic properties of an utterance. The transcription permits the reader to construct a facsimile of the behavior which will have the same effect upon the verbal community as the original sample. It is a practical and economical record, because an indefinite number of different acoustic events may be represented with a few symbols.

This use of a phonetic alphabet makes no commitments about the functional significance of the units identified. We may use English spelling to record bird calls (*to-whit, to-whoo*, or *peewee*), or the noises of inanimate things (*pop* and *boom*), in the sense that in reading such records aloud one constructs a reasonable facsimile of the original songs or noises. But this does not mean that birds and drums speak in English "phonemes." The analytical (rather than transcriptive) function of the phoneme in modern linguistics arises, on the one hand, from an excursion into phonology which will not have to be made here and, on the other, from the study and comparison of

the practices of whole verbal communities. The linguist is concerned with such facts as these: (1) in one verbal community the responses *pin* and *bin* have different effects or occur under different conditions, while in another verbal community they have the same effect or occur under the same conditions; (2) in one verbal community the responses *pit* and *bit* have different effects or occur under different circumstances, while in another verbal community they have the same effect or occur under the same circumstances; (3) in that community in which *pin* and *bin* have the same effect, *pit* and *bit* also have the same effect; and in that community in which *pin* and *bin* have different effects, *pit* and *bit* also have different effects. These facts present problems which lie beyond the mere transcription of verbal behavior, because they include references to the conditions of occurrence of verbal behavior or to effects upon a listener. We shall deal with these additional facts in another way here.

A record of an utterance in a phonetic alphabet provides, of course, less information about its properties than an acoustic report, but there should be no objection if we can show that the properties which have been preserved are the effective properties of verbal behavior. This brings us to an important principle in the analysis of behavior. We distinguish between an instance of a response and a class of responses. A single response, as an instance of the activity of an organism, may be described as fully as facilities will permit. But when we are concerned with the prediction of *future* behavior it may be either impossible to predict the great detail of the single instance or, more likely, unimportant to do so. All we want to know is whether or not a response of a given class will occur. By "of a given class" we mean a response showing certain selected properties. We may want to know whether a man will open a door although we do not care how he turns the knob. We do not dismiss the details of turning the knob as unlawful or undetermined; we simply deal with his opening the door without accounting for them. The property of behavior by virtue of which we classify a response as "opening a door" is our principal interest. In the same way, we do not need to know all the details of a vocal response so long as the sound-pattern which it produces achieves a given effect upon a specified verbal community. There are many practical and theoretical reasons for recording and analyzing given instances of vocal behavior in as

great detail as possible, but they do not coincide with our interests in the prediction and control of verbal behavior, at least in the present state of the science. The "phoneme" was an early recognition of the principle of the defining property of a response. Unfortunately for our present purposes the extension of the concept to historical and comparative linguistics has obscured its relevance in defining a unit of verbal behavior in the individual speaker.

The problem of the speech-sound becomes somewhat clearer, and perhaps loses some of its importance, when we compare other modes of behavior. If verbal behavior were never vocal, there would be no sciences of phonology and phonetics. Yet most of the problems to be considered in the study of verbal behavior would remain. In a community in which all verbal behavior was written, we should have to identify "speech-marks," and discover their essential geometric properties. If such a language resembled modern script, we should have to study a large number of marks which functioned as, say, the letter *a* in order to identify their common features and to discover what properties could for most purposes be ignored. If such a community spoke only with typewriters, the range of properties would be narrow. The advantage of a narrow range for the reader, as well as the scientist, is suggested by the frequent instruction "Please print." Graphology provides a rudimentary "phonetics" of written verbal behavior; here again the "significances" require other techniques of analysis.

A "direct quotation" is a record of verbal behavior which depends more explicitly upon a knowledge of the conditions under which the behavior occurred. It is often, however, little more than an acoustic or phonetic transcription which permits the reader to reconstruct relevant properties of the original behavior. The spoken report that someone said *It is four o'clock* actually reconstructs an instance of verbal behavior. A written report permits the reader to reconstruct it for himself.

A technique which permits the reconstruction of a datum is unusual. Science does not generally resort to models or mimicry; its descriptions of events do not resemble those events. In the field of nonverbal behavior we usually do not report behavior by imitating it. Yet in speaking a language under study the scientist uses mimicry in lieu of the more usual method of description which bears no point-to-point correspondence with the thing described. (This distinction is

discussed further in Chapter 5.) Russell[3] has pointed out that some rare instances of verbal behavior, such as the Coronation Oath or the Lord's Prayer, have proper names. He also mentions the method, due to Gödel, of assigning numbers to words and hence to all possible sentences. The indexing system in a library assigns proper names (identifying numbers) to the large samples of verbal behavior known as books. It is not probable, however, that these foreshadow a descriptive system in which all verbal responses will be given names which bear no greater resemblances to the things named than the resemblances between events and descriptions in science elsewhere.

No matter how tempting it may be to utilize the special possibility of phonetic transcription or direct quotation to reconstruct the behavior being analyzed, it must be emphasized that from the point of view of scientific method an expression such as *It is four o'clock* is the name of a response. It is obviously not the response being studied, because that was made by someone else at some other time. It simply resembles that response in point of form. The conditions responsible for the original response may not share anything in common with the conditions responsible for the response on the part of the describing scientist. This practice, called hypostasis, is an anomaly in scientific method. The field of verbal behavior is distinguished by the fact that the names of the things with which it deals are acoustically similar to the things themselves. As Quine[4] has said, "A quotation is not a description, but a hieroglyph; it designates its object not by describing it in terms of other objects, but by picturing it." Quine is speaking here of the written report of written verbal behavior. In no other science is this possible, because in no other science do names and the things named have similar structures.

A quotation is usually something more than an acoustic or phonetic transcription, hieroglyph, or name. In the first place, it usually, though not inevitably, breaks a fairly continuous sample of behavior into parts. Such breaks need not reflect actual pauses or other properties of the temporal or stress pattern of the behavior. In quoting a speech episode, we separate it not only into speech-sounds, represented by letters, but into larger units called words or sentences, represented by spatial breaks or punctuation. The difference between a phonetic report and a direct quotation is seen in the training needed in the two cases.

A small phonetic repertoire will suffice to transcribe English speech for purposes of reconstruction. But thousands of different "words" must be learned before direct quotations can effectively be written down. The process includes, of course, "learning to spell" and, in particular, to distinguish between homophones. The ability is generally acquired in the process of learning to write and, once acquired, is often taken for granted. We are likely to overlook the fact that a process of analysis is actually taking place.

We are also likely to overlook the fact that in a direct quotation we are inferring something about the conditions under which a response was emitted, or about characteristic effects on a listener. A fairly good phonetic transcription may be made of a language one does not speak, or, as the stenographer often shows, of a familiar language without otherwise reacting as a listener. But the units of direct quotation specify verbal responses as units under functional control. In making a distinction between *through* and *threw*, or between *Send me two* and *Send me, too* we are specifying either the normal conditions under which the responses are made or their normal effects upon a listener. In the *indirect* quotation greater emphasis is placed upon these additional variables. *He said that he would go* permits only a very rough reconstruction of an actual verbal response; only "go" has survived from the possible original *I will go*, and we cannot even be sure that another response characteristic of the same situation was not actually made. But we know with some certainty what kind of situation it was and what kind of effect the remark could have had.

A Unit of Verbal Behavior

From the muscular or acoustic record of verbal behavior we pass through phonetic transcription to direct and indirect quotation. As we do so, we retain less and less information about the specific instance. This loss of detail can be tolerated if properties essential for prediction continue to be described. At the same time we begin to add inferences or facts about the conditions under which the response was made. In undertaking to predict or control verbal behavior, we must, of course, take such additional variables into account, but their status must be clarified. Traditional units of verbal behavior never make a sharp distinction between observed and inferred. Consider, for example, the concept of "word." As used by the layman and by

many linguists, a word may be nothing more than an utterance ("I want a word with you" or "The last word"), or a conventional subdivision of an utterance ("What would be two or three words in English is often only one in German"), or a supposed or real objective counter or token ("to choose a word" or "to string words together"), or something common to two or more modes of behavior ("a word may be either spoken or written"). With less justification we even speak of the same word in two languages ("French and English use the same word for 'accord' "), or in two historical stages of the same language, or in two cognate forms (" 'adamant' is the same word as 'diamond' "). Sometimes "word" seems to mean merely a standard lexical design ("the word 'fast' ").

What is needed for present purposes—and what the traditional "word" occasionally approximates—is a unit of behavior composed of a response of identifiable form functionally related to one or more independent variables. In traditional terms we might say that we need a unit of behavior defined in terms of both "form and meaning." The analysis of nonverbal behavior has clarified the nature of such a unit under laboratory conditions in which the expediency of the unit may be submitted to rigorous checks. An extrapolation of this concept to the verbal field is central to the analysis represented by the rest of this book. The kinds of behavior in which we are usually interested have, as we have seen, an effect upon the environment which has a return effect upon the organism. Such behavior may be distinguished from activities which are primarily concerned with the internal economy of the organism by calling activities which operate upon the environment "operant behavior." Any unit of such behavior is conveniently called "an operant." For most purposes "operant" is interchangeable with the traditional "response," but the terms permit us to make the distinction between an *instance* of behavior ("So-and-so smoked a cigarette between 2:00 and 2:10 P.M. yesterday") and a *kind* of behavior ("cigarette smoking"). The term "response" is often used for both of these although it does not carry the second meaning easily. The description of an instance of behavior does not require a description of related variables or of a functional relation. The term operant, on the other hand, is concerned with the prediction and control of a *kind* of behavior. Although we observe only instances, we are concerned with laws which specify kinds.

The distinction raises the issue of formalism. A response, as an instance, can be completely described as a *form* of behavior. An operant specifies at least one relation to a variable—the effect which the behavior characteristically, though perhaps not inevitably, has upon the environment—and is therefore not a purely formal unit. A formal specification cannot be avoided, since a response can be said to be an instance of an operant only through objective identification. But identification is not enough. As an instance of a verbal operant, the response must occur as a function of a certain variable. In this way we may distinguish between the operant *fast* in which the controlling variable is shared by the operant *speedy* and the operant *fast* in which the controlling variable is similar to that in the operant *fixed*.

A long-standing problem in the analysis of verbal behavior is the size of the unit. Standard linguistic units are of various sizes. Below the level of the word lie roots and affixes or, more rigorously, the small "meaningful" units called morphemes. Above the word come phrases, idioms, clauses, sentences, and so on. Any one of these may have functional unity as a verbal operant. A bit of behavior as small as a single speech-sound, or even a pitch or stress pattern, may be under independent control of a manipulable variable (we shall see evidence of such "atomic" verbal operants later). On the other hand, a large segment of behavior—perhaps a phrase like *vast majority* or *when all is said and done* or *the truth, the whole truth, and nothing but the truth* or a whole sentence such as *Haste makes waste*—may be shown to vary under a similarly unitary functional control. Although parts of these larger operants have the same form as parts of other operants or even of whole units, there may be no functional interaction. If this seems at odds with traditional linguistic analysis, it must be remembered that the verbal operant is exclusively a unit of behavior in the individual speaker. The functional unity of a large operant and the extent to which the presence of that operant in the repertoire of the speaker may affect operants of similar form must be decided by a study of the behavior of that speaker. In the practices characteristic of a verbal community, it may not be possible to establish the functional unity of a similar large sample of behavior.

We observe that a speaker possesses a *verbal repertoire* in the sense that responses of various forms appear in his

behavior from time to time in relation to identifiable conditions. A repertoire, as a collection of verbal operants, describes the *potential* behavior of a speaker. To ask where a verbal operant is when a response is not in the course of being emitted is like asking where one's knee-jerk is when the physician is not tapping the patellar tendon. A repertoire of verbal behavior is a convenient construct. The distinction between "verbal operant" and "word" is matched by that between "verbal repertoire" and "vocabulary." A person is said to possess a vocabulary of so many thousands of words if these words are observed in his verbal behavior during a period of time. But a vocabulary is usually regarded as a warehouseful of inanimate tools from which the speaker makes appropriate selections as he speaks. We are concerned here not only with the fact that certain specific forms of verbal behavior are observed but that they are observed under specific circumstances. These controlling circumstances add a dynamic character to "repertoire" which is lacking in "vocabulary."

Probability of Response

Some parts of a verbal repertoire are more likely to occur than others. This likelihood is an extremely important, though difficult, conception. Our basic datum is not the occurrence of a given response as such, but the probability that it will occur at a given time. Every verbal operant may be conceived of as having under specified circumstances an assignable probability of emission—conveniently called its "strength." We base the notion of strength upon several kinds of evidence.

Emission of Response

If a response is emitted at all, the operant is probably strong. Emission is a better sign of strength, however, if the circumstances are unusual. In one type of verbal slip, for example, the response which intrudes upon or distorts behavior (see Chapter 11) is not appropriate to the immediate situation and therefore appears to be especially strong. A response which appears under inappropriate, difficult, or ambiguous circumstances but is not a slip is probably strong for the same reason. The scientist who continues to talk shop during a thrilling football game or in a noisy subway and the steamrolling conversationalist who will brook no interruption give evidence of especially strong repertoires. Other forms of verbal behavior—

for example, writing—present evidence of the same sort.

Among the unusual circumstances which give evidence of strength we may include inadequate verbal stimuli; from the fact that one sees his name in unclear or briefly exposed printed material or hears his name in a noisy conversation in a room we infer the strength of his name in his own repertoire.

ENERGY-LEVEL

Emission of a response is an all-or-none measure. It enables us to infer strength only in terms of the adequacy of the conditions under which emission occurs. A second sort of evidence suggests that strength lies along a continuum from zero to a very high value. A response may be executed with a certain energy, which is not to be confused with "strength" as a synonym for "probability." Energy seems to vary with probability, and is frequently accepted as a measure of strength.[5] An energetic and prolonged *NO!* is not only a strong response, it suggests a strong *tendency* to respond which would not easily be overcome by competing forces. On the other hand, a timid brief *No* is accepted as an instance of a weak operant from which we infer some inadequacy in the independent variables. Relative energy permits a similar inference. From the response *a RED kite* we conclude that the redness was of special importance to the speaker, while from *a red KITE* we infer the special effectiveness of the kite itself as a variable. Under certain circumstances, a change in energy level may take place rapidly, as in the case of Mr. Winkle in the *Pickwick Papers*, who, just before falling into an alcoholic sleep, cried,

> "Let's—have—'nother—bottle," commencing in a very loud key, and ending in a very faint one.

Other properties of verbal behavior vary with the energy level. At low levels the part of the response which produces "voicing" drops out to leave the familiar whisper. At the other end of the continuum other topographical properties are affected. Probably because of the mechanism of the speech apparatus, the pitch level of a response tends to vary with the energy. Other things being equal, the louder the response the higher the pitch. Pitch level may therefore sometimes be taken as an indicator of strength. In the behavior of young children the low and scarcely audible "proper remark" upon a social occasion and high-pitched playground shouting suggest the range of possible

values. Other forms of verbal behavior generally have a more limited range. In written verbal behavior some indication of strength may be found in the size of letters, pressure of the pen, underlining, and so on. Some allowance for comparable characteristics is made in the design of type. These are now mainly conventional devices, but they retain some trace of an original variation with operant strength.

SPEED

Another property of emitted verbal behavior is the speed with which successive parts of a sample follow one another or the speed with which a response appears after the occasion for it has arisen. In general we accept the implication that strong verbal behavior is rapid and that hesitant speech indicates little strength. A ready answer is one which the speaker is "strongly inclined to make"; a delay in answering leads us to suspect that something is possibly amiss in the controlling circumstances. The weakness may be due to competitive behavior. A man deeply engrossed in a book may respond to a call or a question with delays of the order of several seconds. In young children, when verbal behavior is weak because it is still in the process of being acquired, delays of the order of minutes are sometimes observed. A child thirteen months old had acquired the response *Light*. Upon one occasion he was shown a light and asked, "What is it? What is that?" He made no response for at least a full minute, and the attempt to get him to respond was given up. He had turned to play with a toy when the response came out clearly. In pathological behavior delays may be still greater. An early report of an example is due to Head,[6] who asked one of his aphasic patients to count. The patient did not reply *until ten minutes had passed*, when he suddenly began *One, two, three, four,*..... We sometimes infer the strength of the verbal behavior of a correspondent from the speed with which a letter is answered, and traces of speed in handwriting supply similar evidence. The frantic gesture exemplifies speed of responding in still another mode of verbal behavior.

REPETITION

A third possible indication of relative strength is the immediate repetition of a response. Instead of saying *NO!* with great energy one may say *No! No! No!* A sort of wholesale repetition is implied in *A thousand times no!* Energy and repetition may be

combined. Occasionally it is possible to observe a decline in strength as successive responses drop off in energy, pitch, and speed: *NO!* NO*! No! no*. Repetition is apparently responsible for a class of expressions which imply special emphasis—for example, *Come, come, come* and *Now, now*. Expressions such as *again and again, round and round*, and *miles and miles* are complicated by an additional principle but probably also show the effect of strength. *A very, very sad mistake* serves in place of *A VERY sad mistake*. Repetition may be diluted by intervening behavior. In the response *No, it's not. Not at all. It's not a question of what I think* the exceptional strength of the form *not* is evident in its repetition.

Limitations on Evidence of Strength

It is easy to overestimate the significance of these indicators. If two or more properties of behavior indicate the same thing, they must vary together; but energy, speed, and repetitiveness do not always satisfy this test. We classify people according to the general strength of their verbal behavior in a way which suggests that our measures are closely associated. For example, the garrulous person (when he *is* garrulous) talks loudly, rapidly, and repeats himself, while the taciturn man speaks slowly, quietly, and seldom repeats. But in single instances these measures are altered through other circumstances, and the exceptions must be explained. For example, a poorly memorized answer may be delayed because of its weakness, but during the delay the aversive character of the situation increases, and when the response is finally emitted the energy level may be high. The apparent discrepancy between delay and force of response requires a special account.

Another complication is that our measures—energy level, speed of response, and even repetition—enter into the construction of different *forms* of response. In English this presents no great difficulty. Absolute levels of pitch and intensity are not "distinctive," nor are relative pitch levels important. Changes in pitch, however, distinguish different types of utterance. Energy of response cannot be taken as an inevitable indicator of strength so long as it serves to make *DE-sert* a different response from *de-SERT*. The prolonging of a sound does not necessarily mean strength when it serves as "quantity," nor is reduplication always a useful instance of

repetition of form.

Energy, speed, and repetitiveness are all affected by special conditions of reinforcement. We speak more energetically to the deaf and more slowly to anyone who has difficulty in following us; and we repeat in both cases. Repetition may be needed against a noisy background (*Hear ye! Hear ye!*). To someone at a distance we raise the energy and pitch of our voice and prolong each sound when possible. A quick loud response is more likely to get results in a competitive situation, for example, in reciting in a classroom. We can allow for special conditions of this sort in evaluating any given measure only by inferring operant strength, not from the fact that one speaks loudly, but from the fact that he speaks at an energy level above that which would ordinarily prevail *under the same circumstances*. There is some consolation in the fact that changes in strength due to these special conditions usually exaggerate "natural" strength. They may lead us to mistake the relative importance of an indicator but not its direction or sign.

Unfortunately other kinds of consequences oppose normal evidences of strength. Extreme values of any of these properties interfere with the effect upon the listener. The verbal community, as a collection of listeners, forces speech toward a standard level of speed, energy, and repetitiveness. If a child speaks loudly, he is told not to shout. If he mumbles, he is told to speak up. If he hesitates, he is told to hurry. If his words come tumbling out, he is told to be deliberate. To repeat oneself is bad form, and the double negative, which is merely the innocent result of a strong *No*, is called ungrammatical and illogical.

But if the indicators are somewhat obscured by these conflicting interests, evidence of strength still survives. We still make practical inferences about a speaker's behavior from his energy, speed, and repetitiveness. A complete levelling to a monotone is not achieved and is in fact also opposed by the community. In some kinds of verbal behavior—for example, in reading aloud—the controlling variable generates behavior at a fairly constant level of strength. Except for unfamiliar or poorly learned responses, a text ordinarily does not strengthen one response above another. But a series of responses of uniform energy and speed is not effective upon the listener. The reader is therefore encouraged to introduce spurious signs of strength. He reads *as if* his behavior were determined, not by a text, but

by an assortment of variables similar to those in "real" speech. Now it is significant that he does this by modulating pitch, energy, and speed. From these indicators of strength the listener infers a plausible set of determining conditions. The reader has shown good "interpretation."

We also supply indicators for other reasons. If we are shown a prized work of art and exclaim *Beautiful!*, the speed and energy of the response will not be lost on the owner. We may accentuate the effect by using repetition: *Beautiful, beautiful, simply beautiful!* This is so fully understood by everyone that it becomes part of a culture to simulate characteristics of strength whether appropriate independent variables are present or not—whether the picture is an occasion upon which such verbal behavior would naturally be strong. This would scarcely be the case if the significance of our indicators had been entirely obscured by other considerations.

Over-all Frequency

A third type of evidence is the over-all frequency with which a response appears in a large sample of verbal behavior. For example, the number of times a speaker emits *I, me, my*, and *mine* is sometimes taken to indicate the strength of his behavior with respect to himself as a controlling variable—his "egocentricity" or "conceit." Other responses have been used to indicate other themes. With such a measure it can be shown that a writer's interests change from year to year—that he becomes more or less preoccupied with sex, death, or any other subject. The practice recognizes the general notion of a varying probability of response and the relevance of an over-all frequency in measuring it, but such interpretations depend upon certain assumptions which are not always justified.

Word counts are often attempts to develop a purely formal analysis of the dependent variable alone. Verbal behavior is studied without regard to the circumstances under which it is emitted. But although it may be useful to know that a response of a given form is frequently emitted, it is also important to know the prevailing conditions. Since our unit of analysis is not purely formal, we cannot be sure that all instances of a response are instances of the same operant. Nor can we be sure that frequency is not primarily attributable to the frequency of occurrence of controlling variables. In the case of egocentricity, the speaker himself is always present and his changing

inclination to talk about that subject may be significant; but a response such as *snow* presumably varies with the seasons. A change in frequency may not reflect a changing tendency to "talk about snow when snow is present" but merely certain changing circumstances. Even the frequency of responses such as *I, me, my*, and *mine* may vary as a function of the listener to whom the verbal behavior is addressed. Unless we know that such a listener remains present or absent, a change in frequency cannot be used to infer a change in an underlying tendency to emit such forms.

Although over-all frequencies are interesting and often satisfactory data, they depart from our program of dealing with the individual speaker upon a given occasion. The data are more often relevant to studies of characteristic practices of a given verbal community, and hence to the commoner preoccupations of linguistics. Nevertheless, use may sometimes be made of such data in inferring characteristic processes in the individual speaker.

Probability and the Single Instance

Although the English language contains many expressions which suggest that the concept of probability of response is a familiar and useful one, certain problems remain to be solved in using it in the analysis of behavior. Under laboratory conditions probability of response is easily studied in an individual organism as frequency of responding. Under these conditions simple changes in frequency can be shown to be precise functions of specific variables, and such studies supply some of the most reliable facts about behavior now available. But we need to move on from the study of frequencies to a consideration of the probability of a single event. The problem is by no means peculiar to the field of behavior. It is a basic one wherever the data of a science are probabilistic, and this means the physical sciences in general. Although the data upon which both the layman and the scientist base their concepts of probability are in the form of frequencies, both want to talk about the probability of a *single forthcoming event*. In later chapters in this book we shall want to consider the way in which several variables, combining at a given time, contribute strength to a given response. In doing so we may appear to be going well beyond a frequency interpretation of probability, yet our evidence for the contribution of each variable is based upon

observations of frequencies alone.

INDEPENDENT VARIABLES AND RELATED PROCESSES

The probability that a verbal response of given form will occur at a given time is the basic datum to be predicted and controlled. It is the "dependent variable" in a functional analysis. The conditions and events to which we turn in order to achieve prediction or control—the "independent variables"—must now be considered.

CONDITIONING AND EXTINCTION

Any operant, verbal or otherwise, acquires strength and continues to be maintained in strength when responses are frequently followed by the event called "reinforcement." The process of "operant conditioning" is most conspicuous when verbal behavior is first acquired. The parent sets up a repertoire of responses in the child by reinforcing many instances of a response. Obviously, a response must appear at least once before it is strengthened by reinforcement. It does not follow, however, that all the complex forms of adult behavior are in the child's unconditioned vocal repertoire. The parent need not wait for the emergence of the final form. Responses of great intricacy can be constructed in the behavior of an organism through a procedure illustrated by the following demonstration experiment. We undertake to condition a pigeon to pace the floor of its cage in the pattern of a figure-8. Let us assume that the pigeon is hungry and that we can present food quickly and conveniently as a reinforcer. We need not wait until a figure-8 emerges in its entirety in order to reinforce the behavior. We begin by reinforcing any behavior which is part of the final pattern. In case the pigeon remains relatively immobile, we may have to begin by reinforcing any slight movement. The bird will soon become active, though as yet in no particular pattern. We then withhold reinforcement until the bird begins turning in one specific direction, let us say clockwise. The slightest movement in this direction is immediately reinforced. Later, reinforcement is withheld until an extensive movement is made. Complete circular movements soon appear. This is half the desired result. The operant is then partially extinguished as reinforcements are withheld until the bird turns in a counterclockwise direction. It may be necessary to reinforce an occasional clockwise movement. Eventually the bird makes complete turns in both

directions. The two parts of the pattern are now available but not yet in the required order. It is now possible to wait for a single figure-8 pattern before reinforcing. Under suitable conditions, the final relatively complex performance can be achieved in a short period of time.

In teaching the young child to talk, the formal specifications upon which reinforcement is contingent are at first greatly relaxed. Any response which vaguely resembles the standard behavior of the community is reinforced. When these begin to appear frequently, a closer approximation is insisted upon. In this manner very complex verbal forms may be reached. (We shall see in Chapter 4 that there are other ways of evoking a complex response in order to reinforce it. The present method of "progressive approximation" is usually relevant only in the early stages of setting up a verbal repertoire.)

If the contingencies of reinforcement are for any reason ever relaxed, the properties of the verbal response undergo a change in the other direction. The degeneration of the forms of military commands is an example. Consider a sergeant with a new squad to be conditioned to follow his commands. The sergeant begins with a verbal response borrowed from the larger verbal community, for example, the response *March!* At first this may need to be clearly enunciated, but the squad soon executes the appropriate response regardless of many specifications of the command, partly because other aspects of the situation begin to control the behavior. The form of the response then characteristically degenerates, and may eventually reach the stage of a mere forceful expulsion of air with some voicing but little or no shaping. It is only because the appropriate behavior of the squad survives the deterioration in the behavior of the sergeant that the final form is effective. The squad, as a group of listeners, has been progressively reconditioned. A new squad, however, may bring back the more specific form of response in the behavior of the sergeant.

Reinforcing consequences continue to be important after verbal behavior has been acquired. Their principal function is then to maintain the response in strength. How often the speaker will emit a response depends, other things being equal, upon the over-all frequency of reinforcement in a given verbal community. If reinforcements cease altogether through some change of circumstance, an operant grows weak and may effectively disappear in "extinction."

Operant reinforcement, then, is simply a way of controlling the probability of occurrence of a certain class of verbal responses. If we wish to make a response of given form highly probable, we arrange for the effective reinforcement of many instances. If we wish to eliminate it from a verbal repertoire, we arrange that reinforcement shall no longer follow. Any information regarding the relative frequency of reinforcement characteristic of a given verbal community is obviously valuable in predicting such behavior.

Stimulus Control

A child acquires verbal behavior when relatively unpatterned vocalizations, selectively reinforced, gradually assume forms which produce appropriate consequences in a given verbal community. In formulating this process we do not need to mention stimuli occurring prior to the behavior to be reinforced. It is difficult, if not impossible, to discover stimuli which evoke specific vocal responses in the young child. There is no stimulus which makes a child say *b* or *ă* or *ē*, as one may make him salivate by placing a lemon drop in his mouth or make his pupils contract by shining a light into his eyes. The raw responses from which verbal behavior is constructed are not "elicited." In order to reinforce a given response we simply wait until it occurs.

Prior stimuli are, however, important in the control of verbal behavior. They are important because they enter into a three-term contingency of reinforcement which may be stated in this way: in the presence of a given stimulus, a given response is characteristically followed by a given reinforcement. Such a contingency is a property of the environment. When it prevails, the organism not only acquires the response which achieves reinforcement, it becomes more likely to emit that response in the presence of the prior stimulus. The process through which this comes about, called "stimulus discrimination," has been extensively studied in nonverbal behavior. Numerous examples will be described in later chapters.

Motivation and Emotion

Although reinforcement provides for the control of a response, we do not use reinforcement as such when we later exercise control. By reinforcing with candy we strengthen the response *Candy!* but the response will be emitted only when

the child is, as we say, hungry for candy. Subsequently we control the response, not by further reinforcement, but by depriving or satiating the child with candy. Nonverbal responses are controlled in the same way. Whether a door is opened with a "twist-and-push" or with an *Out!*, we make the response more or less likely by altering the deprivation associated with the reinforcement of getting through the door. If the response has been reinforced in several different ways, we may control it by changing, not the deprivation, but the impending reinforcement. We increase the probability that a man will cross a room by placing a currently reinforcing object on the other side. By removing such an object or, better still, placing it near the man, we reduce the probability of his crossing the room.

When an operant is acquired it becomes a member of a group of responses which vary together with the relevant deprivation. A man gets a drink of water in many ways—by reaching for a glass of water, by opening a faucet, by pouring water from a pitcher, and so on. The verbal operant *Water!* becomes a member of this group when it is reinforced with water. The probabilities of all operants so reinforced vary together. Responses in all classes are made more likely to occur when we deprive the man of water or cause him to lose water—for example, by inducing violent exercise, by feeding him salt which must be excreted, or by raising the temperature of his surroundings so that he sweats. On the other hand, we make all such responses less likely to occur by causing the man to drink large amounts of water.

Such operations are said by the layman to create or allay a "state of thirst." Such a concept is only as valid or useful in prediction and control as the observations upon which it rests. The important events are the operations which are said to change the state of thirst. In predicting and controlling the verbal response *Water!* we do not change thirst directly; we engage in certain operations which are said to change it. It is simpler to omit any reference to a "drive" and say that the probability of the response *Water!* can be changed through these operations.

Suppose, however, that in addition to drinking water our speaker has also used water to extinguish fires. Until we have tested the point, we cannot be sure that a response acquired when he has been reinforced with water while thirsty will be emitted when the wastebasket catches fire. If there is any

functional connection, it must be found in certain events common to drinking water and extinguishing a fire. If the response *Water!* has been reinforced with the visual stimulation supplied by water prior to water in the mouth, and if this stimulation plays a role in controlling the behavior of extinguishing a fire, then the response acquired only under water deprivation may occur in the case of a conflagration. The group of operations which affect the strength of *Water!* suggests, in common parlance, some general "need for water" rather than "thirst." But we should have to examine all behavior in which water plays an essential role in order to define this need. We may say that we increase the strength of any response which has been reinforced with water, including the verbal response *Water!*, by strengthening any behavior which "requires water for its execution." (In more technical terms, the latter would be described as any behavior under the control of water as a discriminative stimulus.)

Aversive Control

There are other types of consequences which alter the strength of a verbal response. Behavior may be reinforced by the reduction of aversive stimulation. When an aversive stimulus itself is reduced, we call the behavior *escape*. When some condition which characteristically precedes an aversive stimulus is reduced, we speak of *avoidance*. Thus, if the verbal response *Stop it!* is reinforced when it brings about the cessation of physical injury, the response is an example of escape. But *Don't touch me!* may be reinforced when it brings about the cessation of the threat of such injury—of events which have previously been followed by such injury and which are therefore conditioned aversive stimuli—and the behavior is then called avoidance. When a speaker has had a history of such reinforcement, we control his verbal behavior by creating appropriate circumstances. We make him say *Stop it!* by pummeling him, or *Don't touch me!* by threatening to do so.

A complete account of the verbal behavior of the individual speaker would lead us to survey other variables in the fields of motivation and emotion, but the processes here are seldom, if ever, uniquely related to verbal behavior. Some relevant points are discussed in Chapter 8.

THE LISTENER AND THE TOTAL VERBAL EPISODE

Our definition of verbal behavior applies only to the speaker, but the listener cannot be omitted from our account. The traditional conception of verbal behavior discussed in Chapter 1 has generally implied that certain basic linguistic processes were common to both speaker and listener. Common processes are suggested when language is said to arouse in the mind of the listener "ideas present in the mind of the speaker," or when communication is regarded as successful only if an expression has "the same meaning for both speaker and listener." Theories of meaning are usually applied to both speaker and listener as if the meaning process were the same for both.

Much of the behavior of the listener has no resemblance to the behavior of the speaker and is not verbal according to our definition.[7] But the listener (and the reader as well) is reacting to verbal stimuli—the end-products of the behavior here analyzed—and we are naturally interested in the fate of such stimuli. On the one hand they evoke responses of glands and smooth muscles, mediated by the autonomic nervous system, especially emotional reactions. These exemplify classical conditioned reflexes. On the other hand verbal stimuli control much of the complex skeletal behavior with which the individual operates upon his environment. The relevant processes in both these broad areas will be taken up as needed in what follows. In neither case do the verbal stimuli differ in any particular from other kinds of stimulation. The behavior of a man as listener is not to be distinguished from other forms of his behavior.

Our interest in the listener is not, however, merely an interest in what happens to the verbal stimuli created by the speaker. In a complete account of a verbal episode we need to show that the behavior of the listener does in fact provide the conditions we have assumed in explaining the behavior of the speaker. We need separate but interlocking accounts of the behaviors of both speaker and listener if our explanation of verbal behavior is to be complete. In explaining the behavior of the speaker we assume a listener who will reinforce his behavior in certain ways. In accounting for the behavior of the listener we assume a speaker whose behavior bears a certain relation to environmental conditions. The interchanges between them must explain all the conditions thus assumed. The account of the whole episode is then complete.