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Words Are Not Things

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On a traditional view, words are the fundamental units of verbal behavior. They are independent, autonomous things that symbolically represent or refer to other independent, autonomous things, often in some other dimension. Ascertaining what those other things are constitutes determining the meaning of a word. On a behavior-analytic view, verbal behavior is ongoing, functional operant activity occasioned by antecedent factors and reinforced by its consequences, particularly consequences that are mediated by other members of the same verbal community. Functional relations rather than structure select the response unit. The behavior-analytic point of view clarifies such important contemporary issues in psychology as (a) the role of scientific theories and explanations, (b) educational practices, and (c) equivalence classes, so that there is no risk of strengthening the traditional view that words are things that symbolically represent other things.

On a traditional view, words are the fundamental units of verbal behavior. They are independent, autonomous things that symbolically represent or refer to other independent, autonomous things, often in some other dimension. Ascertaining what those other things are constitutes determining the meaning of the word. A pervasive implication of this traditional view is that a word is some sort of a mental possession that can therefore be "used" in the same way that other possessed things are used. For example, speakers can use the word to express meanings or intentions. The meaning of a word is something that speakers first formulate in their minds using processes that almost certainly include mental representations of events. Speakers then communicate that meaning to the mind of the listener. Verbal behavior is therefore another sort of an instinctive, information-processing task for the human organism. This task is carried out according to the rules of an innate, mental language-acquisition device, which has evolved in humans alone to process the underlying structural, grammatical, and syntactical features of language in the same way that our stomachs have evolved to process the food we eat. In any case, because language is assumed to follow rules, the processing of language is assumed to be most appropriately analyzed in structural units applicable to logic. Words can therefore be construed as logical symbols or icons for objects. Moreover, words are the principal components of sentences. A sentence expresses a proposition, which has a logical content. An enduring concern is the logical status of the words as they contribute to the logical content of the proposition. Some aspects of this view are derived from the influence of logical positivism in the 1930s, which, under the influence of Whitehead and Russell's *Principia Mathematica* (1913) and the early Wittgenstein (e.g., 1922/1974), sought to establish the meaning of language by tying it to the analytical techniques of formal, symbolic logic. And so it goes.

In contrast, the behavior-analytic view of verbal behavior differs significantly from the traditional view, perhaps as much as natural selection differs from creationism in explaining the origin and diversity of life on earth

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(Skinner, 1989, p. 35). Indeed, Skinner (1978, p. 122) regarded *Verbal Behavior* (1957), in which this alternative view is presented, as his most important work. More specifically, on a behavior-analytic view, words are not independent, autonomous things. In fact, to so regard words is disastrously mentalistic. The present article, then, will seek to sketch out the rough contours of why behavior analysis does not regard words as things.

FUNDAMENTAL UNITS OF VERBAL BEHAVIOR

The Response Unit

A traditional view adopts a structural perspective and often talks of words as independent, autonomous entities called "parts of speech." In contrast, a behavior-analytic view adopts a functional approach. The functionally defined behavioral unit does not necessarily correspond to the structural entity called a word that exists within a sentence, any more than rearing, facing, paw raising, extension, and pressing should necessarily be regarded as structural entities that exist within a rat's lever press. Rather, functional relations between the speaker and the verbal community establish the behavioral unit, just as functional relations between a rat's behavior and the prevailing circumstances in an operant experimental chamber establish the lever press. The behavioral unit could be what in a traditional account is called a word, phrase, sentence, paragraph, or even a portion of one of these structural units. To speak of a word as the fundamental unit is analogous to speaking of rearing or facing or paw raising or extension or pressing as the fundamental unit. They may well be structural aspects of the response, but are not necessarily the functional unit of the response selected by the reinforcement contingency. Indeed, if the functional unit is considered in analyses at all, the mentalism prevalent in our culture has mischievously equated the structural unit with the functional unit. In this regard, dictionaries are conventionally considered to have entries consisting of such structural units as morphemes, phonemes, and words. We could just as well have a "dictionary" for the rat consisting of rearing or facing or paw raising or extending or pressing, if those units were selected by reinforcement contingencies to be independent activities under independent functional control, such that the rat could learn to put elements together in different orders in response to different circumstances in the environment. Skinner (1957) commented on the issue of words as a behavioral unit in the following way:

> 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. (p. 21)

To be sure, the conventional practices of a verbal community may well result in speakers' producing a series of words in sequence, or a sentence. This state of affairs may give the impression that the emergent unit of verbal behavior is the sentence. Place (1981a, 1981b, 1982, 1983) argued to this effect some years ago in a series of articles in *Behaviorism*. Sentences are then taken to express complete thoughts, and the fundamental unit is taken to have some logical integrity, such that verbal behavior is regarded as a logical process. The impression is mischievously deceptive as well, and readers are referred to Sundberg and Michael (1983) for a rejoinder to Place's arguments. To the extent that verbal behavior occurs in the form called sentences, those sentences are the result of the conventional reinforcing practices of the verbal community with respect to the speakers' verbal behavior, not anything about the fundamentally "logical" nature of verbal behavior per se. As Schnaitter (1999, p.

231) has recently noted, for behavior analysis logical and sequential relations in verbal behavior are on the dependent variable side, as effects of an ordering process, rather than on the independent variable side, as antecedent causes of ordering.

The Response Product

For present purposes, we will often speak in terms of a "response product." A response product is the artifact of the response or the stimulation produced by motor activity that actually affects a listener. We engage in the motor act of speaking when we contract muscles in our torso, causing air to pass through the vocal cords and make them vibrate. We move our face, lips, tongue, and larynx to modulate the air passage and the resulting vibrations. However, the response product of sound (acoustic stimulation) is almost always what affects another person, rather than the motor movements of face, lips, and tongue per se (except for lip reading). Comparable statements apply to handwriting and typing. A representative passage from Skinner (1957) follows, in which he pointed out that a traditional view often regards words

> 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. (p. 7)

In many cases, we distinguish among classes of verbal behavior because the topography of producing the response product differs from class to class. We say or write *apple* in the presence of an apple and *orange* in the presence of an orange. The topography of saying or writing *apple* differs from that of saying or writing *orange.*

In other cases, we distinguish among classes of verbal behavior because the various classes select or otherwise identify different portions of the environment that already exist and do not have to be produced. For example, we can point to a picture of an apple or a picture of an orange. The topography of pointing is the same in the two instances, but the object that is pointed at is different. The pointing selects some feature of the environment. This form of verbal behavior might be relevant in language-disabled or developmentally delayed individuals, or when investigating important issues involving nonhumans. Chimpanzees might use tokens on a language board, or dolphins (or even pinnipeds) might manipulate floating objects in the water in prescribed ways. These are instances of verbal behavior as well, but any resulting "words" are not things.

Meaning

A traditional view often makes much of "meaning." What can behavior analysts say about meaning? Behavior analysts distinguish between two kinds of meaning: (a) meaning for the speaker and (b) meaning for the listener (Skinner, 1974, p. 95). Meaning for the speaker is to be found among the determiners, not the properties, of a response. Thus, this kind of meaning is a function of the contingencies that determine a response. To ask what persons mean by their utterances is to ask nothing less than what causes them to speak as they do. The answer must specify contingencies and establishing operations pertaining to antecedent conditions of deprivation or aversive stimulation. This perspective is captured in the colloquial question "Where are you coming from?" when a listener asks what a speaker means.

Meaning for the listener is to be found in the extent to which an utterance enters into contingencies affecting the listener's behavior. The most com-

mon way for the utterance to affect the listener's behavior is to function as a discriminative stimulus. When a listener says to a speaker, "I don't understand what you mean," or "What you say is not meaningful to me," the listener is often saying that the utterance does not occasion any behavior that secures reinforcers (unless, of course, the listener is saying that the utterance is incomprehensible as an acoustic pattern related to the reinforcing practices of the verbal community). To understand can also be used in the echoic sense, as in being able to repeat what has just been said.

Another way for an utterance to affect a listener's behavior is to serve as a function-altering stimulus (Schlinger, 1993). For example, an instruction during a classical conditioning experiment might take the form, "When you hear the bell, you will feel a shock." A subject's heart rate and galvanic skin response might then increase the first time the subject hears the bell, even though the bell has never before been associated with the shock. One could argue that the verbal instruction served as a stimulus that altered the effect of the bell, thereby affecting the listener's behavior.

Unlike the way that traditional psychologists view meaning, behavior analysts do not view meaning as an independent, autonomous entity that is formulated in the speaker's mind and is then transmitted from the speaker to the listener, so that it gets into the listener's mind. The invoking of mind in this traditional sense is associated with information processing and communication theory, and raises questions of a mental dimension.

The "referent" of a given bit of verbal behavior is usually a matter of what exerts stimulus control over the response. In a loose sense, the nature of the stimulus control does determine the meaning, but verbal behavior does not ordinarily entail a referential process. To say that the essence of a speaker's words is that those words refer to objects is just as questionable as saying that the essence of a rat's lever presses is that those lever presses refer to objects. Speakers who say they are referring to something are specifying for listeners what is controlling their verbal behavior, such as what they are ostensibly talking about.

Skinner (1957) commented on these relations in the following two important passages:

> 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 meaning. . . .
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> 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. . . . We must find the functional relations which govern the verbal behavior to be explained. . . . The only solution is to reject the traditional formulation of verbal behavior in terms of meaning. (pp. 7–10)
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> 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. (pp. 13–14)

Lying

A common question in the foregoing approach to verbal behavior is how to make sense of the phenomenon of lying. If language is genuinely the symbolic, referential process that the tra-

ditional view argues it is, then the difficulty is trying to make sense of lying while conceiving of words as things that refer to other things.

Behavior analysts hold that lying involves manding. When a speaker lies, the speaker is exploiting the listener by saying something in a topography that conventionally resembles that of a tact but is not actually a tact (e.g., Parsons, 1989; Skinner, 1957, p. 150). Rather, the speaker is manding the listener to deliver reinforcers that would otherwise not be forthcoming or to refrain from delivering aversive stimulation that would otherwise be forthcoming. If the speaker was tacting, the response would be incompatible with what was actually emitted. Lying is not wholly a mand, in that it is usually related to the environmental context. Malingering, hypochondriasis, and the secondary gains of the neurotic are manding as well. Boasting and exaggerating (stretching the facts, hyperbole) are also manding in this sense. The concept of operant behavior, including functional control of verbal behavior, puts the matter all in good order.

Usage

We sometimes adopt the locution of "usage" in an effort to avoid problems with mentalism, but we must take care in doing so because the locution can create as many problems as it solves. For example, a common misunderstanding of the behavior-analytic view of verbal behavior is that the use of words is reinforced, in much the same way that the use of a hammer or a screwdriver is reinforced. The locution sounds as though words are independent, autonomous things comparable to hammers and screwdrivers. Mentalism flourishes. Skinner (1957) commented on these mischievous and deceptive practices as follows:

> 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. (p. 7)

In summary, the basic concept of words as things is seductive but mistaken. It is the hallmark of mentalistic structuralism, and it interferes with the naturalistic analysis of the conditions that are responsible for verbal behavior. Let us now examine three important contemporary issues to see the advantages of a behavior-analytic approach: (a) the language of science, (b) our educational practices, and (c) equivalence classes.

THE LANGUAGE OF SCIENCE AS A BEHAVIOR ANALYST VIEWS IT

Theories and Explanations

Theories and explanations are traditionally regarded as logical devices. For example, perhaps the dominant form of explanation in science is the covering law model (Hempel & Oppenheim, 1948). According to the covering law model, an event is considered to be explained when its description can be expressed as the logical deduction from (a) a statement of initial conditions and (b) a covering law. Often it is acceptable to express the law as a law-like generalization or, even more tentatively, as a theory. Note that according to this traditional form of explanation, the conclusion and statement of initial conditions are interchangeable. On the basis of the logical structure of the argument, then, the law can be confirmed or corroborated at the same time the explanation is achieved. Indeed, this is the basis of the hypothetico-deductive method of doing science, which is correlated with the deductive model of explanation.

A behavior-analytic view of science is quite different. Skinner (1957) characterized that view as follows:

> Logical and scientific verbal behavior differs from the verbal behavior of the layman (and particularly from literary behavior) because of the emphasis on practical consequences. . . . The test of scientific prediction is often, as the word implies, *verbal* confirmation. But the behavior of both logician and scientist leads at last to effective nonverbal action, and it is here that we must find the ultimate reinforcing contingencies which maintain the logical and scientific verbal community. . . . Logical and scientific verbal behavior, as well as the practices of the community which shape and maintain it, have been analyzed in *logical and scientific methodology*. . . . A . . . sequence in science might be as follows: (1) relatively abstract responses specifying particular properties of stimuli prove useful, (2) the scientific community arranges contingencies of reinforcement which constrain speakers to respond to isolated properties, and (3) the rules and canons of scientific thinking which govern classification and abstraction are studied to explain the effectiveness of (1) and (2) and possibly to suggest improved behavior and practices. . . . The techniques of logical and scientific methodology must, of course, be adapted to the phenomena of verbal behavior. . . . The verbal processes of logical and scientific thought deserve and require a more precise analysis than they have yet received. One of the ultimate accomplishments of a science of verbal behavior may be an empirical logic, or a descriptive and analytic scientific epistemology, the terms and practices of which will be adapted to human behavior as a subject matter. (pp. 429–431)

Readers may note that Moore (1998, 2000) and Terrell and Johnston (1989) have further contrasted some characteristics of a behavior-analytic alternative with those of the traditional view of verbal behavior in science.

Pragmatism, Instrumentalism, and Realism

The traditional view also assumes that theories and explanations have the status of "tools" that are deployed in a logical argument. They are not true or false in a conventional sense (Hergenhahn & Olson, 1997, p. 16). According to this traditional view, it is no more appropriate to ask whether a theory or explanation is true or false than it is to ask whether a hammer or screwdriver is true or false. Rather, one asks whether a theory or explanation is useful or not in predicting outcomes. This whole position is sometimes referred to as the instrumentalist view of theories.

The instrumentalist view of theories is usually contrasted with the realist view of theories. The realist view of theories holds that theories must capture some essential, metaphysically real, and permanent structure of nature in a Platonic sense. A corollary is that if one can indeed talk about some element as existing in nature, then that element must really exist in nature, or else how could the element be talked about.

Debates about whether theories should be interpreted as fundamentally instrumentalist (also known as conventionalist) or realist (also known as essentialist) rage in philosophy of science. Realist theories predominated until the early part of the 20th century; then, under the influence of atomic theory, quantum mechanics, and relativity theory, instrumentalist approaches predominated.

However, instrumentalism too has had its challenges. Is a theory really about nothing that exists in space and time? Is a theory just a manner of speaking? Is science all a matter of who can make up the best fictions? Current thinking has swung back toward the realist interpretation, albeit with a renewed appreciation of the problems caused by reification.

Pragmatism is an issue that is often related to instrumentalism, by saying that theories need to be evaluated in terms of their cash value or their ability to pay their way by accounting for an agreeably high percentage of the variance, predict novel findings, and so on (Moore, 1998). A traditional view sometimes takes pragmatism to be synonymous with instrumentalism. Moore (1998) has proposed that they be distinguished. Strictly speaking, instrumentalism is not concerned with the origin of the theoretical or explanatory verbal behavior, just its ability to predict or explain. Pragmatism may be understood as a position that asks for the basis by which a theory may predict or

explain. More on this interpretation of pragmatism is found in the section immediately below.

Multiple Control

A behavior-analytic view helps to clarify the various concerns about theories and explanations. Theories and explanations are verbal behavior. They may be analyzed in terms of the conditions responsible for them. In the ideal case, scientific verbal behavior is occasioned by scientific operations and contacts with data. It is reinforced, however indirectly, through practical, effective action, such as prediction and control. Skinner (1957) put it as follows:

> The scientific community encourages the precise stimulus control under which an object or property of an object is identified or characterized in such a way that practical action will be most effective. . . . Generic extensions are tolerated in scientific practice, but metaphorical, metonymical, and solecistic extensions are usually extinguished or punished. Metaphorical extension may occur, but either the controlling property is quickly emphasized by additional contingencies which convert the response into an abstraction or the metaphor is robbed of its metaphorical nature through the advent of additional stimulus control. . . . In ruling out the effects of other consequences of verbal behavior the contingencies established by the scientific community work to prevent exaggeration or understatement, misrepresentation, lying, and fiction. . . . Scientific verbal behavior is most effective when it is free of multiple sources of strength; and humor, wit, style, the devices of poetry, and fragmentary recombinations and distortions of form all go unreinforced, if they are not actually punished, by the scientific community. . . . In general, however, practices are designed to clarify the relation between a verbal response made to a verbal stimulus and the *nonverbal* circumstances responsible for it. The community is concerned with getting back to the original state of affairs and with avoiding any distortion due to the intervening verbal linkage. (pp. 419–420)

However, most verbal behavior is multiply determined, and scientific verbal behavior is no exception. Moore (1981, 1998) has argued that verbal behavior called *theoretical* or *explanatory* is occasioned at least in part by operations and contacts with data. It is also occasioned at least in part by social-cultural discriminative and reinforcing factors that have influenced the scientist. These relations are illustrated schematically in Figure 1. For example, some scientific verbal behavior simply manifests "control by ordinary language habits, extensive chains of familiar intraverbals, and one or another preconception about the inherent nature of scientific explanation" (Day, 1969, p. 323; see also Moore, 1990). As Day (1969, p. 319) noted, the traditional conception assumes that the chief function of language is to identify the Platonic nature of the thing spoken about. It assumes that any time we do speak, the words we use must be things that refer to other things in the world at large that have actually been declared as metaphysically real and permanent, by virtue of the inherent properties that give the things their essential identities. Speakers then assume that they have correctly isolated the things talked about. At best, such reification only illustrates the "formalistic fallacy" (Skinner, 1969, p. 265; see also the discussion of realism in Moore, 1998, p. 220).

Other explanatory verbal behavior manifests control by metaphors and social-cultural factors that are cherished for irrelevant and extraneous reasons. Although he was neither a radical behaviorist nor a behavior analyst, Kantor (1938) characterized the problem as follows:

> We may, however, demand that all [explanatory verbal behavior] be connected with the primary data or events by a substantial link of observation and observational procedure. . . . The exigencies of scientific work may be such as to attenuate the thread binding the construction with events to a very thin calibre. . . . But it is an established maxim that this thread can never be broken. When the ratio of construction to observation is very large we may still regard the speculative construction as scientific, but when the observational factor is zero we have no other alternative than to characterize the speculation as unscientific or non-scientific. (pp. 11–12)

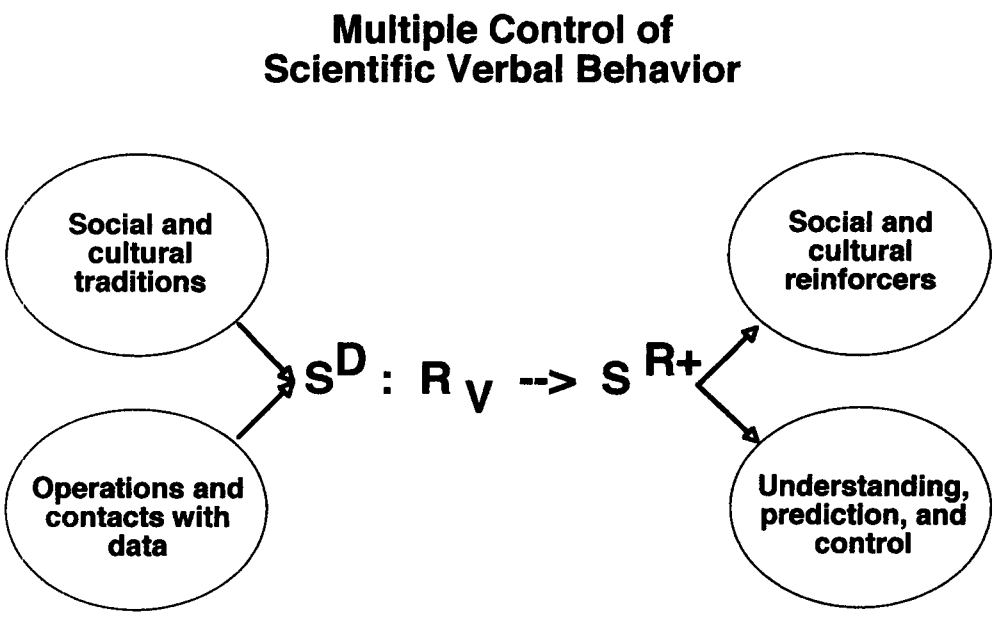

Fig. 1. Scientific verbal behavior under the multiple control of scientific and social contingencies.

Kantor (1945) continued on this same theme by noting that "The lesson is plain—namely, by the frail process of language manipulation ideas are established with which no scientific enterprise is in any manner concerned," to which he added the following footnote: "Excepting, of course, the psychological and cultural investigation of the origin and maintenance of such theories" (p. 148). In sum, behavior analysis is concerned with the contingencies that are responsible for a given instance of verbal behavior, and the contingencies into which the verbal artifact subsequently enters, for example, as it exerts discriminative control among those who entertain it. The argument is that we must strip away control that arises from mischievous social and cultural contingencies, leaving only the factors that produce such things as manipulation and control, to understand the validity of a scientific explanation.

Thus, not all verbal behavior called theoretical or explanatory is engendered by factors related to operations and contacts with data. Some is occasioned in large part by cultural factors, yet predictions are still possible on the basis of these theories. For behavior analysts, the important question is what does the theory nevertheless take into account that allows it to predict? Day (1969) framed the issue as follows:

> Even so, in the last analysis the radical behaviorist is committed to an exceedingly liberal position with respect to the verbal behavior of his colleagues. Admittedly, the reliance upon a speculative epistemology is deplorable, but objection is ultimately to be raised only on pragmatic grounds. . . . In responding to professional language, the radical behaviorist has his own new course to follow: he must attempt to discover the variables controlling what has been said. Even the most mentalistic language is understandable and valuable in this sense. The meaningfulness of psychological and mental terms provides no insuperable problems. . . . The meaning of such terms can be clarified by an attempt to assess the observable (not necessarily publicly observable) events that act as discriminative stimuli in control of the emission of the term. This kind of analysis is what Skinner has in mind when he speaks of "operational definition" (1945, p. 271). (p. 320)

As Day indicated, his remarks were presumably occasioned by Skinner's comments over the years. In addition to the passage from Skinner (1945) that Day cited, we can identify the follow-

ing three passages, the first two of which existed at the time of Day's comments:

> We may quarrel with any analysis which appeals to . . . an inner determiner of action, but the facts which have been represented with such devices cannot be ignored. (Skinner, 1953, p. 284)
>
> No entity or process which has any useful explanatory force is to be rejected on the ground that it is subjective or mental. The data which have made it important must, however, be studied and formulated in effective ways. (Skinner, 1964, p. 96)
>
> The truth of a statement of fact is limited by the sources of the behavior of the speaker, the control exerted by the current setting, the effects of similar settings in the past, the effects upon the listener leading to precision or to exaggeration or falsification, and so on. . . . A scientific law is derived from possibly many episodes of this sort, but it is similarly limited by the repertoires of the scientists involved. The verbal community of the scientist maintains special sanctions in an effort to guarantee validity and objectivity. (Skinner, 1974, p. 140)

These passages are noteworthy because they point to the possibility that a functional analysis of language will identify whether a kernel of truth lies in a given scientific statement, irrespective of its apparent mentalistic nature.

The difficult question, of course, and perhaps the one anticipated in Skinner's third quote (1974, p. 140), is whether behavior analysts will find it worthwhile to continually assess stimulus control over the mentalistic language found in traditional psychological theories. Could not the time given to this task be better used by simply seeking to move forward on one's own, and by attempting to discover new facts and relations, rather than attempting to make sense out of very complex verbal material related to who knows what in a speaker's mentalistic history? The answer is not easily arrived at. As Figure 1 suggests, Skinner's radical behaviorism holds that scientific language is usually under multiple control of both (a) operations and contacts with data and (b) social-cultural factors. Thus, despite its inclinations, even the most mentalistic-sounding theory might contain something of value. The value would derive from the theory's implicit contact with operations and data rather than its contact with social-cultural traditions. On the one hand, if psychologists entertain the mentalistic theory, then psychologists run the risk of finding out later that time and resources have been wasted by entertaining something trivial at best. On the other hand, if psychologists reject the mentalistic theory, then psychologists risk missing something of genuine value, even though the value is not what the mentalist thinks it is. Skinner (1969, pp. 93–94) suggested that an emphasis on basic dimensions would help in making such decisions. Graphs in the research related to the theory should not ordinarily show changes in behavior from trial to trial, in terms of time or number of errors required to reach a criterion, or in terms of amount remembered. In addition, dimensions are probably suspect if the work was done with mazes, jumping stands, or memory drums. Perhaps the choice will also involve the "track record" of individual scientists in individual laboratories. At present, the variance is great indeed. However, the problem is never even recognized if words are regarded as things.

EDUCATIONAL PRACTICES AS A BEHAVIOR ANALYST VIEWS THEM

Provenance of Verbal Knowledge

Suppose we design instructional practices in the form of drills and exercises, or use fluency training that is designed to evoke high rates of lightly cued vocalizations. Is it correct to believe that, just because students are able to say or write something in response to a test question in the course, they possess "knowledge"? What we are doing as instructors is establishing intraverbals, and then hoping that intraverbals generalize to other forms of responding. In many cases they do, but often they do not. How many instructors have turned around multiple-choice questions, reversing questions

and alternatives, only to find that students cannot answer the questions when they are posed in this form? Are we assuming that words are things that have independent meanings, and once they are possessed, they will be deployed correctly in all future situations?

Another possibility in keeping with a behavior-analytic view is to not accept mere intraverbal status as showing knowledge, as if possession of a word (indicated by being able to say it in a sequence with other related words) means the speaker can deploy it in whatever sense is needed or helpful in the speaker's life. Behavior said to show knowledge needs to be traced back to the conditions that promoted it. We need to be sure that what students say will function as discriminative stimuli to guide future behavior. Such a concern is focused on the conditions responsible for the provenance of the response and the relations among the resulting response classes.

Collateral Responses and Equivalence Classes

The knowledge that is sought in educational activities is often reflected in the ability to engage in collateral responses. The importance of collateral responses in determining what is called *knowledge* and *meaning* cannot be underestimated ("A similar issue concerns meaning. A machine may behave like a man but its behavior may still be called meaningless. . . . What is resented is the lack of collateral behavior," Skinner, 1969, p. 291). What does it mean to say an individual knows something, say the meaning of a term (cf. Bloom, 1956)? The individual could presumably provide a definition of the term (1 below), but one would also expect certain collateral responses (2 through 11 below):

1. selecting a definition that fits the term
2. selecting a term that fits the definition
3. stating a synonym of the term
4. stating an antonym of the term
5. matching the term with an appropriate synonym
6. matching the term with an appropriate antonym
7. selecting a picture that represents the term
8. stating the principle that fits the term
9. stating the relation between the term in question and a second term
10. stating the differences between the term in question and a second term
11. selecting the best meaning of the term when it is used in a sentence

Those who are said to know the meaning of a term can engage in all of these collateral responses, if not more.

What is the nature of these collateral responses, specified in terms of contingencies? At issue here is the establishment of equivalence classes, often supplemented by abstract stimulus control. The term *equivalence classes* refers to stimulus control that emerges as a result of certain experiences but does not involve specific discrimination training and differential reinforcement. For example, suppose a linguistically competent individual is presented in a conditional discrimination task with Stimulus A1 and then is trained to pick Stimulus B1 rather than B2. Suppose next that the individual is presented with Stimulus B1 and is trained to pick Stimulus C1 rather than C2. A wide variety of recent research has shown that if the individual is presented with Stimulus C1, he or she will reliably pick Stimulus A1 rather than A2, even though there is no history of differential reinforcement involving the relation.

Equivalence relations are important because, as with abstractions, an instructional process must provide the appropriate kinds of experiences that promote them. That is, the instructional process must presumably provide the "given A1 pick B1 rather than B2," the "given B1 pick C1 rather than C2," and then the "given C1 which to pick from A1 and A2?" experiences. In practice, implementing these kinds

of experiences will resemble abstract discrimination training, and the experiences will establish stimulus control beyond the intraverbal: collateral responses. In any event, the word is not regarded as a thing that is possessed, such that by virtue of being possessed it can be appropriately deployed in other instances and we can blame the student when it is not.

EQUIVALENCE CLASSES AS A BEHAVIOR ANALYST VIEWS THEM

Sidman's Vocabulary

Equivalence relations are intimately involved in verbal behavior; Sidman (e.g., 1990) has worked extensively on equivalence relations, principally from the standpoint of their role in language rehabilitation. Sidman's basic vocabulary is taken from mathematical concepts and is applied to a conditional discrimination procedure:

1. Reflexivity: given A1, then A1 picked and not A2
2. Symmetry: given B1, then A1 picked and not A2
3. Transitivity: given A1, then C1 picked and not C2
4. Symmetry-transitivity: given C1, then A1 picked and not A2

If the first three conditions are obtained, and presumably the fourth as well, then on Sidman's view we can legitimately speak of equivalence responding.

Hayes' Vocabulary

In contrast to Sidman's view is that of Hayes (1994). Hayes refers to his view as relational frame theory. Hayes' vocabulary of relational frame theory differs somewhat from Sidman's, appealing to mutual entailment, combinatorial entailment, and transfer of function. For example, relational frame theory holds the following:

1. Symmetry is a special case of the more general concept of mutual entailment when the relation is same; the relation could also be different, greater than, less than, and so forth. For example, Barnes-Holmes and Barnes-Holmes (2000, p. 256) have recently pointed out that if a subject learns A is larger than B, the derived relation is that B is smaller, not larger, than A, as would be required by the narrow interpretation of symmetry.
2. Transitivity is a special case of the more general concept of combinatorial entailment when the trained and derived relations are the same; they could also be different. For example, Barnes-Holmes and Barnes-Holmes (2000, p. 256) have recently pointed out that if a subject learns A is larger than B and B is larger than C, the derived relation is that C is smaller, not larger, than A, as would be required by the narrow interpretation of transitivity.
3. Reflexivity is a specific instance of the more general concept of relational reflexivity-irreflexivity when the basis for responding is identity; the basis could also be oddity (identity or oddity matching to sample), and it could also be direct or indirect, based on the nature of the stimulus control experiences of the subject (Barnes-Holmes & Barnes-Holmes, 2000, p. 262).

To understand complex stimulus relations and transfer of function a bit better, let us consider some representative research. A representative study showing complex stimulus relations and transfer of function in the area of respondent conditioning is by Dougher, Augustson, Markham, Greenway, and Wulfert (1994). In this study, researchers first established two four-member equivalence classes using conditional discrimination procedures. Then, one member of each class was paired with electric shock. When the remaining stimuli were presented, they elicited conditioned responses in 6 of 8 subjects. Researchers next established two four-member equivalence classes again using conditional discrimination procedures. Then, all members of each class were paired with shock. The parameters of the shock were adjusted for each subject, but a representative set of

values was 200 ms in duration and 1.0 to 2.0 mA in intensity. Then, one member of each class was presented in extinction trials. When the remaining stimuli from the class were presented, they failed to elicit a conditioned response. In a subsequent condition, the stimulus that had previously been presented in extinction was reconditioned. Test trials with the other stimuli indicated that the stimuli in the class had regained their eliciting function. These results were consistent with other studies showing other sorts of transfer of function: discriminative control, contextual control, conditioned reinforcement, and conditioned punishment (see discussion in Hayes, 1994, p. 23).

A representative study showing complex stimulus relations and transfer of function in operant conditioning is by Steele and Hayes (1991). As Barnes (1994, p. 100) has described this study, researchers pretrained subjects on conditional discrimination tasks to relate "same" stimuli (e.g., a large square with a large square) in the presence of one contextual cue, "opposite" stimuli (e.g., a large square with a small square) in the presence of a second contextual cue, and "distinct" stimuli (e.g., a square with a cross) in the presence of a third contextual cue. Afterwards, subjects were taught an extensive network of additional conditional discriminations, with each conditional discrimination being made in the presence of one of the three contextual cues used in the pretraining.

Thus, in the presence of the contextual stimulus for opposite, suppose subjects were given A1 and were trained to pick B2 but not B1, and were given A1 and trained to pick C2 but not C1. Suppose subjects were then presented with a test trial, in which the opposite contextual stimulus was again present. Subjects were given B2, and the choice was between C1 and C2. Subjects chose C1.

The Steele and Hayes (1991) study is particularly challenging for Skinner's and Sidman's views of the relations that underlie verbal behavior. For example, Skinner never formally addressed the question of equivalence specifically or derived relations in general, relying instead on direct experience to form stimulus classes and relations between classes. Clearly, the results of Steele and Hayes are beyond anything with which Skinner dealt. In addition, on Sidman's (1990) view, equivalence is a basic stimulus function, not derived from other relations, and it cannot be analyzed into constituent components. It precedes the development of language. Yet, in the Steele and Hayes study, when subjects were given B2 in the presence of the opposite contextual stimulus and were asked to choose between C1 and C2, the subjects chose C1 rather than C2, indicating that they were responding on the basis of the mutually entailed relation of opposite. That is, subjects responded on the basis of the derived relation by showing that if A1 is the opposite of both B2 and C2, then B2 and C2 must be the same. According to an interpretation in terms of simple equivalence as a basic function, subjects should presumably have chosen C2, because they had been trained to pick B2 and C2 when given A1. Overall, the orderliness of the results implies that the stimuli are related to each other in fairly complex ways that are not easily accommodated by Skinner's and Sidman's approaches.

Analysis

Hayes (e.g., 1994) has asserted that Skinner's (1957) analysis is an early behavior-analytic account of language, but is not necessarily an account that reflects modern behavior-analytic concepts. For example, despite grudging acknowledgment of Skinner's contributions ("We have not yet worked through the similar arrangement from the point of view of the speaker, but when we do I expect to find something there very much like the tact," p. 28; "We have not yet worked through the similar arrangement from the point of view of the speaker, but when we do I

expect to find something there very much like the mand," p. 28; "it may still be possible to integrate the direct contingency analysis of Skinner with the present relational account," p. 28), Hayes (1994) ultimately judges Skinner's analysis to be conceptually limited, empirically incorrect, and theoretically flawed. Hayes further argues that the unwarranted dominance of Skinner's approach has led us down the wrong path in our understanding of verbal behavior and has prevented us from appreciating the true nature of verbal behavior, how it develops, and how it applies to educational practices and psychopathology ranging from anxiety disorders to substance abuse (Hayes & Wilson, 1994; Wilson & Hayes, 2000). Hayes' criticisms principally concern the manner in which (a) stimulus classes evolve and (b) the resulting relations among those classes evolve, not that verbal behavior is functional operant behavior occasioned by members of a class of discriminative stimuli and under the control of contingencies of reinforcement. Skinner's classes are engendered by direct relations, such as differential reinforcement administered in the presence but not the absence of the discriminative stimulus in question. Hayes questions whether this direct differential reinforcement is in fact necessary, and from this has expanded to notions of bidirectionality and so forth. On Hayes' view, then, equivalence is one of a number of relations emerging from a prolonged history of trained social mediation within the verbal community. The stimulus relations are derived and indirect, not basic and direct. Hayes argues that we should recognize the phenomenon of arbitrarily applicable relational responding instead of equivalence classes, in which the important feature is the bidirectional nature of language with respect to environmental events. Hayes further argues that the various categories of verbal behavior that Skinner identifies are with respect to an observer, rather than the behavioral process by which they occur. A phenomenon should be regarded as verbal behavior only when it is a function of trained social mediation involving mutual entailment, combinatorial entailment, and transfer of function. Otherwise it is just social behavior, and not specifically a verbal event. The Dougher et al. (1994) and Steele and Hayes (1991) studies could quite easily be explained in terms appropriate to the traditional mentalistic view of verbal behavior. For example, on a traditional view, one can argue that the results show the effects of mental activity, carried out according to the rules of symbolic logic, in which the stimuli have become symbols, icons, or tokens for particular relations. The challenge for behavior analysis is to avoid interpreting such research as showing that words are independent, autonomous things or symbols after all.

Fortunately, an interpretation based on behavior-analytic principles is available. As Barnes-Holmes and Barnes-Holmes (2000; see also Barnes-Holmes, Barnes-Holmes, & Cullinan, 2000) have recently suggested, according to relational frame theory what is responsible is "higher order" generalized operant classes of responding that are taught in the environment:

> According to [relational frame theory], derived relational responding is established, in part, by an appropriate history of multiple exemplar training (see Barnes, 1994, . . .). Learning to name objects and events is perhaps one of the earliest and more important forms of such relational responding. For instance, a caregiver will often utter the name of an object in the presence of a young child and then reinforce any orienting response that occurs towards that object. We can describe this interaction as, hear name A → look at object B. Sometimes, the caregiver will also present an object to the child and then model and reinforce an appropriate "tact" (Skinner, 1957), and this interaction may be described as see object B → hear and say name A (see Barnes, 1994, for a detailed discussion). During the early stages of language training, each interaction may require explicit reinforcement for it to become established in the behavioral repertoire of the child, but after a number of name-object and object-name exemplars have been trained, the generalized operant

> response class of "derived naming" is established. (p. 257)

This derived relational responding is similar to generalized imitation (e.g., Baer, Peterson, & Sherman, 1967; Poulson & Kymissis, 1988), as well as Skinner's discussion of the generalized acquisition of "autoclitic frames" and "grammatical frames" (e.g., Skinner, 1957, p. 336). Indeed, it is entirely appropriate to speak of subjects learning to "frame relationally" in this sense, as an overarching, higher order operant response.

Hence, it follows that a naturalistic account is available for extraordinarily complex processes, such as equivalence relations. Words are not things that commit one to a logical, symbolic conception of verbal behavior. Rather, to emit words is to behave under the control of prevailing relations in the environment.

SUMMARY AND CONCLUSIONS: HOW DO WE DISTINGUISH VERBAL BEHAVIOR FROM OTHER SOCIALLY MEDIATED BEHAVIOR?

What then is an appropriate definition of verbal behavior, such that it can be clearly distinguished from nonverbal but socially mediated behavior? Do nonhumans have verbal behavior and language? These questions are tricky, because the properties that define language have been a matter of controversy for centuries. Consider the following series of definitions:

> Behavior which is effective only through the mediation of other persons. (Skinner, 1957, p. 2)
>
> 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. The 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 only cover as much of the behavior of the listener as is needed to explain the behavior of the speaker. (Skinner, 1957, p. 2)
>
> To say that we are interested only in behavior which has an effect upon the behavior of another individual does not go far enough, for the definition embraces all social behavior. . . . If we make the further provision that the "listener" must be responding in ways which have been conditioned precisely in order to reinforce the behavior of the speaker, we narrow our subject to what is traditionally recognized as the verbal field. (Skinner, 1957, p. 225)
>
> Verbal behavior is behavior that is reinforced through the mediation of other people, but only when the other people are behaving in ways that have been shaped and maintained by a verbal environment [transmitted from one generation to another] or language. (Skinner, 1986, p. 121)
>
> A slightly different way of saying this is that in verbal behavior, the speaker produces or selects a stimulus (in the presence of a verbal or nonverbal stimulus or motivative variable) to which a trained listener responds. (Hall & Chase, 1991, p. 117)
>
> It is sometimes necessary . . . to regard "doing nothing" as a response if it has identifiable reinforcing consequences. (Skinner, 1957, p. 379)

How then might we define the verbal in verbal behavior?

Hayes (1994) has maintained that Skinner's approach does not constitute a truly functional analysis of verbal behavior. For example, Hayes suggests that Skinner's approach does not distinguish mere social behavior from genuine verbal behavior. In addition, Hayes suggests that Skinner's approach is not based on an analysis of the source of the the actual behavioral functions involved, but rather only on the source of reinforcement. Hayes wants to include the behavior of the listener in the definition of verbal behavior, as involving trained social mediation, but is not mollified by Skinner's two quotes above about listeners whose behavior has been conditioned (1957, p. 225) or otherwise shaped (1986, p. 121) by the verbal community (see also Barnes-Holmes et al., 2000, and Leigland, 1997, for in-

formed discussions). Hayes' suggestions overlap somewhat with Catania (1986), from which much of what follows is taken.

Innate or Operant?

Clearly, some animals raise cries of alarm when predators are observed in the immediate area and other animals respond. Parrots imitate and are given crackers. Dogs beg for food from their owners and receive it. Rats press levers in experimental chambers and humans mediate the delivery of food pellets. Do these examples count as instances of verbal behavior? An important consideration here is whether such instances of behavior have developed through reinforcement arising from others of the same species, as it has for humans. Cries of alarm and parrot imitations are presumably innate forms of behavior, selected by increased chances of survival rather than through reinforcement. The dog that begs for food is engaging in operant behavior, but it probably has not been shaped through reinforcement mediated by another dog. (Begging for food by pups from parents is presumably phylogenic in origin, rather than ontogenic and operant.) To be sure, some animals might be trained to engage in interactions that resemble verbal behavior, but an important consideration is whether that behavior has evolved through any sort of systematic interaction with others of its own species. By itself, however, this criterion is concerned with the locus of reinforcement, not the nature of the behavior process.

Instructional?

A second issue is whether vocalizations are in any sense evolved phylogenically from instruction. One organism can, by means of its verbal behavior, change another's behavior, both verbal and nonverbal. In any case, once both organisms engage in verbal behavior, then one can instruct the other. Society and culture are based on systematic patterns of such exchanges, transmitted through time by means of verbal behavior. An important consideration is whether anything like verbal instruction, resulting in societies and culture with transmitted artifacts, is present in interactions among nonhuman species. Presumably the answer is no.

Equivalence Classes

A third issue concerns equivalence classes. As noted above, when humans are presented with the printed name of an object and learn to pick out its picture and when presented with its picture learn to recognize the spoken form of the word, they can also recognize the spoken word when presented with the printed name, even though no formal training concerning these two elements has taken place. Thus, human verbal behavior has a sort of "emergent" property, where we learn that some elements of verbal relations are "equivalent" to others. Nonverbal behavior does not appear to have this property. This issue is at the heart of Hayes' (1994) approach, and he has built an entire new conceptual framework on it, including a therapy. An important consideration is whether nonhumans demonstrate equivalence relations. Various experimenters are attempting to demonstrate equivalence in nonhumans, such as pinnipeds or cetaceans, and discussion is lively on the topic (Schusterman & Kastak, 1993).

Verbal Behavior That Is Occasioned by and Modifies the Effects of Other Verbal Behavior

A fourth and final issue is that some kinds of verbal behavior modify or provide additional information about other verbal behavior. Skinner (1957, chap. 12 and 13) identifies these kinds of verbal behavior as "autoclitic." For present purposes, we will identify four kinds of autoclitic behavior. The first is descriptive autoclitics. This kind of autoclitic activity is controlled by something of the circumstances in which a response is emitted, something of the

source of the response, or something of the emotional or motivational condition of the speaker, including the strength of the response. Examples include starting sentences with such phrases as "I am sure . . .," "I doubt . . .," "I think . . .," "I believe . . .," "I heard . . .," "I see from . . .," "To coin a phrase," "Presumably," and so forth.

The second is qualifying autoclitics. This kind of autoclitic activity qualifies an accompanying verbal response in such a way that the intensity or direction of the listener's behavior is modified. Examples include negation, assertion, certain adverbs, and suffixes (*-like, -less*). For example, an assertion (*yes!*) involves attempting to persuade (mand) the listener to accept comments on a given state of affairs as relatively pure tacts. Negation involves adding *no* or *not* to verbal commentary to signal (mand) the listener not to construe the commentary as a tact.

The third is quantifying autoclitics. This kind of autoclitic activity affects the listener by indicating either a property of the speaker's behavior or the circumstances responsible for that property. Examples include such modifiers as *few, many, some, all, all but, however, almost, always, perhaps, too.* Articles such as *the, this, that,* and *a* are also quantifying autoclitics.

The fourth is relational autoclitics. This kind of autoclitic activity is controlled by relations among basic verbal operants. Sometimes the responses are unique words that in everyday language are called spatial prepositions: *above, below, far, near.* Other times they are more complex: grammatical agreement in tense, case, and number; possessives and the use of apostrophes; predication (use of *to be*); punctuation; and syntactical word ordering.

Grammar consists of engaging in behavior such that the sequence of behavior and relations among components of the sequence are separately reinforced. Our verbal community reinforces ways of speaking that modify the effects of other verbal behavior, showing the relations among the components of longer sequences. This is not essentially a symbolic process.

Similarly, in predication, the speaker uses some form of the verb *to be* to indicate that there is an important relation between, say, two tacts, such that a tact specifying an object and a tact specifying a property are related in the sense that the speaker is signifying that the object has the tacted property. That is, the same physical object occasions both tacts. To illustrate, consider the statement, *The apple is red. The* is a quantifying autoclitic, designating one specific object. *Apple* is one tact concerning that object, and *red* is another. The verb *is* is a relational autoclitic of predication, indicating that the particular physical object that is being talked about is an apple rather than a fire hydrant, and that it is red rather than green.

In the case of syntactical word ordering, no unique "words" are involved. In addition, we presumably do not want to say that the person first covertly emits scrambled words, then covertly arranges them into a complete sentence that is grammatically and syntactically correct according to some mysterious mental editorial process involving mental "rules," and then finally emits audible speech. Rather, we simply have to acknowledge that early words in what will eventually be a complete utterance have some bearing on later words. The verbal community reinforces complex statements about events (or whatever) from speakers, but those statements must take forms that are conventionally acceptable to the verbal community. Given that early words in what will become a sentence have been emitted, later words will follow from the earlier ones according to the form that the verbal community finds acceptable, and according to the context of the speaker's utterances. (By context here we mean both variables present and their functional role in contingencies.) The verbal community may even go so far as to condition "autoclitic frames," which are conven-

tionally prescribed formats or sequences for emitting verbal behavior, as in subject-verb-object or actor-action-object sentences.

In any event, autoclitics cannot occur unless the speaker can sufficiently discriminate the conditions that control the original verbal behavior. The circumstances must be favorable for the establishment of the discrimination, through being promoted by others of the same species, and the verbal behavior must be sufficiently differentiated to detect that this sort of a discrimination has been established. As noted above, nonverbal behavior does not appear to have this property. An important consideration is whether the nonhuman behavior thought to be verbal manifests this property. This question has not been systematically investigated in the research laboratory.

In conclusion, then, verbal behavior has always been of utmost importance to the behavior analyst. The four characteristics of verbal behavior noted above (learned operant behavior, instructional origin, existence of equivalence classes and arbitrarily applicable relational responding, occasioned by and modifying other verbal behavior) appear to distinguish it from other behavior, including other forms of socially mediated behavior. In any case, behavior analysis does not regard words as things, any more than it regards any other stimuli or forms of responding as things. Although our understanding of the nature of the stimulus control over verbal behavior is evolving, the fundamental conception of verbal behavior as ongoing functional activity occasioned by antecedents and reinforced by its consequences has not changed. The ability of the behavior-analytic view to promote applied programs in language rehabilitation for developmentally delayed individuals shows the validity of that view, but the job is not yet done. An even greater understanding of verbal processes means even greater progress in rehabilitation programs, educational programs, science, the arts, and literature.

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