

Antecedents and Consequences of Words

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As instances of behavior, words interact with environments. But they also interact with each other and with other kinds of behavior. Because of the interlocking nature of the contingencies into which words enter, their behavioral properties may become increasingly removed from nonverbal contingencies, and their relationship to those contingencies may become distorted by the social contingencies that maintain verbal behavior. Verbal behavior is an exceedingly efficient way in which one organism can change the behavior of another. All other functions of verbal behavior derive from this most basic function, sometimes called verbal governance. Functional verbal antecedents in verbal governance may be extended across time and space when individuals replicate the verbal behavior of others or their own verbal behavior. Differential contact with different verbal antecedents may follow from differential attention to verbal stimuli correlated with consequential events. Once in place, verbal behavior can be shaped by (usually social) consequences. Because these four verbal processes (verbal governance, replication, differential attention, and verbal shaping) share common stimulus and response terms, they produce interlocking contingencies in which extensive classes of behavior come to be dominated by verbal antecedents. Very different consequences follow from verbal behavior depending on whether it is anchored to environmental events, as in scientific verbal practices, or becomes independent of it, as in religious fundamentalism.

Key words: words, verbal governance, replication and selection, attention, shaping, social contingencies, scientific practice, religious fundamentalism.

The human species took a crucial step forward when its vocal musculature came under operant control in the production of speech sounds. Indeed, it is possible that all the distinctive achievements of the species can be traced to that one genetic change

—B. F. Skinner (1986, p. 117)

Behavior analysis is concerned with three-term contingencies, or the relations among antecedents and behavior and consequences. To refer to both the antecedents and the consequences of words, as in the title of this paper, is implicitly to recognize words as instances of behavior. A qualification is necessary, however. Once words appear in written documents or recorded speech, they have become artifacts of past behavior. Even as artifacts they may eventually engender further behavior in the verbal responses of readers or listeners. It is hard to get away from words. We are sur-

rounded by them through most of our waking hours. Nevertheless it is difficult for us to think consistently about them as behavior, and as a species we humans are only beginning to learn about their functions.

This account considers how the interlocking contingencies that act upon verbal behavior can create coherent systems of behavior that vary in the degree to which they are anchored in social and nonsocial environments. Our focus will be on four major topics: (1) *verbal governance*, in the contingencies, mainly social, that lead not only to the following of instructions but also to correspondences between what we do and what we say about what we do; (2) *replication*, in the echoic and other processes that are prerequisites not only for the initiation and maintenance of the verbal behavior of the individual but also for the spread of verbal behavior throughout social communities; (3) *attention to verbal stimuli*, in which the reinforcing and aversive properties of these stimuli affect not only whether they will be sought out or avoided but also whether they will become incorporated into one's own verbal behavior; and (4) *verbal shaping*, in the natural and artificial contingencies that arrange consequences for verbal behavior and thereby raise or lower the probabilities of different verbal classes.

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An essential feature of the account is the combination of these processes in the multiple causation of verbal and nonverbal behavior. The account is not a theory. Each of the four topics just listed involves common and readily demonstrable properties of verbal behavior. For example, we observe verbal governance and replication and differential attention and verbal shaping whenever we see individuals responding to simple requests or repeating something said or attending to one speaker rather than another or changing a topic of conversation upon changes in the reactions of an audience. To enumerate such effects is simply to describe how verbal behavior works. The account suggests how complex human behavior can sometimes be effectively interpreted in terms of combinations of and interactions among these known properties.

It may also be useful to point out that the account does not appeal to meanings or ideas or other contents of words. The range of phenomena that can be addressed in terms of the verbal processes considered here suggests that for the purposes of analyzing and interpreting some functions of verbal behavior those terms might be expendable.

THE NATURE AND ORIGINS OF VERBAL BEHAVIOR

Verbal behavior includes any behavior in which the responses are words, without regard to whether the words are spoken, written or signed. It involves both speaker behavior shaped by its effects on the behavior of listeners and listener behavior shaped by its effects on the behavior of speakers. The functional units of verbal behavior (such as phonemes and words and grammatical markers) are maintained by the practices of verbal communities.

The most basic consequence of verbal behavior is that through it speakers change the behavior of listeners. In other words, verbal behavior is a way to get people to do things; it is "effective only through the mediation of other persons" (Skinner, 1957, p. 2). Sometimes its effects are nonverbal, as when we ask someone to do something; sometimes its effects are verbal, as when we change what someone has to say about something. This function is primary because other functions gain their significance only through it. Transmitting information and describing feelings are functions of language, but these secondary functions

matter only if they sometimes make a difference by changing the behavior of others. For example, we transmit information or convey our thoughts because, as a consequence, others may act upon them, and we describe our feelings and express our emotions because, as a consequence, others may behave differently toward us. The thoughts or feelings or emotions do not travel from the speaker to the listener. Only the words do.

Speakers can lead others to say things as well as to do things, and whether an instance of verbal behavior functions as an instruction does not depend on its grammatical form. Giving a definition or stating a fact instructs with respect to verbal behavior just as giving an order instructs with respect to nonverbal, and all utterances are, usually in multiple senses, ways of telling someone else what to do.

Verbal behavior allows individuals to act upon stimuli available to others but not to themselves, as when one monkey's vocal call allows another to escape from a predator it had not seen (Seyfarth, Cheney, & Marler, 1980). But here too the irreducible function is that the behavior of the second monkey is changed by the vocal behavior of the first. An account of the ways in which such contingencies might evolve in complexity is beyond the scope of this paper, but consider the potential impact on reproductive success of just a single utterance, corresponding in its effect to that of the contemporary word "stop," that reduces the likelihood that an out-of-reach offspring will wander off into danger. From such a start, a minimal vocabulary with relatively simple effects (keeping together during movement, coordinating aggression or flight, etc.) could evolve over millennia into a richly differentiated repertory involving the behavior of mothers and offspring, mates, and other subgroups of hominid social units (for a more detailed account, see Catania, 2003).

Verbal behavior can emerge only in organisms whose behavior is or can become sensitive to social contingencies. Any account of the origins and evolution of language must be consistent with selection as it operates at three different levels: at the level of phylogeny, as populations of individuals (and their genes) are selected by evolutionary contingencies; at the level of ontogeny, as populations of responses are selected by their consequences over the lifetime of individual organisms; and at the level

of cultural practices or memes, as social contingencies select behavior as it is passed on from one organism to another (Darwin, 1859, 1871; Dawkins, 1976, 1982; Skinner, 1981). The evolution of the particular anatomical and physiological features of human vocalization, such as the structure of the vocal tract and the functional organization of respiration and articulation in operant classes, was no doubt crucial, but human languages could arise only when verbal behavior began to be replicated not only in individuals during their own lifetimes as speakers and listeners but also among the different speakers and listeners of social groups within and across successive generations (Catania, 1985, 1991, 1994, 2001).

This account will appeal only occasionally to Skinner's functional verbal units in *Verbal Behavior* (Skinner, 1957), but as in that book it will give considerable emphasis to the multiple causation of verbal behavior. A given verbal response is jointly determined by many variables, including but not limited to nonverbal discriminative stimuli, earlier verbal responses, prior reinforcing or aversive consequences of related responses, the nature of the audience, and the condition of the speaker. In his treatment of multiple causation, Skinner described cases in which novel behavior emerges from the novel combination of variables as "a different type of multiple control, in which functional relations, established separately, combine possibly for the first time upon a given occasion" (Skinner, 1957, p. 229). For example, two or more newly learned words may appear together for the first time in a child's sentence that the child has never heard or uttered before. The coming together of existing responses in novel combinations to produce new behavior is sometimes called adduction.

Skinner also gave special consideration to the hierarchical organization of verbal behavior, as when smaller verbal units such as phonemes or letters combine in larger units called words and words combine in still larger units called sentences. It was implicit in his account that the contingencies operating on operant classes at one level of analysis need not be consistent with those operating on the higher-order classes at another level. For example, the contingencies that determine the thematic features of an utterance or its grammatical form may be different from those that determine its

pronunciation. A higher-order class is one that includes within it other classes that can themselves function as operant classes, as when generalized imitation includes specific imitations each of which can be separately reinforced as a subclass. The emergence of novel instances is one criterion for distinguishing between higher-order classes and sets of specific cases. But when different contingencies operate for a higher-order class than for the subclasses within it, behavior can seem to be insensitive to one or the other set of contingencies (Catania, 1995); opportunities can be missed by accounts that do not explicitly consider the different contingencies that can operate at different levels (e.g., Hayes, Barnes-Holmes, & Roche, 2001).

We are now ready to consider the cases of verbal governance, replication, attention to verbal stimuli, and the shaping of verbal behavior. Each of these is likely to be already familiar, so each will be outlined only briefly in preparation for a discussion of their interactions.

1. VERBAL GOVERNANCE

Verbally governed behavior is behavior, either verbal or nonverbal, determined by verbal antecedents (it has been called rule-governed behavior, but definitions of rules are problematic because they are sometimes based on structural criteria and sometimes on functional ones). Such behavior is maintained not so much by consequences arranged for particular responses given particular verbal stimuli, but rather by social contingencies that generate higher-order classes of behavior characterized by correspondences between verbal antecedents and subsequent behavior. Higher-order classes of behavior are held together by the common contingencies shared by their members, just as the various topographies of a rat's food-reinforced lever pressing (e.g., left paw, right paw, both paws) are held together by the common contingencies according to which they produce food. Verbal behavior includes other higher-order classes along with verbal governance; one example is naming, as in Horne & Lowe (1996).

Within higher-order classes, relations between responses and their consequences at the higher-order level need not be compatible with those at the more local level of the subclasses.

In the case of verbal governance, social contingencies maintain the higher-order class, but other contingencies act on specific instances. In the military, for example, social contingencies maintaining obedience may conflict with nonsocial contingencies prevailing on the battlefield, as when the aversive nonsocial consequences of advancing under fire oppose the aversive social consequences of retreat. When social consequences prevail, the component responses remain consistent with the higher-order class (orders are obeyed) and the behavior is called verbally governed; it is relatively insensitive to the nonsocial contingencies. When nonsocial consequences dominate (retreat occurs against orders), the behavior is called contingency-governed or contingency-shaped. The former usage emphasizes maintaining contingencies and the latter emphasizes origins (cf. Skinner, 1969).

The vocabulary of verbal governance and contingency governance is convenient, but it is important to recognize that contingencies operate at both levels, the *higher-order* and the *local* levels, and that the distinction between higher-order and local levels is orthogonal to that between verbal and nonverbal behavior. In other words, verbal behavior is defined by certain social contingencies, but such contingencies can operate either on higher-order classes or locally on specific subclasses or on both. Verbally governed behavior is often determined more strongly by higher-order social contingencies than by more local (often nonsocial) contingencies, and therefore is often less likely than contingency-governed behavior to change when the local contingencies change. We do not ordinarily tell people to do what they would do even without being told.

Verbal antecedents in verbal governance are most obvious in the form called instructions, as when we are told to do or say something. But "I'm thirsty," a declarative, may have the same function as "May I have a drink of water?," an imperative. Furthermore, verbal antecedents may specify contingencies, as when we are told what will happen if we do or say something, or they may specify behavior, as when we are simply told what to do.

Verbal governance, like any other operant class, may be conditional on other events. Humans learn to follow instructions from some individuals but not others. Humans often talk to themselves, usually silently but occasion-

ally, as when following complex instructions, out loud. Thus, verbal antecedents may lead to other verbal behavior, as when implications and courses of action are derived from something said. And because humans can often distinguish between what they have been told and what they have arrived at without being told, the most effective verbal antecedents may be those that they generate themselves. In such cases, they may fail to recognize the remote origins of what they generated, in the verbal behavior of others that initiated their own self-talk.

Local contingencies may also generate verbal behavior that in turn produces nonverbal behavior consistent with natural consequences (as when making calculations based on measurements). Behavior then may become sensitive to its consequences because an effective verbal account of contingencies and related performances has been formulated. But such cases still qualify as instances of verbal governance, and the indirect sensitivity to contingencies, mediated by verbal behavior, remains functionally different from that of contingency-governed behavior (Shimoff & Catania, 1998; Skinner, 1969).

Ironically, one class of human behavior more likely to be locally than verbally governed is verbal behavior itself. Our everyday language does not include an effective vocabulary dealing with the functional properties of our own verbal behavior, so we rarely talk about the variables that determine it. In other words, many properties of verbal behavior are typically not verbally governed. That may be why the shaping of human verbal behavior is often easier than the shaping of human nonverbal behavior. But verbal shaping is discussed further below. For the moment it is sufficient to display verbal governance paradigmatically: Verbal discriminative stimuli set the occasion for verbal and nonverbal responses, and these responses may have consequences:

Verbal Governance

VERBAL S^D's → VERBAL/NONVERBAL R's

VERBAL/NONVERBAL R's →
CONSEQUENCES

2. REPLICATION

We tend to repeat what we and others say.

But this replication is not mere reproduction. The child who echoes what a parent says duplicates not the acoustic properties of the parent's utterance but rather a particular sequence of phonemes the properties of which depend on the arbitrary vocal practices of a particular verbal community. The different phonetic units of different human languages are acquired by speakers over long individual histories in which complex articulations are shaped by the differential consequences of vocalization. Included among these consequences are the degree of correspondence between the sounds individuals produce themselves and those produced by others and especially those produced by caregivers. The latter are likely to become significant because they have been correlated with significant interactions between the individual and caregivers or others. The role of such correspondences as reinforcers that shape the various details of the verbal behavior of young speakers during the acquisition of language has been extensively treated elsewhere (e.g., Catania, 1998, pp. 241–246; Palmer, 1996, 1998; Risley, 1977; Skinner, 1957, p. 58).

But we must deal with more than speech. Based on a long and complex history in which we learn the relations among spoken and written stimuli and responses, we say that words are the same whether they are in the auditory or visual mode. We repeat what others say or copy what they have written, but we also speak what has been written or copy down what has been said. For the present purposes, these are all instances of replication, even though they sometimes carry across different modalities.

The main relevance of replication viewed in this way is that these practices allow the effects of verbal stimuli to be extended over time and space as the verbal behavior produced by some individuals is passed on to others. Such replication is not merely a prerequisite for language development. It remains important throughout life, as when we repeat something we have heard or jot down a note about it.

Replication is crucial to the maintenance of verbal behavior both in individuals and in verbal communities: once some individuals begin repeating what they or others say, verbal behavior may be maintained by cultural contingencies and therefore survive across generations (cf. Blackmore, 1999). On the other hand, evolutionary contingencies are likely to favor

systems in which replication can serve additional functions over those in which replication does not. Some effects of replication are fairly simple and straightforward. For example, if a single utterance does not produce characteristic effects on the behavior of a listener, one or more repetitions may do so; the summation of the effects of repeated stimuli is a familiar phenomenon. But if the replicated verbal response also participates in verbal governance, the listener's replication of the speaker's verbal behavior extends the influence of the speaker, as when instructions are passed along from one member to another in a large group. Furthermore, the listener's repetition may create conditions under which instructions may be followed in the speaker's absence, later and elsewhere, in effect transferring governance from the speaker's verbal behavior to the listener's replication of it, as when we repeat to ourselves the details of a task that someone has asked us to complete. The continuing replication of the listener's own verbal behavior may therefore create conditions under which the effects of verbal governance become extended over time and space, even in the absence of the speaker who originally produced the verbal behavior (cf. Jaynes, 1976).

Replication has to come first, but once in place powerful contingencies can maintain it. The effects are potentially far reaching, though their paradigmatic display is simple: verbal discriminative stimuli set the occasion for verbal responses, and those responses can function in turn as verbal discriminative stimuli:

Replication of Verbal Behavior

VERBAL S^D's → VERBAL R's

VERBAL R's → VERBAL S^D's

3. ATTENTION TO VERBAL STIMULI

Some discriminative stimuli are correlated with the delivery of reinforcers and others with periods of extinction. Only the former are likely to acquire reinforcing functions of their own; when they do so they are called conditional or conditioned reinforcers. The effectiveness of discriminative stimuli as occasions for behavior depends on whether the organism attends to them, which in turn depends on their status as conditional reinforcers (Dinsmoor, 1983,

1995). Looking at or attending to a stimulus is reinforced when the stimulus is correlated with reinforcers but not otherwise. An informative stimulus is also a discriminative stimulus, in the sense that different contingencies operate when the stimulus is present than when it is absent. It is not necessarily a conditional reinforcer, however, so informativeness alone is not sufficient to maintain attention to discriminative stimuli. A discriminative stimulus correlated solely with extinction or with aversive events will not function as a conditional reinforcer and therefore may not maintain attention. Experiments on attention typically make the behavior of attending explicit by introducing an observing response, a response that produces discriminative stimuli that would otherwise be unavailable, and then record changes in the rate of this response as a function of the correlations of discriminative stimuli with various reinforcing or aversive contingencies (Kelleher, Riddle, & Cook, 1962).

In other words, organisms do not attend to stimuli because they are informative. Instead, they attend to informative stimuli only if those stimuli are conditional reinforcers. This finding undercuts the appeal to information processing as a primary cognitive process. It also has implications for what happens when stimuli are verbal, because it follows that the effectiveness of a message depends more on whether its content is reinforcing or aversive than on whether it is correct or complete. The phenomenon has long been recognized in folklore, as in accounts of the unhappy treatment of messengers who bring bad news. In fact, what needs explanation is that humans attend at all to bad news or that sometimes they reach conclusions even when the answer is not what they wanted to hear. It is presumably relevant that bad news does sometimes allow effective avoidance behavior and that many stimuli are correlated with sufficient reinforcers that they can maintain attention even when they are also correlated with occasional aversive events.

Attention to a verbal stimulus is a prerequisite for its replication or for governance by that stimulus, and the consequences of either variety of behavior may change the likelihood of subsequent responses to that and similar verbal stimuli. We repeat to ourselves what we have heard or read, and once we have done so our own verbal behavior is likely to summate with other verbal antecedents that participate

in the verbal governance of our behavior. If these verbal stimuli were reinforcing in the first place, then behavior producing contact with more or similar instances will be strengthened, in turn providing even more related initiating instances. It is no surprise, for example, that people turn to news media that are biased toward political views they already hold.

The responses that provide access to verbal stimuli may themselves be either verbal or nonverbal. For example, at a newsstand we can get a newspaper either by asking for one or by picking one up. In the paradigmatic display of attention to verbal stimuli, verbal or nonverbal responses produce verbal discriminative stimuli, and these in turn produce other verbal or nonverbal responses:

Differential Attention to Verbal Stimuli

VERBAL/NONVERBAL R's →
VERBAL S^D's

VERBAL S^D's →
VERBAL/NONVERBAL R's

4. VERBAL SHAPING

We are most familiar with examples of shaping from the laboratory, but natural contingencies may produce shaping, as when differential attention by a parent inadvertently shapes an infant's annoying cries. Shaping is effective because behavior is variable. Reinforcement of a response produces a spectrum of responses that differ from the reinforced response along dimensions such as topography and magnitude. Verbal shaping is of special interest because verbal behavior can also vary along semantic and syntactic dimensions. Demonstrations of the shaping of verbal behavior have an extensive history (e.g., Greenspoon, 1955; Lovaas, 1964; Rosenfeld & Baer, 1970).

Once verbal behavior has been shaped, it may participate in other verbal functions, such as verbal governance. When verbal governance involves an individual's own verbal behavior, it can make a difference whether that verbal behavior has been shaped or instructed. The difference has been studied in the context of human performances maintained by schedules of reinforcement (e.g., Catania, Lowe, & Horne, 1990; Catania, Matthews, & Shimoff, 1982; Catania, Shimoff, & Matthews, 1989;

Shimoff & Catania, 1998), where nonverbal behavior is sometimes more easily changed by the shaping of relevant verbal behavior than by changes in the contingencies arranged for the nonverbal behavior itself.

Just as verbal governance by the instructions given by others can be conditional on other variables, so also for verbal governance by one's own shaped verbal behavior. For example, it makes a difference whether what is shaped describes behavior or describes contingencies operating for that behavior (Catania, Shimoff, & Matthews, 1989). Descriptions of what is relevant behavior in a given environment are not equivalent to descriptions of how that environment works.

The shaping of verbal behavior is a potent technique for changing human behavior. A practical implication is that shaping what people say about their own behavior may be a more effective way to change their behavior than either shaping their behavior directly or telling them what to do, perhaps because verbal communities arrange contingencies for correspondences between saying and doing, as in those for lying versus telling the truth or for keeping versus breaking promises (e.g., Baer, Detrich, & Weninger, 1988; Risley & Hart, 1968).

The fact of verbal shaping implies that verbal behavior itself is sensitive to local contingencies even when it governs other behavior. The greater effectiveness of verbal shaping relative to instructions may depend in part on the speaker's failure to discriminate the sources of the verbal behavior. In other words, even speakers who accurately discriminate among various sources of verbal behavior when following instructions usually call their own shaped verbal behavior self-generated. To change beliefs is to change verbal behavior, but it matters whether we have been told what to say or have come to say it in other ways (cf. Rosenfarb, Newland, Brannon, & Howey, 1992).

Audiences provide discriminative stimuli that set the occasions on which verbal behavior may have consequences and provide reinforcers that shape verbal behavior. Different audiences set the occasion for different verbal classes. Verbal shaping has been studied in experimental contexts, but anyone who has observed drifts in the content of conversation as attention to particular topics or speakers picks up or flags has seen it in a natural set-

ting. Verbal shaping is difficult to track in natural environments because a wide range of social reinforcers enters into it (e.g., eye contact, changes in facial expression or posture, continued verbal behavior) and their effectiveness changes over time (e.g., a comment that works early in a conversation may be totally irrelevant later on).

Verbal behavior is typically shaped by social contingencies, but nonsocial contingencies may also be effective, as when an engineer's calculations lead to successive changes in the specifications of a project or as when a writer edits successive drafts of a manuscript. Such instances, however, clearly depend on an extensive social history of behaving verbally, so it could be argued that the interactions in the behavior of the individual as both writer and reader are functionally similar to the interactions that occur when writer and reader are different individuals.

Shaping typically involves quantitative changes along one or more dimensions of an organism's behavior, but sometimes it produces qualitative changes, analogous to a horse changing from one gait to another as it increases its running speed (cf. Catania & Harnad, 1988, p. 476). Similarly, the gradual changes produced by selection relative to a population mean in phylogeny have been contrasted with more abrupt changes (sometimes called saltations) produced by large-scale changes in the environment. Analogies in the shaping of verbal behavior by natural contingencies might be those dramatic changes called religious conversions or epiphanies, when an accumulation of small changes is followed suddenly by major shifts over a range of verbal and nonverbal classes. In any case, the paradigmatic display of verbal shaping illustrates not only that verbal responses have consequences but also that the new verbal responses shaped by these consequences may then function as verbal discriminative stimuli:

Verbal Shaping

VERBAL R's → CONSEQUENCES

NEW VERBAL R'S → VERBAL S^D's

THE COHERENCE OF VERBAL CLASSES

We have just considered verbal shaping, and

it is relevant to note that some of the most interesting reinforcers of verbal behavior are themselves verbal: an answer to a question, an acknowledgment, a continuation of a line of thought, and so on. But if some verbal consequences are more effective reinforcers than others, it follows that some command more attention than others. Verbal stimuli are discriminative stimuli, and we attend to them, as we attend to nonverbal ones, not on the basis of the information they carry but rather as a function of their correlation with reinforcers. Having attended to them we may replicate them, but in the course of successive replications they may be subject to further shaping. And the newly shaped verbal behavior may also begin to participate in verbal governance. In this brief compass we have already touched on each of the four verbal properties that have been considered. Here they are again, but with a slight difference. These paradigms do not include the nonverbal components.

Verbal Governance

VERBAL S^D's → VERBAL R's

VERBAL R's → CONSEQUENCES

Replication of Verbal Behavior

VERBAL S^D's → VERBAL R's

VERBAL R's → VERBAL S^D's

Differential Attention to Verbal Stimuli

VERBAL R's → VERBAL S^D's

VERBAL S^D's → VERBAL R's

Verbal Shaping

VERBAL R's → CONSEQUENCES

NEW VERBAL R'S → VERBAL S^D's

The point is that the same sorts of terms enter into each of the categories. It has been crucial to distinguish among verbal and nonverbal antecedents and consequences in the course of this account, because verbal units can serve as any term in the three-term contingency. Similar relations can be generated for nonverbal

stimuli and responses, but they cannot so readily exchange their positions (we do not worry about a pigeon greening in the presence of pecks or a rat toning in the presence of lever presses). A verbal discriminative stimulus that participates in verbal governance can be replicated, it can command differential attention, and its replications can be shaped by their consequences. Verbal behavior that has been replicated can participate in verbal governance, it can command differential attention, and it can be shaped by its consequences. A verbal stimulus that commands differential attention can be replicated, it can participate in verbal governance, and its replications can be shaped by their consequences. A verbal response that is shaped is replicated in the course of its shaping, and it can function as a verbal stimulus that commands differential attention and that participates in verbal governance. But if the consequences that maintain these aspects of verbal behavior are primarily social, then verbal communities can create and maintain verbal classes that have ever diminishing contact with nonverbal contingencies. In other words, they can create verbal worlds that become increasingly autonomous.

The individual who generates varied verbal stimuli some of which are more potent reinforcers than others may be producing conditions for automatic verbal shaping. Thus, differential attention to verbal stimuli may lead to self-generated verbal behavior that is somewhat independent of current environments and that may become a pervasive feature of an individual's behavior across a range of different situations. Skinner (1957) provides examples in the areas of poetry and other literary verbal behavior. As contact with current antecedents and contingencies becomes more tenuous (it is after all difficult to disprove claims of heaven and hell, parallel universes and alien abduction) and the circle of speakers and listeners becomes more limited, higher-order verbal contingencies may generate idiosyncratic verbal interactions that are maintained in the behavior of isolated individuals or small groups, as even the social consequences available in the broader verbal community become less relevant. When such concentrated effects show up in the behavior of individuals, they are sometimes called interests or obsessions; when they extend across groups, they are sometimes called fads or cults. Though such behav-

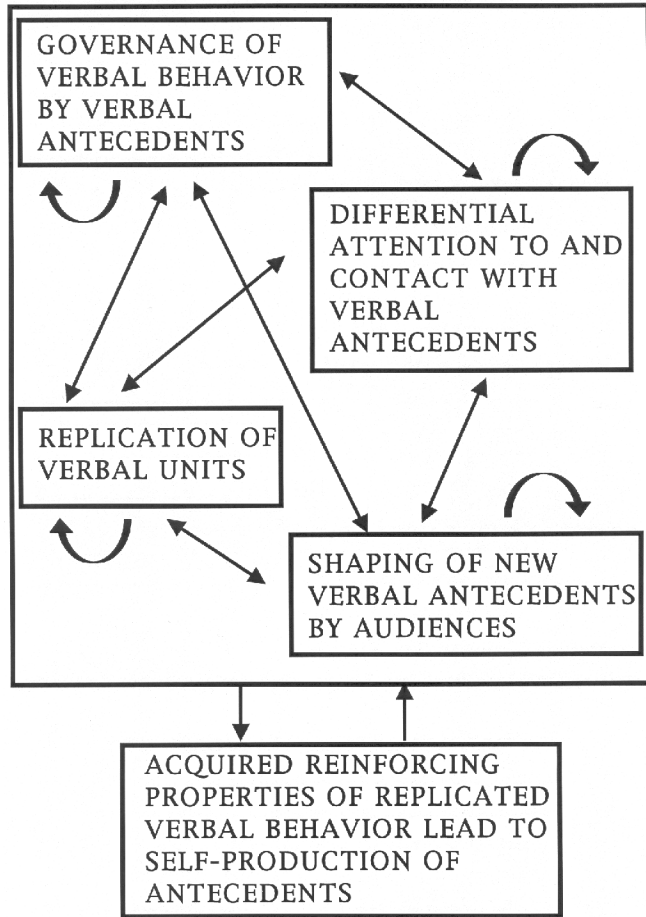


Fig. 1. Schematic display of potential interactions among four verbal processes: verbal governance, verbal replication, differential attention to verbal stimuli, and verbal shaping. These processes may operate not only as different speakers and listeners interact with each other but also within the verbal behavior of an individual speaker/listener.

ior has its own internal coherence, it may appear incoherent to those with other verbal histories. In such cases, verbal behavior seems to stand between the individual and the contingencies of the nonverbal environment.

Figure 1 illustrates these interactions. A flow chart representing a sample behavior stream in which the relations among the various verbal stimuli and responses of a small number of speakers and listeners were labeled according to our several categories might have been attempted, but it could not have done justice to the different degrees in which particular stimuli or responses might share multiple functions or might vary in the magnitudes of their contributions to each verbal relation. This figure must suffice. It shows that each process interacts with every other one as well as with itself, and the

bottom frame suggests that such verbal functions can have their effects not only on the verbal behavior that passes between different members of a verbal community but also on the verbal behavior that is maintained in the repertory of the individual speaker or listener.

The parts of Figure 1 do not merely fit well together; they also become components of cycles within which they strengthen and build upon each other. Omit any one and the cyclicity is significantly attenuated. Even if the social reinforcers that participate in these functions are ordinarily small, they operate on behavior day in and day out over weeks and months and years. We know how much behavior we can shape in just a few minutes with a nonverbal organism, so should we be surprised at the effects of interlocking verbal contingencies op-

erating over human lifetimes? These are powerful variables, and it is easy to imagine how they could sometimes produce verbal behavior that is dull and highly stereotyped and sometimes verbal behavior that is flexible and highly creative. Verbal governance and verbal replication and differential attention to verbal stimuli and verbal shaping make their own separate contributions, but their synergistic effects produce complex behavior that is much more than just the sum of its parts.

With regard to nonverbal contingencies, verbal behavior need not always get in the way. It takes social contingencies to create higher-order classes of verbal behavior occasioned by nonverbal antecedents, but such classes, once established, may be maintained by nonsocial contingencies, as when a situation occasions a description of contingencies that alters someone's subsequent nonverbal behavior. Similarly, governance by verbal antecedents is established by social contingencies, but once established it can be maintained either by nonsocial consequences, as when someone makes a repair by following a service manual, or by social ones, as when someone complies with a request. Although social consequences hold everyday conversation together, the contingencies that involve nonsocial consequences of verbal governance are essential features of science and technology and other extensions of the ways in which we act upon our environments. Its anchoring to nonverbal environments through data is the special advantage of scientific verbal behavior.

CONTINGENCIES IN POLITICS AND RELIGION

Those who become engrossed in some kinds of artificial verbal worlds (e.g., those of Don Quixote or Frodo Baggins or Harry Potter) may get themselves into trouble by neglecting other contingencies, but they might not otherwise make much trouble for others. That is not inevitably the case, however. For example, an individual with a history of replicating verbal behavior in the recitation of religious texts may later differentially attend to a speaker whose verbal behavior is consistent with those texts. That speaker may then shape new verbal behavior and in the course of doing so may also become a potent source of verbal governance. Is it too far-fetched to suggest that such an individual might be induced to hijack a commer-

cial airliner and fly it into an office tower or a military structure?

In fundamentalism, the word is the last word. It cannot exist without verbal control. It is maintained through the shaping of verbal behavior that is consistent with the replication of sacred texts that command differential attention and that participate in verbal governance. Given what we know about verbal governance, acts in the name of religion that some call terrorism and others call martyrdom should come as no surprise. Given what we know about verbal replication, the political endorsement of religious speech should come as no surprise. Given what we know about differential attention to verbal stimuli, the suppression of the teaching of evolution or of Darwin's theory of natural selection by those who endorse the literal truth of the biblical story of creation should come as no surprise. Given what we know about verbal shaping, the vast diversity of human religions should come as no surprise.

Once speakers could instruct the verbal behavior of listeners who could in turn instruct nonverbal behavior, the prerequisites for human political and religious institutions were firmly in place. The invention of writing, perhaps initially a matter of record-keeping, moved verbal governance further from the behavior of individual speakers. Human behavior throughout the world has been and still is heavily influenced by records of long-past verbal behavior. We need only list a few among many: The Analects of Confucius; The Old Testament; Tao Te Ching; The New Testament; The Brahma-Sutras; The Koran; The Adi Granth; Bhagavad-Gita; The Book of Mormon. Even within these examples, disputes may rage over which version of a text is legitimate (the status of the King James version of the Bible provides one obvious example).

In "Science and Human Behavior," Skinner (1953) treated the areas of government and religion as separate topics. Both, however, entail strong elements of verbal governance. It is useful to distinguish the kinds of consequences that governmental institutions can bring to bear from those available to religious institutions, but whether reinforcers are promised and punishers are threatened in this life or in an afterlife, both the promises and the threats depend on a verbal history. Exhortations to behavior in the name of patriotism are not so very different from exhortations in the name of a de-

ity. In their reliance on verbal governance, the two sorts of institutions have much in common. Again we need only list a few documents among many: the Code of Hammurabi; Mein Kampf; the Communist Manifesto; the Napoleonic Code; the Code of Bushido; the Talmud; the Little Red Book of Chairman Mao; the Declaration of Independence; the Charter of the United Nations. The details of the social contingencies that maintain or have maintained verbal governance are somewhat less obvious in these cases than in instances of religious verbal governance, and those details differ in important ways from one instance to another. Perhaps a case can be made that some of those details are more likely than others to be consistent with the survival of cultures.

We have seen that verbal behavior can be tightly determined by nonverbal environmental contingencies, as in scientific practices, or loosely determined, as in social practices such as literature and religion. Like government, religion has its roots in social control. Religious behavior provides compelling examples of the phenomena reviewed here, in verbal governance as demonstrated by the following of religious precepts, in the replication of verbal behavior through recitations of sacred scripture, in differential attention to prescribed and proscribed texts, and in the shaping of verbal behavior by religious leaders in both informal interactions with constituents and in formal ones such as confessions or inquisitions. Heaven and hell, like angels and devils, are human verbal creations. But remember: Anything that threatens them and their interlocking verbal contingencies is sometimes called blasphemy or heresy.

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