

On Verbal Behavior: The Second of Four Parts

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Editor's note: Interest in the behaviorological analysis of verbal behavior (Skinner, 1957) continues to grow. (For an example see the editor's note to Fraley, 2004, which is Part 1 of this paper. Also see the syllabi for TIBI's two online verbal behavior courses, BEHG 355-Verbal Behavior I, and BEHG 475-Verbal Behavior II. These syllabi appear, respectively, in these issues of *Behaviorology Today*: Volume 7, Number 2, and Volume 8, Number 1.)

To help support continuing interest in verbal behavior, *Behaviorology Today* presents this four-part series on verbal behavior. The first part appeared in Volume 7, Number 1. This is the second part. And the remaining parts will appear in the next two issues. (One part appears in each consecutive issue, beginning with Volume 7, Number 1.) All four parts derive from a chapter of the author's book *General Behaviorology: The Natural Science of Human Behavior*. (See the "General Behaviorology" page at www.behaviorology.org for more detailed information on this book.)

For each part, the headings hint at the contents:

✂ Some interesting headings in *Part 1* (Fraley, 2004) were: Terminological Issues, The Antecedent Control of Verbal Behavior, How Instances of Verbal Behavior are Classified, and The Mand.

✂ In *Part 2* some interesting headings are: Verbal Behavior Under the Control of Verbal Stimuli, The Tact, Abstraction, Private Events, Reality, and Temporal Relations.

✂ Some interesting headings in *Part 3* are: Autoclitic Verbal Behavior, Descriptive Autoclitics, Autoclitics that Function as Mand, Qualifying Autoclitics, Quantifying Autoclitics, Grammar and Syntax as Autoclitic Processes, and The Nature and Occurrence of Composition.

✂ In *Part 4* some interesting headings are: The Private Verbal Behavior of Thinking, The Productivity of Thought, The Utility of Thought, Issues of Privacy and Antiquity, The Absence of Thinking, and Nonverbal Consciousness.

Here is Part 2.—Ed.*

Part 2

Verbal Behavior under the Control of Verbal Stimuli

With an appropriate conditioning history, verbal behavior may occur under the antecedent stimulus control of other verbal behavior or its products, such as printed text. Such an antecedently functional (evocative) class of verbal behavior may be provided by other persons, as when a teacher speaks the new vocabulary word *emulate*, and a student repeats the word *emulate*. However, the vocalizer's own verbal behavior can also function to evoke the vocalizer's additional verbal behavior, as when a person who is thinking or saying "two, four, six,..." then produces "eight." Thus, in the major class of verbal behavior that is discussed in this section, the analytical concern is with why the response has occurred rather than with its after-effects. This differs from the analysis of mands, which was carried forward in time to reveal how a mand affected a potential mediator.

Examples of Controlling Relations in this Class

Suppose that a parent mands a child to say *uncle*, whereupon the child says *uncle*. Such a mand is called an *instruction*, and it may be said that the child has complied with the instruction (although the child's response was functionally *evoked* by the mand and was not a willful compliance by a mystical internal child-agent).

If we analyze the antecedent controls on the child's reaction, we can attribute the child's utterance in general to the manding nature of the parent's instruction. The child has been conditioned to behave in ways that reinforce the parent and therefore lead to reinforcing reactions from the parent. The child is also conditioned to avoid the parent's punitive reactions, which may follow any noncompliant behavior from the child. In this example, the parent's statement in the form of a mand to *...say...* controls the utterance of some kind of vocal response by the child. *Say* insures that the child's response will manifest vocally, while *uncle* controls the form of the vocal response that will be reinforced by the audience. Note that in this section of the chapter our analytical attention is focused on what controlled the *mediator's* response, and of interest is the fact that it was a verbal stimulus (i.e., *uncle*).

In common agential language it is said that those features of the parental instruction that define it as a mand to speak *make clear to the child* that a vocal response is now required. Note, however, that mands are not instruments

*The author's footnotes are at the end of the paper.

of persuasion that are directed at the inner child-agent in the hope that such a residential agent will then deign to will that its host body produce a certain kind of response. Instead, as a result of the past conditioning, the parental mand and the child's response are now directly linked in a functional sense. Given that particular mand in the presence of that appropriately conditioned body, the response is simply evoked (i.e., it simply happens, and at that instant it is the only thing that can happen). If the relevant parts of the child's body are currently in working order, but the manded response is *not* forthcoming, our assumption about the adequacy of the child's conditioning history is thereby revealed to have been unwarranted.

Furthermore, as noted in the case of this particular mand, the form of an adequate response has also been specified. That is, the child's vocal response matches the parent's vocal stimulus. The child's response is effective merely insofar as it echoes what the parent specifies. The parent says *uncle* and the child responds *uncle*. Thus, the parent's manded sample and the child's correct response, considered as a pair of stimuli, exhibit two distinct characteristics: (a) what is called a *point-to-point correspondence* and (b) *formal similarity*.

Let us review the relevant controls: (a) The manding form of the parent's statement makes a response probable. (b) The verb *say* determines the *vocal* nature of the child's required response, and in particular that it be an *echoic* verbal response. (c) The vocalized term *uncle* precisely controls the form of the child's echoic verbal response.

The relevant operant conditioning history that prepared the child for an appropriate response of this kind (a) increased the probability that the child's responding will comport with any parental instructions, (b) increased the probability that the child will respond vocally after hearing the word *say*, and (c) increased the probability that the vocal response will have a point-to-point correspondence with any vocalized sample that follows the word *say* in a vocalizer's mand. With those three kinds of conditioning in place, the child is ready to perform in the manner featured in this example.¹

Let us move on to other examples of behavior that fall within this major class of verbal behavior. In the case of *textual behavior*, the response (usually called *reading*) occurs under stimulus control of textual products. Someone's earlier verbal behavior has resulted in a textual product that is now controlling the verbal behavior of the reader. During the early operant conditioning of such textual behavior (i.e., reading), a student may be presented with a sequence of letters (e.g., H-O-U-S-E), following which only the student's audible sound "*hous*" is reinforced. The operant conditioning procedure is repeated until that audible sound follows the presentation of that letter sequence with sufficient reliability. If the spoken word and the printed text are phonetically related

(e.g., the printed word *tad* and the spoken word *tad*), the spoken word exhibits a letter-to-sound correspondence with the text in the sense that each printed letter evokes a distinct sound. Those sounds string together to make the complete word-sound. Note, however, that such a vocalized utterance bears no formal similarity to the sequence of printed letters (i.e., sound forms and print forms are entirely different kinds of forms).²

During such training, in addition to being manded to say the word, the student may also be manded to draw the picture that is privately evoked either by the sequence of letters or by the audible sound that they evoke. Note that with respect to the word *house*, for the child to render the drawing, some additional special conditioning must have occurred in addition to the conditioning of general drawing skills. Either (a) the child, previously, must have contacted houses or pictures of houses, while utterances of the audible sound *house* were being reinforced differentially; or (b) the child, previously, must have contacted houses or pictures of houses, that were paired with the textual stimulus *HOUSE*.³

Given that the child has never before responded in a graphic way either to the spoken sound "*hous*" or to the written letters *h-o-u-s-e* (i.e., by drawing a picture of a constructed dwelling), if the drawing does occur, its appearance is evidence that prior conditioning of the kind described above has established the stimulus equivalence relations that are implicitly required for the child's exhibition of the manded pictorial response (i.e., drawing a house). Note that in these functional relations, which feature drawing behaviors, the spoken or textual stimulus and the drawn response do not have a point-to-point correspondence (or any approximation thereof) nor do they have formal similarity.

Let us now reconsider text, such as that which you are now reading. Text is a product of previous verbal behavior and for that reason is usually classed as a verbal stimulus. The person whose verbal behavior is controlled by text is usually called a *reader*. When reading aloud, a vocal sound is produced in response to each functional stimulus element. The particular graphic form of the textual elements remains an independent variable, so while a reader who is exhibiting textual verbal behavior may be responding to printed words, syllables, or even single letters, that reader can also be responding to pictures, pictographs, or hieroglyphics. The only requirement is that repeated presentations of a given mark, or set of marks, reliably evoke the production of the same vocal sound. People refer to the conditioning history that establishes those controlling relations as *learning to read*.

Not all reading falls in this major class of verbal behavior. Here is an example of such an exception: Suppose that many boxes are hauled onto an aircraft. Each box contains 30 round, white, 12-inch diameter disks that are

thin but rigid. Later, in flight, one box at a time is dumped out of the aircraft door into the air stream, and the individual disks from each box flutter to the green fields below where the disks from each box come to rest in a seemingly random cluster. Each such cluster can then be seen from the aircraft as a patch of small white dots.

Let us assume that, by chance, the disks from one box come to rest in a dot pattern that, if properly connected by straight lines, would form the letter sequence *cow*, and a passenger in the aircraft, looking down at that dot pattern, utters the vocal sound *kou*. The person's utterance of the sound *kou* under stimulus control of those white dots would represent normal reading. However, the antecedent stimulus, consisting of the dot pattern, was not a product of verbal behavior, so that vocal utterance would classify as a *tact* (another major division of verbal behavior that will be discussed in a later section of this chapter). Although the vocalizer's utterance of the word *cow* is verbal behavior of the kind that is commonly called *reading*, in this case that reading does not represent the class of verbal behavior that occurs under stimulus control of *other verbal behavior (or its products)*.⁴

Textual behavior is obviously simpler than what is usually implicit in the common term *reading*. When reading, not only are vocal sounds (or their private subvocal versions) produced—that is, not only are the words publicly or privately spoken—but some additional private kinds of verbal behavior are occurring to which people generally refer as *comprehending*. The production of the sounds that are evoked by the textual elements⁵ in turn evoke a variety of further private responses—for instance, a visualization of an object and visualizations or descriptions of its relations to other events—that is, the context in which it exists or operates. As one's reading skill matures, the comprehension behaviors can come under direct stimulus control of the printed text, and the raw textual behavior extinguishes. In that case, as the mature reader's eyes scan the text, comprehension behaviors are evoked directly, but the individual vocal or subvocal production of the sounds, which previously were evoked by the textual elements, no longer occurs.

On the other hand, textual behavior can continue to occur indefinitely *without* comprehension if the reader has had an appropriate, if atypical, conditioning history. For example, a person can be conditioned to pronounce correctly the printed words in an alien language without either those sounds or the textual elements that evoke them ever being related to other particular environmental elements. That precludes the private evocation of any kind of comprehension responses. Thus, a person can become a skilled reader of text that is printed in that strange language without experiencing comprehension behaviors with respect to any of it. As that situation is commonly

described, such persons vocalize the text correctly, but personally have no idea what they are saying.

In fact, as the person's skill becomes refined, such a "reader," who is actually exhibiting only raw textual behavior, could theoretically daydream about entirely different events while engaged in such vocal textual behavior. Raw textual behavior requires, at the minimum, only that the vocal musculature be under direct stimulus control of the printed text. Daydreaming can then occur concurrently, because it need not involve any of the body parts that are preoccupied by such raw textual behavior. However, such a behavioral bifurcation is *not* possible for a comprehending reader, because the neural body parts with which one would daydream are involved in producing comprehension behaviors and are thereby preoccupied.⁶

Another subclass of verbal behavior that is controlled by verbal stimuli is called *transcription*. An example is taking dictation. Recall that vocal verbal behavior involves a vocalizer who exhibits an auditory pattern that is reinforced when it affects the listener as an auditory pattern. In transcription, a writer creates a visual stimulus that is consequated after having affected a reader as a visual stimulus. The reader may be a third party. Both the listener (as transcriber) and the reader of the transcription typically function as mediators of consequences for the verbalizer's verbal productions.

Consider the behavior of the transcriber. The antecedent stimuli that evoke transcribing behavior can be auditory or textual. If a person produces written text in response to linguistic stimuli that are being heard, the process is called *taking dictation*. If the antecedent stimuli are in graphic form, the person is said to be *copying*. In either case, the transcription behavior is shaped by its consequences, which are normally provided by the readers of the written product. If the antecedent graphic stimuli are not linguistic, the transcription process is more likely to be called *drawing* than *copying*, as when an artist who is looking at a tree, *draws* that tree.

The final subclass to be discussed in this section is called *intraverbal behavior*. Note, in regard to the earlier classes of this subsection, that in both echoic behavior (saying what one hears), and in writing from copy, there is a formal correspondence between the evocative stimulus and the verbal behavior of concern. That is, in echoic behavior, the vocalizer is producing sounds that are similar to the sounds being heard. In writing from copy, the writer is producing records that are similar to those being copied. In both cases, the stimuli and behavioral products are in the same medium (i.e., both are sounds, marks on paper or on monitors, etc.).⁷ In cases of reading aloud or taking dictation, the medium changes insofar as a reader produces vocal sounds that are evoked by text printed on paper, and a transcriber produces written text that is evoked by vocal sounds that are produced by a vocalizer.⁸

Note that in all four kinds of behavior that were mentioned in the previous paragraph, some approximation of a point-to-point correspondence exists between the stimuli and the behavior or its products (see the earlier footnote on the connotations of "point-to-point"). For example, in echoic behavior, the sounds being vocalized are similar to the sounds being heard, and each element of the vocalized stream of sounds corresponds precisely to a specific element in the stream of sounds being heard. Likewise, in writing from copy, each element of the written text corresponds precisely to a specific element in the text being copied. In both textual behavior and taking dictation, even though the dimensional system (i.e., the medium of expression) changes within those processes, an approximate point-to-point correspondence is maintained between the evocative stimuli and the behavior of concern (or its products). Here again, each element of the behavioral product corresponds precisely to a specific element in the stimulus stream that controls the production behavior. For instance, each elemental utterance of a reader can be matched precisely to a specific stimulus element in the text that is being read—hence, the point-to-point (or at least range-to-range) correspondence.

In the intraverbal class, however, that location-based correspondence is missing. That is, in many instances of verbal behavior that is occurring under stimulus control of other verbal behavior, no such point-to-point correspondence, nor any approximation of it, can be found. The verbal behavior is precisely evoked by other verbal behavior, but it remains impossible to match a given element of that verbal behavior to any *specific* element of the evocative stimuli.

For example, if the presented stimulus is *a-b-c-d-e-f..* and the response is *g*, we see no locational correspondence between the stimulus (*a-b-c-d-e-f..*) and the response (*g*). The absence of such locational correspondence in verbal-verbal functions defines what B.F. Skinner called the *intraverbal* subclass of verbal behavior. It features verbal behavior that is occurring under stimulus control of other verbal behavior, but the stimulus and its evoked behavioral product lack locational correspondence or any approximation thereof (point-to-point, part-to-part, zone-to-zone, etc.).

Another example of intraverbal behavior occurs when a person hears the sound *apple* and responds with the sign for apple. The audible stimulus *apple* and the response to it in the form of movements of the arms, hands, fingers, and perhaps the face that together constitute the corresponding sign for *apple* share nothing that can represent locational correspondence between their constituent elements. That is, no point or region in the sound corresponds precisely to a point or region in the movements of the body parts that are creating the sign for *apple*.

Intraverbal behavior is readily explicable in terms of the conditioning history that has established the relation between stimulus and response. We quickly point to such a conditioning history to explain a person's saying *World War Two* when presented with *1939-1945* or a person writing *Pierre Renoir* when shown the famous painting that is entitled *Luncheon of the Boating Party*. Likewise, most people are quite familiar with the kind of conditioning history that renders probable the response *g* in the presence of a stimulus consisting of *a-b-c-d-e-f..*

Note that, in the case of intraverbal behavior, not only is there is no point-to-point correspondence between the stimulus and response that it produces, the dimensional system of the stimulus need not match that of the response or its product. In the previous example in which *a-b-c-d-e-f..* evoked the response *...g...*, the stimulus could be presented either as printed text that must be read, as audible sounds, or as Braille that must be felt tactually. Similarly, regardless of the nature of that stimulus presentation, the intraverbal response *...g...* could have been rendered either as text, in spoken form, or as a special array of raised dots. Other unmatched forms for the stimuli and responses to it are also possible.

Consider another typical example: When one encounters an acquaintance, one is likely to say *How are you?*—a kind of greeting to which the other person may have a standard response: *Very well, thanks!* Such a standard and perfunctory response, when controlled intraverbally, is independent of the actual status of the person who is responding and may therefore not validly describe the status of the person who is responding to the inquiry. Given the question *How are you?*, the intraverbally controlled utterance of the standard response *Very well, thanks!* is functionally similar to the utterance of *g* in response to the stimulus *a-b-c-d-e-f..*

The recitation of a lengthy memorized verbal sequence occurs intraverbally, as in the prior example pertaining to the recitation of the alphabet with each response functioning as the stimulus for the next response. The process is often called *chaining*. Each utterance in the chain of responses is analogous to a link in a manufactured chain. Far more complex sequences than the letters of an alphabet may be featured. For instance, a West African griot recites the ancestral history of the tribe members, which may span hundreds of years. Each short passage is evoked intraverbally, mainly by the features of the previous short passage. Such recitations may not require any supplementary private verbal stimulation of the various kinds called *analysis*, *problem solving*, *critical thinking*, *reflection*, or any kind of thought in general. The common descriptive phrase *mindless recitation* reflects the absence of such supplements from the antecedent controls on intraverbal behavior.

However, the control of each link in a chain of intraverbal responses is not usually under the exclusive control of the previous link. Some of the evocative capacity resides in the preceding *sequence* of links. Thus, if interrupted, the griot may be unable to restart from the point of interruption, and may have to resume from an earlier and particularly salient event that is more readily evoked (in agential language, more easily recalled). The griot thus gets a new running start that restores the full measure of intraverbal control over subsequent sections of the narrative.

A school child may have a similar problem when reciting the memorized names of the American states in alphabetical order. The child may successfully complete the task after beginning with *Alabama...*, but if during such a recitation the child is briefly interrupted—for instance, after *Michigan*—the child may be unable to continue with *Minnesota...* If no prior link has special strength among its evocatives that affords a more economical starting point, the child may have to restart from the beginning with *Alabama...*

As some previous examples have suggested, we often respond intraverbally to stimuli that we ourselves generate. If an American vocalizer says *red, white, and...*, that composite verbal sequence tends to evoke *blue* as that speaker's next response. Similarly, among people who have been conditioned in an American verbal community, the vocal or subvocal stimulus *white* is more often followed by the response *house* than among persons conditioned in the verbal communities of other countries. Upon uttering all but the final syllable of a multisyllabic word, the vocalizer is likely to emit the final syllable under stimulus control of the preceding syllables of that word. For instance, given the vocal stimulus *po•lar•i•za...*, the speaker is likely to complete the word by uttering the final syllable *...•tion*.

In the process of pure *translation* a stimulus in one language evokes a corresponding response in another language—a special case of intraverbal behavior. In theory, translators need not respond to relations between their textual or audible products (in either language) and other environmental events. That is, for example, theoretically, the translator need not be able to define *ouk* or *lur* in either language to produce *lur* in language B when given *ouk* in language A (although in practice translators are typically skilled in both languages, because they are usually expected to interpret as well as to translate). Given the stimulus *ouk*, either as text or as an audible sound, a simple translator needs only to respond reliably and appropriately under intraverbal control with a textual or audible rendering of *lur*. However, satisfactory translation usually requires far more than mere intraverbal control of the responding, especially when the differences in the lan-

guages extend beyond words to include structural and compositional issues.

Conceptual Instability

After Skinner published the seminal book *Verbal Behavior* in 1957, the class of verbal behavior that is discussed in this major chapter subsection (Verbal Behavior under the Control of Verbal Stimuli) was subjected to more redefinition than perhaps any of the other major classes of verbal behavior that Skinner delineated. During the final few decades of the twentieth century, two professors of Skinner's general concept of verbal behavior, Jack Michael, at Western Michigan University, and Ernest Vargas, at West Virginia University, were respectively prominent in tweaking the subcategories in the general class that Skinner denoted as *verbal behavior under the control of verbal stimuli*. Vargas reorganized the whole class under Skinner's subclass name *intraverbal* and then divided the verbal phenomena in that major verbal-behavior category into three subcategories called *codic*, *duplic*, and *sequelic*. Michael moved *codic* and *duplic* verbal behavior out of this major class and promoted them to the same kind of major class status that was accorded to mands and tacts.

The Tact

If we divide the behavior-stimulating environment into verbal and non-verbal events, we can discuss kinds of verbal behavior that are evoked respectively by each of those stimulus classes. Previous sections were devoted to verbal behavior evoked (a) by stimuli that are characteristic of deprivation or aversive stimulation and (b) by verbal stimuli.

In contrast, this section will focus on verbal behaviors, called *tacts*. Tacts in some way specify or indicate the stimuli that evoke them, which can be anything in the physical environment. Tacts benefit the listener and are consequated by generalized reinforcers (mands, in contrast, benefit the speaker and are consequated with specific reinforcers that are often specified by that verbalizer). A simple example of a tact occurs when two lookouts are scanning a landscape, and one of them, upon seeing a distant gray plume, exclaims *Smoke!* The other person may respond to the tact *Smoke!* by saying *Well done!*

Consider the functional difference between a mand and a tact. If hunger pangs are occurring within a person's body, and another person is present who can provide food, the person who is experiencing the hunger pangs may respond verbally to those pangs by saying *Feed me!* That request for food is a mand, and it benefits the person who has said it. However, that same person may instead simply report private contact with that kind of stimulation by saying *I am experiencing hunger pangs*.

That statement includes the tact *hunger pangs*. Thus, the pangs, functioning as antecedent stimuli, may evoke a mand, a tact, or one or more of each. Note that, in the presence of someone who has provided food when informed that the speaker is hungry, the previous statement may function as a polite mand to again provide some food. However, if the mediator obviously will not be providing food, perhaps because, as both parties know, no food is available, the same statement merely functions informatively, but the statement is not a mand for food.

In the general analysis of contingencies under which verbal behavior is produced, we specify the evocative stimulus, the verbal behavior that is evoked, and the source and nature of its consequences. When the verbal behavior in such a relation is a *tact*, the evocative stimulus is some piece of the real or physical environment. It can be anything (e.g., a blood cell, a rose, a cow, a distant mountain, a star, or a galaxy). It can also be a relation between or among such environmental events.

Let us consider an example of a behavior-controlling relation in which the verbal product is a tact. Suppose that an observer is confronted with a vertically oriented wooden shaft that is about six inches in diameter and six feet long and exhibits an approximately circular cross section. Its bottom two feet are sunk into the ground and lateral strands of wire are nailed to its upper exposed segment. If that observer reliably responds to that composite stimulus by saying *fence post*, that utterance is a *tact*.

Some people may say, in agential terms, that *the person has tacted the fence post*, but that tact-type of response was not initiated by the vocalizer; it was evoked by the post. That is, to speak accurately, the causal nexus of a tact does not inhere, as some kind of spontaneous generator, within the body of the person that exhibits the tact. Therefore, the person who produces the tact does not *do it* in the sense of originating it. Rather, that person merely mediates the production of that tact. The controlling function is between the tact as a behavioral event and a detectable and measurable (i.e., real) environmental event.

The post could produce that verbal behavior *fence post*, because the body that came into contact with light reflected from the post had undergone micro-structural changes during its operant conditioning history that left it reactive to such posts by exhibiting that particular kind of verbal operant response to them (viz., the vocal utterance of *fence post*). The capacity for that kind of functional relation between fence posts and people inheres in their respective structures. The kind of operant conditioning that is called *language training* is a way of restructuring part of the person's nervous system for susceptibility to involvement in such a functional relation during subsequent encounters with fence posts.

The operant conditioning (neural micro-structuring) of the person is one way to establish the relation that pro-

duces the tact. The other way is to alter the structure of the environmental event. In the fence post example, if the respective structures that can sustain this particular environment-behavior relation (i.e., the tact *fence post*) are generally in place, but the particular post on this occasion has some salient atypical features, the evocation of the tact *fence post* may not occur. (It may be said that the observer does not recognize that the thing is a fence post.) Instead of tweaking the microstructure of the person's body through additional operant conditioning, we may leave the body alone and restructure the fence post to render it more typical of the kind of fence posts that were involved in the past conditioning of the verbalizer to produce that tact. The tact *fence post* may then be evoked. In such a case, the verbal tact *fence post* occurred in reaction to a particular environmental structure following a modification of the environmental structure that removed extraneous features (and perhaps added some common features) until the structure of that post came into the structural range that can evoke the tact *fence post* by that particular body.

When the tact *fence post* is forthcoming, it may be said redundantly that *the person now recognizes the thing as a fence post*. However the current structure-to-structure functional interaction occurs naturally whenever both structures have the necessary configuration to support that particular functional reaction of the one to the other. That natural function does not require the intervention of a person-agent that is superstitiously summoned from a putative spirit world to perform, in some proactive way, the tacting operation. The tact will simply happen naturally and inevitably when the necessary conditions "fall into place" (as they say). That is, the tact happens automatically in the same sense that any kind of dependent variable manifests on the occasion of contact with an appropriate independent variable.

The term *stimulus* implies an energy transfer from some aspect of the environment to the organic body that, in turn, exhibits a behavioral response. However, the energy that is transferred from an environmental stimulus to a behaving body acts only as a reaction-specific trigger, because that energy is insufficient to produce the subsequent behavioral reaction through conservative energy transformations (light waves from an approaching baseball lack the energy required to swing a bat). Organic bodies are inherently structured to maintain a general dynamic potential that releases in the manner that we call behaving. The energy transferred from the environmental event merely triggers the release of some of that potential energy, which has been stored in the body, to produce a behavioral manifestation of the kind that we describe as the behavioral response to that stimulus. While the specificity of the resulting behavior is a function of the properties of the small triggering energy that is impinging from the

environment, the greater energy that is necessary to produce that behavioral manifestation must be released from general reserves that have been stored in the body.

Through the processes of behavioral conditioning, a particular form of the behaving becomes precisely related to a particular triggering event. To establish such a relation between an environmental stimulus and a particular behavior, it is necessary to change the microstructure of the body's nervous system to render it uniquely sensitive to the properties of that particular environmental stimulus. Although that kind of microstructural change could at least theoretically be accomplished by surgery or drugs, it is instead typically the natural result of a behavior-conditioning process.

For a more detailed account of such events, we must switch to a different level of analysis and look to the neural physiologists, who, like the behaviorologists, represent one of the basic natural sciences (i.e., biology, in the case of the physiologists). The respective scientific concerns of the behaviorologists and the neural physiologists overlap along certain disciplinary interfaces, the behavioral conditioning process being an obvious example.

However, to provide such a naturalistic account, the neural physiologists will have to divorce their interpretations from the popular but mystical accounts of behavior that implicitly accept a mind-body dualism by featuring explanatory reliance on autonomous or semi-autonomous body-dwelling self-agents that can "do things on their own." No part of nature can work that way, and there is no natural way that brain activity, that must always operate reactively, can spontaneously initiate behavioral events. Those who assume that brains are somehow engaging proactively, on their own initiative, in the origination of the behavior that the body then exhibits usually speak of *minds* that putatively are either synonymous with *brains* or remain mystical constructs that they conceptually superimpose on brains.

A natural science community cannot do good natural science in conjunction with a scientific community that is informed by non-natural philosophy. Substantial progress can be made only when such a blending of accounts occurs between two natural science communities.

Conditioning a Tact

Consider a person who has never, in any sense, contacted a thromble. It may be said that the person is unfamiliar with thrombles and has no idea as to their nature. Suppose that we then place a thromble before that person in a way that permits different kinds of contact with it, each involving a different sense. We then descriptively label it by saying *This is a thromble*. Next, we mand the person to identify the item by name, which the person can do easily by repeating the term *thromble* that we have just spoken. If the person then produces an echoic response

to the nominal part of our mand by saying *thromble*, let us suppose that we reinforce that response, perhaps merely by replying *You are correct*.

To the extent that the consequence was a reinforcing stimulus, the person thereby will have become more likely to say *thromble* in the presence of such an item. With successive reiterations of that operant conditioning cycle, the person becomes increasingly likely to exhibit that response as a tact in the presence of a thromble. We may then alter the form of our mands in ways that put the person under contingencies to become more verbally involved with thrombles—thinking, speaking, reading, and writing about thrombles, perhaps while in visual, aural, olfactory, and tactile contact with them. During all such interactions, we insure that each correct verbal response pertaining to thrombles is reinforced.

When an acceptable reliability is attained in each of those verbal kinds of behavior-environment functional relations, it may be said that *the person has come to know what a thromble is, and to know something about them as well*. However, operant conditioning does not educate spirits that are called *persons*. Operant conditioning establishes functional relations that manifest naturally when an appropriately structured organic body and a specifically structured environmental elements come into appropriate contact.

The kind of lone response that simply identifies something is sometimes called a *raw* tact, because it consists of nothing more than an unenhanced utterance under stimulus control of an environmental event (e.g., *Thromble!* when uttered in response to contact with a thromble). Raw tacts are common under contingencies to name or identify whatever is presented. However, the raw tact is often accompanied by other verbal behaviors that are functionally controlled in ways to be discussed later: *There is a thromble; It is a thromble; This is a thromble; I see a thromble; I think that I feel a thromble*.

The strength of the relation that controls a tact, being operantly produced, is subject to reduction through punishment or extinction. Presented with an object and manded to name it, a vocalizer who then says *thromble* may find that that response is followed by what seems to be a punitive consequence supplied by a mediator (e.g., *Wrong! You stupid disgusting dolt!*). A subsequent presentation of the item may then be less likely to evoke the tact *thromble* due to the suppressing effect of its previous aversive consequence—an outcome that confirms the punitive function of the listener's reaction. If the response (*Thromble!*) is simply ignored whenever it occurs, it will also become less likely to occur, but in that case the decrease is said to represent extinction. Just as the verbal community can condition the controlling relations for the production of verbal behavior, the verbal community can also reverse the conditioning of such relations.

Mands and tacts have different effects on a mediator. Upon hearing a mand, the mediator infers something about the condition of the vocalizer—in particular, the vocalizer's state of deprivation with respect to the environmental event specified by the mand. In contrast, upon hearing a tact, the mediator infers something about the environment of the vocalizer. For example, compare the effects on the mediator of hearing *Give me a knife* and hearing *There is a knife*. In the former case, the vocalizer is inferred to be deprived of a knife. In the latter case, a knife is inferred to be a stimulus element of the vocalizer's immediate behavior-controlling environment.

The utility of a tact can be revealed by a simple illustrative interaction between a verbalizer and a mediator. Suppose that the mediator is knife-deprived and is not in current contact with a knife. If the vocalizer then tacts a knife (e.g., *There's a knife*), the mediator may benefit from the vocalizer's tact insofar as that tact may function to evoke elements of the mediator's searching repertoire. That is, the mediator may then start searching for a knife, because, in the past, when verbalizers have provided tacts of that kind, the mediator's searching behaviors have been more likely to be reinforced by contacts with the tacted item. In the present example, the knife-deprived listener is more likely to find a knife if a nearby vocalizer indicates a personal contact with a knife. In fact, a verbal community conditions its members to exhibit tacts precisely for such reasons. All parties generally benefit when an individual indicates to others how he or she is being affected by the environment, especially when at least some part of that environment is being shared with others who are also under contingencies to interact with it.

Tacts are often manded by others, which indicates a greater likelihood of their being reinforced. Suppose, for instance, that two people are confronting the same environmental event. Person A asks *What is that?*, which to person B is an occasion on which B's tact will probably be reinforced. If B then says *It's an impact crater*, person A may respond with *I think you're absolutely right!* However, A may instead punish or extinguish B's tact if in the past A's different tacts of events with similar features have generally been reinforced. In that case, we may say that *A knows better than to call that thing an impact crater*, provided that we have had a conditioning history similar to A's history with respect to such events. On the other hand, if our conditioning history with respect to such events has been similar to B's history, we would exhibit the same tact as B in the presence of that event, and we may react to A's disagreement by concluding that *A just doesn't get it!*

The Stimulus Control of Tacts

Tacts are conditioned operantly, but environmental events have various properties to which the conditioning

of tacts pertains differentially. Suppose that we present a thromble to two persons who have no experience with thrombles. We arrange for both of them to contact the thromble in similar ways. We then announce to both trainees that *This is a thromble*, which is the occasion for an echoic response to our follow-up mand *What is this?* Suppose that both trainees then respond by saying *A thromble*, and continue to do so reliably as we repeat the mand. We may then conclude that *both of those people have learned what a thromble is*, or that *each of them can now identify a thromble*.

Nevertheless, a question remains as to what stimuli have actually come to control their respective common responses. Thrombles have many properties, including color, texture, shape, size, and different kinds of motion. Furthermore, each such property is represented by a particular and unique set of more elemental stimuli. During the operant conditioning that characterized the training, which stimuli, intrinsic to thrombles, were actually gaining functional control of the tact? Perhaps more importantly, were the *same* stimuli gaining control of the tact *thromble*, which both persons can now utter in common when a thromble is presented. Even when a given elemental stimulus that constitutes one aspect of a thromble comes to share in the evocation of each person's common tact *thromble*, we have no reason to assume that its share of the control of that tact is equal for both speakers. The question of stimulus control-share represents a standard kind of challenge during behaviorological analyses of tact-producing functions.

While it is probable that a number of properties share in evoking each person's common tact *thromble*, it remains unlikely that any one stimulus element shares equally in those evocations. Furthermore, it is possible that a given stimulus element that shares in defining a thromble for person A, may have acquired no detectable evocative capacity for the tact *thromble* by person B. After all, a given person's susceptibility to conditioning is always a function of earlier relevant conditioning, so persons A and B cannot be expected to share the same state of readiness for any given lesson. The implications of this fact pose a kind of fundamental challenge to all teachers who must work with groups of students.

It is also possible that certain properties of the settings in which thrombles commonly occur may gain some of the evocative capacity when the tact *thromble* is reinforced. That is, contextual stimuli that are not intrinsic to thrombles may have gained some control of the tact *thromble*. It may then be said that the person's concept of a thromble is *imprecise* or *not entirely correct*. (Note that *concept* is a fictional construct that substitutes for the tact-producing functional relation between an environmental event and a verbal tact.)

These various kinds of imprecision in the conditioning of a tact can leave properties of the environment with unanticipated or disproportional evocative capacities. In common agential terms, it may be said that the two speakers have different reasons for calling the same object a thromble. The commonalty in the respective controls on their common tact contributes to the socio-cultural integrity of their verbal community, while the unsuspected differences may create disconcerting problems. In common language, it may be said that one person's new "knowledge" of thrombles differs from the other person's new "knowledge" of thrombles even though, outwardly, it may appear at first that both have simply learned to identify a thromble by name when it is presented.

Suppose, for example, that the conditioning of one of the persons has left one or more irrelevant properties in partial control of the tact *thromble*. In that case, given a thromble that does not feature such irrelevant properties, the person would fail to call it a *thromble* even though others may reliably do so. Consider a person who has learned to identify sycamore trees, all previously encountered examples of which have been full grown. That individual may fail to identify a sycamore seedling as a sycamore tree, because the conditioning of the functional relation between tree and utterance of name has left size (an irrelevant property) in partial but essential control of the nominal tact. We allude to that kind of flaw in the conditioning of that tact when we note that size is not a definitive property of sycamore trees.

People may say that the person's concept of a sycamore tree is flawed, but the person does not *have a concept* (flawed or perfect). Instead the person has a neural microstructure that requires some further conditioning tweaks, so that when the person's body reacts functionally to sycamore trees by producing the appropriate nominal tact, the range of environmental controls that are evoking those tacts will be appropriately narrower. Only definitive properties must share in evoking the nominal tact, and in the case of sycamore trees, size is an irrelevant property. That is, little sycamore trees are still sycamore trees.

If a new composite stimulus is encountered that shares some property with the stimuli that were present when the tact was reinforced, that novel composite stimulus may evoke that same tact in this new and perhaps inappropriate context. In such cases, that single common property exerts a predominant evocative control over the tact. Often, the result is a familiar kind of mistake. An example occurs when a person, who is familiar only with red fire trucks but not with ambulances in general, is presented with a red ambulance and calls it a fire truck. In some cases, however, the resultant tact is appropriate to the new situation. Such oddly evoked but acceptable tacts are described as *extended tacts*, and several subclasses have been identified.

Let us consider some examples. Suppose that upon encountering a new kind of knife for the first time, a person says *knife* without additional preparatory conditioning. While that particular knife has some properties not previously encountered in other knives, it shares the minimal definitive properties of all knives. We look for the evocatives of this tact among those previously strengthened common definitive properties, not among the novel features of this particular knife. This kind of extension of a tact is called a *generic extension*. The generically extended tact specifies a class into which the stimulus fits. Generic extension is regarded as desirable insofar as it results in a person eventually responding with the tact *knife* to a large variety of objects that feature one or more cutting blades.

Thus, generic extensions of a particular tact can represent a worthwhile economy for the verbal community. Within a verbal community, it is generally effective for a person to emit the tact *knife* when contacting *any* given member of that class of objects whether or not that person has ever encountered a knife with that particular set of irrelevant properties. Peculiar knives are still knives. It would be too burdensome if the verbal community had to condition each person anew to exhibit the generic tact *knife* in response to each different kind of knife when it was encountered. When an automobile manufacturer first puts a new model on public display, although none of the public viewers will previously have seen that particular style of car, they are all likely to tact it at once as an *automobile*. In fact, that kind of generic extension of a tact is so widely anticipated that a witness's pretense that it is not happening is accepted as humor (e.g., the question *What is that?* expressed with mock start and exaggerated emphasis on the word *What*).

Properties that are not essential to membership in the major class can play a role in controlling the tacts of subclasses within in the major class. For instance, sets of properties that may be associated with some but not all knives can be put in control of the adjective that completes the tact of a category of knives (e.g., *pen* knife, *hunting* knife, or *carving* knife). Such a set of properties is irrelevant to the basic generic tact *knife*, but that set of non-definitive knife properties is the definitive evocative factor for the designation of the categorical tact (i.e., *pen*, *hunting*, or *carving*).

Such categorizations, which are based on *extraneous* properties of knives per se, are to be distinguished from generic extensions of the tact *knife*, which occur when certain *definitive* properties of knives occur in close combination with properties that may bear no relation to familiar knives. Thus, in generic extension, the bow of a ship may evoke *knife* as when a vocalizer describes the bow of a ship as a *great knife that slices the water*. Here, the critical property (a sharp cutting edge) is not extrane-

ous. Rather, it is part of the definitive set of properties for knives, and the bow of a ship functions as a knife to cut the water. Ships are fitted with big knives called bows, and when such a statement first emerges as an original observation it represents a generic extension of the tact *knife*.

Another kind of extension of the tact is characterized by metaphor. In a metaphorical extension of a tact the property that controls the extended tact is not a property that the verbal community respected when originally conditioning the verbalizer to emit that tact. A metaphorically extended tact is evoked instead by a property that was associated with the originally tacted event but was not a definitive property of it.

Consider, for example, the statement *The old crab had nothing nice to say and just stood there with a sour look on his face*. Let us analyze the tact *crab* in that statement. First, we note that *his* indicates that *crab* refers to a male and, because only humans normally talk, we infer that the *crab* in this sentence is a human male. While (a) this particular man and (b) crabs in general both share certain behavioral patterns when provoked, note that those kinds of behaviors by crabs were not the definitive properties of crabs respected by the verbal community when it was conditioning this speaker to tact certain kinds of organisms as *crabs*. Regardless of how a crab is behaving, it is still a crab. That even remains true when the crab is dead. Nothing that a crab does behaviorally bears in any way on its membership in the crab class.

Therefore, when first being conditioned to produce the tact *crab* on appropriate occasions, the verbalizer's tacts had to be freed of control by any behavioral events that are associated with crabs. To accomplish that, the verbal community had to vary the irrelevant behavior-related properties of crabs that appeared along with the minimum definitive set of properties while reliably reinforcing each correct expression, and only correct expressions, of the tact *crab*.

The man in this example was tacted as a crab under stimulus control of a behavior pattern that is often associated with crabs (but not definitive of crabs). That sort of control of the verbalizer's utterance (by a frequently crab-related but non-definitive property) rendered it a metaphorical extension of the tact *crab*.

Another example of the metaphorical extension of a tact occurs in the lyrics of an old but well known song: *You are my sunshine, my only sunshine. You make me happy when skies are gray. You'll never know dear how much I love you. Please don't take my sunshine away*. The person about whom the song is sung is designated by the extended tact *sunshine*.

When the verbalizer was originally being conditioned to produce the utterance *sunshine* as a valid tact, nothing about the electromagnetic radiation emanating from a particular stellar source included behavior-related properties. The contingencies arranged by the verbal commu-

nity to condition valid tacts of that phenomenon kept the verbalizer's tacting free of control by behavior-related events.

However, sunshine does commonly evoke certain behavioral reactions that have reinforcing properties. "*Sunshine makes me feel good!*" is an old and familiar expression. Obviously, one's emotional reactions to sunshine are not definitive properties that should control valid tacts of solar light energy. However, when another person's behavior evokes one's behavior that is similar to that evoked by sunshine, one may then exhibit the tact *sunshine* under stimulus control of that person's behavior. Linguistically, that person is said to *be* sunshine, which, of course, is not true as all parties recognize. Such an utterance is said to represent a metaphorical extension of the tact *sunshine*.

Suppose that, for the first time, a vocalizer describes a narrow projection of land that extends into a lake as a *finger* of land—never before having read nor heard of such a piece of land being described as a finger. Such an elongated projection of land into a large body of water and a finger that is attached to a hand share some geometrical and relational properties. Although those geometrical properties of appendages to hands and land masses are shared, those were not strictly definitive properties of fingers that served as criteria for the verbal community's reinforcement of the tact *finger*. Short, stubby, and round-shaped appendages could also validly have evoked that tact *finger* if other more definitive properties were also present.

When the verbal community is conditioning its members to utter the tact *finger*, the limited subset of geometrical properties typically occurs *as an intrinsic characteristic* along with a larger variety of properties that characterize such appendages to peoples' hands. That is, when conditioning its members to say *finger*, the verbal community reinforces the relations between the tact *finger* and properties that include connection to a biological hand, protrusion from that hand, physiological factors that characterize organic tissues, articulated joints, and perhaps the capacity for movement that enables various behaviors that are characteristic of fingers. In the verbal community, a finger is one of those five, similar, elongated, and triple jointed biological parts that extend from the palm of a hand. Pronounced elongation is typically exhibited along with the other properties of those appendages. However, that elongation is simply not a technically definitive property, and a carefully managed program of conditioning of the tact *finger* would exclude that geometrical property from the contingent relations in which the general tact *finger* manifests. Short, bulging or stubby fingers are still called fingers.

However, during that conditioning, the evocative capacity of some of the irrelevant general geometric properties of fingers may have been strengthened

inadvertently simply because those geometric properties were often paired with the properties upon which the conditioning was focused. Thereafter, those geometrical properties may evoke the tact *finger* even when they appear in a part of the environment that has many other salient properties that are unassociated with fingers. An example is a narrow extension of land projecting out into a body of water.

When such a piece of land first evokes the tact *finger*, that utterance is said to represent a *metaphorical extension* of the tact *finger*. The capacity of the land mass to evoke the extended tact *finger* inheres in geometrical properties that are shared with most organic fingers. Such vocalizers may say that such projections of land remind them of fingers, but events that occur in the normal operant conditioning of the tact *finger* account for its relatively rare metaphorical manifestations in such novel contexts without explanatory recourse to mental agents that have to be *re-minded*. Another similar example of the metaphorical extension of a tact is provided by original references to Italy as a *boot*.

To distinguish between generic and metaphorical extensions of tacts, note that in a generic extension of a tact the new stimulus that has come to evoke that tact represents a valid member of the evocative class. Consider a newly encountered substance that for the first time is tacted as *coffee*. If that has indeed occurred through generic extension, the new substance is actually a kind of coffee. The minimal set of properties that are definitive of coffee were the ones that evoked the extension of the tact *coffee*, and that is what rendered that extension *generic*.

In a metaphorical extension of a tact the functional control is exerted by a set of properties that are insufficient to establish a valid generic extension of the tact. To experience a complete appreciation of a metaphorical extension of a tact, a mediator must recognize both the commonality and the shortfall in the evocative properties that control the verbalizer's statement. Both definitive and non-definitive properties may be involved in controlling a metaphorical extension of a tact, but the set of properties that are controlling it do not include the minimal definitive set of properties for the tact that is undergoing the extension.

For instance, when, for the first time, the phrase *the jutting chin of Gilasitan* is uttered in response to a peninsula on the human head shaped island of Gilasitan, the listener does not react as if that peninsula is really a chin. Note that the metaphorical extension of the tact *chin* did occur in response to certain geometrical and relational properties that are shared with real chins. While the precise shape of the peninsula probably does not match that of any real chin and only approximates the general shape of human chins, the relational property of a rotated protrusion from a central mass is closer to a definitive prop-

erty of a human chin. However, additional properties of other kinds are also necessary to complete the minimal qualification as a human chin.

Nevertheless, the qualitative success of a metaphorical extension of a tact is a function of reliable commonality of the stimuli that are in control of both the normal occurrences of the tact and its metaphorical extension. Consider a person who encounters a grove of red maple trees on a sunny autumn day when the leaves are a bright red color. Suppose that this person describes the scene as *trees of knives*. That statement seems to be some sort of metaphorical reference, but most listeners would be perplexed, and may punish the statement as an unskillfully rendered linguistic product.

Suppose that analysis reveals that the verbalizer had undergone an insufficient program of conditioning of the tact *knife*, perhaps being exposed only to knives that had bright red handles. That salient red hue was common to *all* of the knives that were encountered by this verbalizer during the conditioning of the tact *knife*. Although an irrelevant property of knives per se, the bright red handle color was paired with the definitive properties of each given knife on every occasion during the operant conditioning of the tact. That circumstance permitted some associated respondent conditioning that brought the tact *knife* under stimulus control of the bright red color. Allowing that sort of thing to happen is a common kind of teaching mistake.

Thus, the verbalizer in this example was well prepared for an extension of that tact in response to the bright red patches of color presented by the autumn foliage of red maple trees. To the verbalizer, it was a generic extension (however faulty)—that is, the red leaves were knives too. However, most if not all of the potential mediators in that person's verbal community were conditioned to respond to the tact *knife* only when uttered under a composite stimulus control that excludes color-related properties. In this example the speaker is saying *knife* exclusively under control of a red hue, while the audience disregards color as a relevant property of knives, having failed to contact redness among the constituent properties of many of the knives with which they are familiar. During their conditioning of the tact *knife*, redness and knives were too infrequently paired to sustain the metaphorical extension uttered by this particular verbalizer, and they do not reinforce its production.

As this example illustrates, in a generic extension of a tact, more and more collateral properties may be brought into the range of properties that control the tact, often inadvertently. In the agential language that ignores environmental control and instead regards tacts as evidence of internal constructs called *concepts*, the display of an invalid generic extension such as the tact of red leaves as knives is said to reflect a *faulty concept*. If the invalid ge-

neric tact is instead interpreted by a member of the audience as a metaphorical extension, that audience member would be assuming that the speaker “knew that the leaves were not really knives.” However, for the previously described reasons, that metaphorical reference to leaves as knives would fail to qualify as a worthwhile metaphor. People would tend to say that the implicit relation of knives to leaves seems too vague, a condition that condemns the metaphor to ineffectiveness.

In valid generic extensions of a tact, the new stimulus that comes to control the tact possesses all of the definitive properties that collectively or elementally could control the original tact. We say that a newly recognized hammer is indeed a hammer, although its collateral properties may control a further tact that manifests as a qualifying adjective (e.g., a *sledge* hammer or a *tack* hammer).

In contrast, in metaphorical extensions of tacts, the new stimulus that comes to control the tact does *not* include the complete set of definitive properties that can share in the control of the valid original tact. For example, when a verbalizer refers to the largest watermelon in a garden as the “Jupiter of the patch,” we do not react as if that statement had occurred under stimulus control of the largest solar planet. That is because the only property of Jupiter that is exhibited by that melon is the relational property of largest in a set. All other properties of a watermelon and the planet Jupiter evoke uncommon responses—or, as we say on that basis, that particular watermelon and Jupiter are defined by entirely different properties (except for the one common property on which the metaphor relies).

Some metaphorical extensions of tacts cannot be related to any property that is exhibited in common by (a) the traditional kind of evocative stimulus and (b) the new evocative stimulus. Consider, for example, the statement “*your book is a breath of fresh air*,” uttered by a reader to the author of that book. Detailed examination of the book and of wafts of fresh air are unlikely to reveal *any* common properties, yet the metaphor may seem to be effective. In such cases, the commonalty is not between properties in the respective evocative stimuli, but in the speaker’s responses to them. That is, the book and fresh air, although composed of entirely different stimuli, share the capacity to evoke a common emotional response by the verbalizer, and the metaphor is based on that commonalty in the responses to the entirely disparate sets of stimuli that are specified in the metaphorical statement (*viz.*, book and fresh air).

When certain properties of narrow terrestrial projections into bodies of water came to evoke the tact *finger*, that metaphorical extension relied on two properties, one geometric and one relational (i.e., elongated shape and contact, along a shorter side, with a large area). Except for

those two properties, fingers and land masses share few if any other properties.

Suppose that, in the experience of a particular verbalizer, such fingers of land that project into bodies of water have *always* been covered with vegetation having a particular green shade. Further suppose that that individual is a passenger in an aircraft that is flying over a similarly colored but *not* elongated patch of vegetation in the middle of a large forest far from any bodies of water. When that somewhat circular patch of green is viewed from overhead by this individual, it may evoke the tact *finger*. For instance, that person may mand a companion to *look at that finger of vegetation* (in this case, a *finger of vegetation* within a larger forest).

Here, however, only color and complete isolation by contrast are the critical evocative properties for the extended tact *finger*. Geometric factors are no longer sharing in the control. (For most people, such a set of properties more commonly evokes the tact *patch* than *finger*, and the metaphor may be ineffective with such an audience). However, it may be effective in this case if the verbalizer’s companion has shared this verbalizer’s conditioning history with respect to the initial extension of the tact *finger* under the control of a certain kind of land mass that consistently happened to feature vegetation of the particular green hue that has become functional.

Note that this example illustrates the metaphorical extension of what is already a metaphorical extension. That is, it features a second order metaphorical extension insofar as the phrase *finger of land* already represented a metaphorical extension of the tact *finger* before the final metaphorical extension occurred under control of just the color and its isolation.

Consider another example: Suppose that, in the same geographical region featured in the previous example, big crops of watermelons are produced, but they are grown only on such fingers of land that extend into bodies of water. Further suppose that *all* watermelon patches in that person’s experience have been located on elongated stretches of land that extend outward into bodies of water and that all such peninsulas that this verbalizer knows contain patches of watermelons. Such a verbalizer may then report his or her location by saying that he or she is now “on a *melon patch* about 40 miles west of town,” when he or she is 40 miles west of town on a projection of land that extends into a body of water.

When reporting the location as a *melon patch*, the verbalizer may not, at that moment, be in contact with an actual watermelon patch, although he or she is on the kind of peninsula on which watermelons are invariably produced. Such an expression of position is, of course, effective only with a mediator whose conditioning history has prepared that person to respond to “*melon patch*” in

the same way that people in general respond to “*peninsula*” or merely to the metaphorical phrase “*finger of land*.”

From this example we see that tacts are thus extended in yet another way, called *metonymical extension*, in which the form of the tact is changed. This kind of extension occurs when a stimulus that reliably accompanies the stimulus that controls a tact also gains control of that tact, which emerges in a new form. Functionally, it is the same tact, but a different word or phrase is vocalized. Such an extension is exemplified by the famous exclamation transmitted by Navy Captain James A. Lovell, Jr., commander of the 1970 Apollo 13 lunar mission, following an on-board explosion in space while en route to the moon: *Houston, we have a problem!*

Lovell was not speaking to the city of Houston, Texas, but was instead speaking to a flight controller at the mission control center that was located in Houston. The essential fact is that the mission control facility from which that flight controller spoke was located within the area to which people refer as *Houston*. In the past, whenever more direct tacts of that controller had been reinforced, the proximal city shared in the conditioning effects of those reinforcements. Once the city name began to replace the controller’s usual designator as the tact, the relation between the controller and the speaker’s tact *Houston* began to absorb the *main* reinforcing effect of the reinforcing consequences, and that metonymical extension of the original tact therefore became increasingly probable during subsequent transmissions. The natural metonymical extension of what originally may have been a nominal tact (e.g., *Jack*) or a generic tact (e.g., *Flight Controller*), as described above, actually occurred historically before Lovell’s time in space and thereafter was simply taught to new astronauts, Lovell included.

Many other common examples can be cited. *According to the New York Times...* is not a reference to a newspaper that writes itself. It is a reference to some text written by some author that was published in that newspaper. Through a metonymical extension of the tact of that author’s name, the name of the newspaper has become the tact. When we read that *the rank and file of musket advanced behind the charge of twenty horse*, we respond as if we are being informed that a group of foot soldiers advanced behind twenty cavalymen who led the way with a horse mounted charge. The appearance of the tact *musket* in place of foot soldiers, and *horse* in place of cavalymen, represent metonymical extensions of those respective tacts. The conspicuous omission of the conventional plural *...s* from *musket* and *horse* in the printed report is a stimulus tweak that helps alert the reader to the metonymical nature of those tacts within the statement.

Metonymical extensions of tacts may occur accidentally and surprise both speakers and listeners. They may also emerge under contingencies to exhibit novel forms

of speech. They sometimes gain strength as negatively reinforced escape behaviors as, for example, when a vocalizer, unable to identify the mediator, resorts instead to a metonymical extension. For example, suppose that a person has placed a telephone call to the Chief of Police to report a crime, but when Chief Badger answers, the excited caller cannot recall the Chief’s name (i.e., Badger). The caller may say *Hello, Police Department, I want to report a theft in progress*. However, the caller is actually talking only to the Chief Badger, not to the whole police department.

Note that this extension of the tact is metonymical because of the change in form. In the earlier metaphorical extension, the *finger* of a hand became a *finger* of land; the verbal form of the tact *finger* survived the extension. However, when *Flight Controller* became *Houston*, and when *Chief Badger* became *Police Department*, the original forms of the tact did not survive the extension. Thus, the latter examples represented metonymical extensions.

In metonymical extensions of a tact, the paired stimulus, which gains control of the tact in the functional sense, is already in control of a different nominal tact, so, as they say (invalidly), “the vocalizer starts saying a different name.” Functionally, it is an equivalent tact in terms of what it accomplishes, but the transfer of control to the new paired stimulus results in a new nomination. That is, the same flight controller that previously may have evoked “*Joe*” now evokes “*Houston*”; the same person that previously evoked “*Chief Badger*” now evokes “*Police Department*.” The new nomination is determined by the stimulus that is paired with what remains the functional referent.

In yet another kind of extension of a tact, known as a *solecistic* extension, the shared property that gains control is only remotely related to the definitive property upon which standard reinforcements are contingent or it bears only an irrelevant relation to it. For example, a person who runs from a burning building may exclaim that “the whole place is *inflated*!” The term *inflated* bears some obvious resemblance to the term *inflamed* and to the phrase *in flames*. However, we must still account for the curious transformation, the salience of which pertains both to its rarity and its vague hint of the curious relations by which it has emerged.

First, the entire phrase (i.e., “the whole place is *inflated*!”) is similar to the more common phrase, “the whole place is going up in flames,” or more briefly, “the whole place is in flames.” A somewhat tenuous relation exists between the facts that both flames and inflated things (e.g., balloons) often “go up.” If the speaker is particularly familiar with balloons and if effective instances of the term *inflated* have been reinforced strongly in that context, some of that strengthening may have accrued to the upward motion of the balloons that got inflated. That can happen when upward movement is reliably paired with inflation. Upon later encountering flames that also move

upward, the stimulus control exerted by the flames may be faulty insofar as the speaker, responding under the inappropriately restricted control of the previously misconditioned property of upward motion, exclaims that “the whole place is inflated.” This particular sequence of historical events is not the only way that the term *inflated* could have been prepared for emergence in the instance that is featured in this example. Other sequences of historical conditioning could have prepared the speaker to exclaim that “the whole place is inflated.” However, if it happens as a result of the kind of conditioning history that has been described in this example, the emergence of the term *inflated* represents a solecistic extension of a tact.

Solecistic extensions of tacts are seldom appropriate and hence are typically extinguished or even punished within a verbal community. Solecistic extensions have often been assumed to reflect some kind of neurological disorder. However, while any pattern of unusual behavior could be rendered more probable by an unusual kind of physiological state that we call a *disorder*, we can account for the general occurrence of solecistic extensions of tacts through explanatory recourse only to behavioral conditioning in conjunction with current circumstances. Some solecistic extensions can be useful for their humorous effects and on that basis may be reinforced.

Although the term *tact* often describes a response in isolation, a tact is more correctly construed to be the behavior–environment functional relation in which that response is merely the dependent variable. Thus, given a response that could be a tact, we complete the diagnostic analysis by seeking and specifying the relevant antecedent stimulus and demonstrating the functional relation between the two variables. As we have seen in this section, we can then further categorize a tact on the basis of how it was conditioned and the history of changes in how it is controlled.

Abstraction

Abstraction is often attributed to special mental powers, and examples of abstraction are adduced as evidence of what are assumed to be cognitive activities initiatively demonstrated by a mental agent (i.e., a creative mind at work). However, the process of abstraction, by which ultimately a response can be brought under control of a single stimulus property, is a natural process. The process of abstraction has been demonstrated, not only in human behavior, but in the behavior of other species as well.

Normally, when a particular response is reinforced in the presence of some stimulus, that stimulus will actually be a composite set of stimuli. During a conditioning process, those stimulus elements take on different evocative strengths with respect to the subsequent response. For example, given an experimental subject, let us begin by presenting a stimulus consisting of a large yellow beach ball

and manding an utterance of *sphere*. Suppose that, as we conduct repeated trials of this procedure, we reinforce only the vocal response *sphere* in the presence of this stimulus. Such conditioning of the tact *sphere* may render that relation reliable, but what exactly is then evoking the response *sphere* in the presence of this large yellow beach ball?

The salient properties of this particular ball include size (e.g., relatively large), and color (yellow), as well as the additional set of properties that define beach balls, only one of which is spherical shape (others include elasticity, surface texture, overall density, construction seams, etc.). The capacity to evoke the response *sphere*, which the operant conditioning has imparted to this beach ball, has been distributed among the various properties of this ball, and among various combinations of those properties, all in proportions that remain unknown. Although, as a result of the previously described program of conditioning, our subject now responds reliably with the tact *sphere* to presentations of this large yellow beach ball, we remain unable to specify, in terms of the specific properties of that ball, the precise controlling function, or functions, through which the tact *sphere* is being evoked.

People may say that we cannot be sure that our subject has “learned the true concept” of *sphere*, but more accurately, we cannot identify the properties that are now in control of the tact *sphere*. We may find that our subject now identifies as a sphere any relatively large object that is yellow in color regardless of its shape. In that case, that response would be under the shared evocative control of relative size and yellow color, neither of which are among the definitive properties of a sphere.

The technical definition of a sphere has nothing to do with size, color, construction materials, or applications. To avoid the undesirable extensions of tacts that leave them under the control of such irrelevant properties, the members of a verbal community, especially teachers, will counter such potential extensions by confining reinforcement to tacts that are more narrowly evoked.

For instance, in the current example, the evocative control of the tact *sphere* by irrelevant factors can be eliminated if on some occasions we present those irrelevant properties in the absence of the properties that define a sphere. On the occasions of such presentations we would extinguish manifestations of the tact *sphere*, while reinforcing that tact on all other occasions when the definitive properties of a sphere are present. Although teachers deliberately pursue such procedures under the controlled conditions of formal education, such narrowing of the controls on tacts also occurs naturally if somewhat imprecisely across the years of informal language conditioning within a verbal community.

Eventually, regardless of whether irrelevant properties are also present, only those that define a sphere will be left in control of the tact *sphere*. At that point, any sphere

will be tacted as such, regardless of its superfluous properties. It may be said invalidly that the subject *has mentally abstracted the concept of sphere*, but we completely account for the phenomenon of abstraction by considering only that the stimulus controls on the tact *sphere* have been narrowed to the minimal definitive set of properties for a sphere.

Tacts of Private Events

The stimuli that collectively constitute the real physical world are not confined to the realm beyond the skin. In pursuing our analyses of behavior-controlling functions, we do not cross into a mystical domain simply because we begin to investigate the behavior-controlling capacities of stimuli that are located *within* the body of the behaving organism. Many contingencies of reinforcement involve stimuli that occur within the body that is exhibiting the behavior of concern. As often noted, the environment pervades the body, and the naturalness of functions between environment and behavior is not dependent on where in the world the functional antecedent stimuli are located. It matters only that behavior-controlling stimuli are measurable events, although the relatively inaccessible location of some such stimuli pose substantial challenges to those who are under contingencies to measure them. The tact *tree* and the tact *pain* may be equally valid even though the evocative stimulus for the former is in public view on a remote mountain side and the evocative stimulus for the latter is deep within the knee of the vocalizer.

Stimuli that arise within the body are usually private in the sense that other people seldom have access to them. That problem of access is not limited to others. We ourselves seldom see, and only occasionally hear, events within our own body, nor can we usually touch, taste, or smell them. Many of our senses are biologically evolved to facilitate contacts with the outside environment and are of limited help in making contact with internal stimuli.

However, we do have interoceptive nervous systems of limited range by which we privately contact certain kinds, although not all kinds, of internal events. Such contacts enable speakers to produce tacts that are evoked by certain kinds of events within their own bodies. Thus, a person may tact such internal events as hunger pangs, pains, various pulses, and the kinds of systemic after-effect of glandular chemical discharges into the blood stream that we know, in general, as *emotional arousal*.

The privacy of the kind of behavior-controlling relations that feature internal stimuli creates problems for a verbal community. Those problems pertain to access, but the privacy of those functions does not preclude the potential reality of their constituent events. Although the members of the verbal community must supply the behavior-changing consequences of verbal behavior (i.e.,

the postcedent stimuli), they cannot accurately and precisely do so when they cannot share in contacting whatever has evoked an instance of public verbal behavior. If the mediator is reliably to provide timely and appropriate consequences for a vocalizer's response, the antecedent stimulus for that response must affect *both* the vocalizer *and* the mediator.

In cases of a vocalizer's tact-like response that seems to have been evoked by a private stimulus that has arisen within that vocalizer (a stimulus to which a mediator cannot be privy), a given kind of consequence that is then supplied by the mediator may not be appropriate. That is because, from the mediator's limited perspective, that specific instance of the vocalizer's verbal behavior may or may not represent a valid tact of the private event of which it is a *prima facie* description. If a vocalizer says *I have a headache*, that statement may be occurring in response to stimuli that are entirely unrelated to pain-generating events within the speaker's head.

Let us further consider that kind of important distinction. If a person produces the vocal utterance *bird* as an apparent tact, a member of the verbal community can often determine independently whether a bird is present before providing consequences. In that way the mediator reinforces only appropriately controlled responses by the vocalizer. If, on the other hand, the utterance is *headache*, a mediator may have no way to confirm the reality of the implicit stimulus. In fact, the feigned headache is a common social ploy of avoidance when the verbalizer would prefer not to describe the impending events, thereby aborted, as aversive in general.

When consequating a statement that tacts a private event, the mediator may have to rely on indirect evidence, however tenuous, or simply follow the general social prescription, common within the culture, for how to react on such occasions. An example is the common practice of politely giving the benefit of the doubt to a person who claims to have a headache. Speakers thus have some latitude to manipulate the behavior of their listeners by falsely reporting private events, while listeners cannot be held strictly accountable for inappropriately consequating what seems superficially to be a speaker's tact of a private event occurring within his or her own body.

One solution to the mediator's problem of limited access is the use of special equipment to expose events that occur within the vocalizer's body, thus making those events publicly detectable. Modern medical facilities feature a wide variety of such devices. A patient who says that a strange sensation is being felt in the abdomen may be vocalizing that tact to a doctor who is looking at an image of that patient's internal organs and seeing a metal shard lodged in the wall of the small intestine. That doctor is thus prepared to consequate the patient's report in a way that comports with a valid tact.

In addition to the use of special equipment, a mediator may simply probe the body of the vocalizer tactilely, as when a mediator feels for a suspicious lump of which that vocalizer claims to be aware within some part of his or her own body. Note that the patient and the doctor do not contact, in the same way, an event that is occurring within the patient. The patient may be responding to pain or pressure sensations that manifest in response to transmission along the interoceptive nervous system, while the doctor is responding to the feel of the lump that is generated by tactile probing from without. However, when the respectively detected events seem to share a common location, they tend to be accepted by both parties as the same event. Thus, the patient's tact *lump* and the doctor's tact *lump* may depend respectively on control by different properties of what both parties treat as the same event.

Note that the tact of a pain is necessarily a response to certain properties of the arriving energy and not a response to the latent properties of the source from which that energy emanated. One's response can pertain to the location from which the energy began its neural transmission, and the response may comport with aversive stimulation. Thus, a person may report a pain in the right elbow or an ache in the left calf muscle, yet remain unable to respond to any other potential independent variables that may define the events that are occurring at those locations. In agential terms it may be said that the verbalizer could not *provide more detail*, because only pain is available to control the responses.

An external analogy would be a person's report of an almost blindingly bright light shining directly into the person's eyes. The person's tact may occur under exclusive control of the impinging light and be vocally descriptive only of its direction, wavelength, and intensity. Certain properties of that response may comport with aversive stimulation, but, as with the private pain, the person may remain unable to respond to additional independent variables and thus provide a more detailed account. That is, this person may be unable to say anything more about the external light source just as the other person could say nothing more about the internal source of the pain.

In the frequent absence of special help for listeners in contacting private stimuli that are implicit in tacts that are uttered by speakers, listeners are not always helpless in producing appropriate responses to those speakers' statements. Many private events have non-behavioral publicly detectable accompaniments. The person who says *My left leg hurts* may have a visible wound or bruise on that leg of a kind that, in the past, has produced pain for the listener. The potential mediator is not privy to the vocalizer's pain but is contacting a kind of non-behavioral event that has accompanied pain sensations in that mediator's own experience. That correlation increases the

probability that consequences relevant to pain, supplied by the mediator, will be strengthening what was a valid tact by the vocalizer.

Another kind of indirect confirmation of the validity of a private tact involves *collateral responses*, which may be nonverbal, yet are also exhibited by the vocalizer along with that tact. If the vocalizer who is reporting a private pain in the left leg is also holding or rubbing that leg—and perhaps exhibiting a grimacing facial expression, the listener is more likely to consequte the verbal utterance as if it is a valid tact of a private event. Such reinforcement of the vocalizer's audible report conditions the vocalizer to report future pains on such occasions, thus establishing that tact in the vocalizer's verbal repertoire⁹. The reinforcers of the tact also incidentally strengthen the correlated practices of manipulating the sore spot and grimacing. Thus, in general, the private event that evokes a publicly audible verbal response may also be evoking other kinds of public responses—a multiplicity of dependent behavioral variables that together increase the verisimilitude of their hidden, implicit, and commonly shared, independent variable.

A mediator may comprehend a vocalizer's tact of a private event if, within the verbal community, that tact has been strengthened in public contexts. The vocalizer is merely extending that tact to a private event that shares some properties with whatever has evoked that same tact when it has been uttered and reinforced in public contexts.

Suppose, for example, that a vocalizer describes the feeling that is generated by a private emotional state as *frothing*. The term *frothing* describes the exuding of foam, often correlated with agitated states of fluids, and, in the case of animals, with the aggressive madness that may characterize rabies. A vocalizer who is emotionally aroused under aversive stimulation, especially when that stimulation has been arranged by an identifiable party, may exhibit agitated, aggressive, and hostile patterns of behavior that share some properties with the kind of circumstances that produce froth. If that aroused person vocally tacts his or her private state as *frothing*, the listener may have no difficulty in reacting appropriately to the vocalizer's remark. It could still be an invalid tact, but at least the mediator is not confused about the general nature of the internal state that the vocalizer is putatively describing in that metaphorical way.

As we have seen in the previous discussion, listeners are not always exclusively reliant on a vocalizer's tacts of private events. Additional evidence may be available to support or contradict what implicitly is a tact of a private event. However, even with such additional evidence, the mediator's response to such a tact will always be occurring under less than complete control. (Put agentially, the mediator's confidence in the vocalizer's tact is always less than complete.) A person's request to be excused from an

activity because of a toothache may not be occurring in response to such pain, and that may still be true even though the vocalizer exhibits publicly visible damage to a tooth, holds the jaw in one hand, displays a grimacing facial expression, and describes the pain as *piercing*.

Tacts and Reality

Special analytical problems arise when a tact of an implicitly external event occurs in the public absence of the kind of event that normally evokes that tact. A person saying *blue* while looking at the daylight sky poses no problem. However, suppose that a person, in the complete absence of any stimuli that evoke the tact *blue* by other members of the verbal community, says *I see blue*. One immediate issue is what, if anything, is evoking that response as a tact. Perhaps it is an extended tact of some kind.

If the statement presents a tact of a real on-going event, which currently is not also affecting any potential mediators (i.e., they don't detect it), then the evocation of that complete *statement* (i.e., *I see blue*) is being shared by (a) some privately detected general seeing behavior as well as (b) the properties of the particular private vision that is occurring. That is, in that case, the vocalizer who says *I see blue* is responding to the behavior of seeing (i.e., *I see...*) as well as to a property of the vision that is occurring (i.e., ... *blue*). That blueness may also be regarded as a property of an environmental event that implicitly is the source of the impinging energy (e.g., a piece of blue paper, a patch of sky, or the open flower of a morning glory).

With respect to the issue of blueness, blue is a behavior in the class that is commonly called *visual consciousness* or *visual awareness*. When the verbal tact *blue* is being conditioned, the blue visual behavior that is being tacted tends to happen when light of a certain range of wavelengths impinges upon the eyes of the behaving organism as well as the eyes of those who provide consequences for the tact. We cannot confirm that contact with light of consistent wavelength results in exactly the same private behavioral manifestation within each person in the verbal community. That is, we cannot be sure that how you behave blue is identical to how I behave blue.

Nevertheless, given common access to wavelengths of light impinging from the same environmental direction, individuals become conditioned to tact their private respective visions as *blue*. The commonality that supports interpersonal communication pertinent to these ongoing events thus inheres in the incoming wavelengths and in the resulting tacts; it does not necessarily inhere in the particulars of the private behavioral manifestations that are evoked by that incoming energy.

The *capacity* to produce behaviorally the private manifestation of blue is apparently a biological endowment. Taking that into account, we simply expect private blue behaviors, which manifest neurally, to occur

automatically in the presence of appropriate stimulation. That being the case, the private neural behavior described as *blueness* would occur respondently and do so simply because its manifestation is physiologically capacitated by genetically endowed structure. That is to say that, given the appropriate eliciting stimulation, the private neural behavior called *blue* occurs automatically. However, its tacts (such as calling it *blue* and reporting that it is occurring [*I see blue*]) are verbal operants that must be conditioned by a verbal community. That is also true of the nonverbal classes of discriminative responding to that private neural behavior.

Actually, among behavior scientists, the question of whether the visual awareness of *blue* precedes the conditioning of the tact *blue* (and other kinds of discriminative behavior) has long been debated. Is the very awareness of blue a product of conditioning? As the question is often posed, is one aware of blue before being conditioned to talk about it? That is, at issue is whether a blue sensational behavior (i.e., a visual awareness of blueness) is a predecessor or a correlated product of the operant conditioning of discriminative behavior with respect to blue. Put another way, given the environmental input of light having a particular range of wavelengths, must a new person's first private blue visual awareness response be prompted in some way before it can occur—or does it happen automatically?

Some organisms that have no physiological capacity for verbal behavior and little if any capacity for consciousness nevertheless respond differently in nonverbal ways to contacts with respectively different wavelengths of light. This could be occurring respondently, or it could be occurring operantly under direct stimulus control—in either case without the additional neural behavior of color awareness.

Something similar can occur in the case of humans if the capacities to behave consciously are sufficiently preoccupied. For instance, a person who is given batches of marbles each containing a mix of blue and red marbles can be trained to sort them by color while daydreaming about entirely different events. The training need only continue long enough for the extinction of the various behaviors of consciousness that are evoked by the sorting-related events, so that the alternative behavior of daydreaming can emerge prepotently and thus preoccupy that behavioral capacity. While engaged in that sorting during such daydreams, the person is not visually aware of the marbles or their colors.

Likewise, the right foot of a daydreaming automobile driver may discriminatively alternate between pressing the throttle and the brake in respective response to changing events in the external driving environment without any concurrent behaviors of awareness being produced by the driving-related events. (In such in-

stances that feature humans, the body parts that exhibit the behavior of awareness are preoccupied; in many other species the body does not include neural parts that can exhibit awareness-type responses.)

At issue is how that neural behavior of color awareness (or any kind of awareness) first arises. As the question has often been posed, is an awareness that manifests as blue a respondent behavior that occurs automatically in response to certain wavelengths of light and, upon occurring, can then evoke whatever verbal behaviors a verbal organism becomes conditioned operantly to exhibit in the presence of that kind of visual awareness? ... Or, is an awareness of blue an operant neural behavior the primal manifestations of which must somehow be teased into operant occurrence? One must be conditioned operantly to talk and think about one's visual awareness of blue, but what about the origins of that kind of awareness behavior per se?

All verbal behavior is based on awareness behavior in the sense that verbal behaviors consists of responses to awareness behaviors. Eliminate awareness, and a state of ultimate oblivion ensues—a state in which, *for all verbal behavior*, the functional connection with the behavior-controlling environment has been severed by the removal of one of its critical internal links. Organisms that successfully interact with their environments exclusively under direct stimulus control (echinoderms, for example), not surprisingly, exhibit no kind of verbal behavior.

Evolution operates by the selection mechanism, and evolutionary progress can be made only in the presence of variations from which selection can occur. The class of events that exhibits the variation must already be present, and in addition, certain of the variations must portend a greater survival advantage than others.

As we attempt to relate these principles to the physical capacity for awareness behavior, a relevant family of questions lingers: Do awareness behaviors happen automatically in a respondent mode even before we react operantly to them in further discriminative ways? Or, are they already operant responses that we have had to acquire through some kind of operant conditioning? Is the capacity for awareness behavior an essential element in the mediation of unconsciously occurring behaviors in response to sensory inputs—or, is the capacity for visual awareness not in the linkage of such mediation? That is, do the structures that exhibit awareness behavior have to be in place even for direct stimulus control to occur, even though in such cases those structures would not be exhibiting awareness behaviors? If that is so, the structural capacity for awareness behavior would at least be available to “come under operant control” whether that implies some further biological evolutionary tweaking or merely their subjection to some new kinds of behavior-

controlling arrangements within the scope of operant conditioning (or both).

This issue of how a private neural behavior such as blue can first arise is somewhat peripheral in the field of behaviorology. It is more central to the concerns of evolutionary physiologists, who bring the appropriately relevant scientific repertoire to such issues.

Logically, it seems as though a person must behave blue privately *before* being conditioned by a verbal community to call it *blue*, otherwise there would be nothing to talk about. We remain less sure about the need to behave blue before responding discriminatively to it in non-verbal ways under natural contingencies. For instance, a visual awareness of colors may not be relevant to the discriminative approach of an insect to blue flowers in the presence of both red and blue flowers even when the discriminative responding is controlled by the wavelength of the impinging light. Here we allude to a *direct* stimulus control of the approach behaviors. That is, if visual awareness is a *separate* behavior in response to impinging light waves of a certain frequency, that kind of behavior may not be a necessary link in the control of the discriminative behavior of approaching certain flowers but not others even if the behavioral elements of approach are controlled by those light waves via the visual sense. Such control would be direct, just as the daydreaming driver's car-steering behavior is controlled by light impinging from the scene that is ahead of the car, although that light is failing to evoke any concomitant seeing behavior.

In the case of verbal organisms, we assume that the private behavioral sensation that comes to be tacted as *blue* must precede the operant conditioning of its tact, and people have usually extended that reasoning to other kinds of discriminative operant responding to the incoming wavelength of light such a pressing a blue key but not a red one. Yet the basic question remains: Is the human bodily structure entirely prepared, as a matter of genetic endowment, to produce the behaviors of *awareness* in the same sense that the body is genetically structured to produce a wide variety of other respondent behaviors, given the appropriate antecedent stimulation? ... Or, must the body undergo further micro-structuring through some kind of behavioral conditioning before it is ready to exhibit awareness behaviors?¹⁰

Knowing per se is a behavioral phenomenon. To be aware of, or to know of, a distinction (e.g., the presence vs. the absence of a given stimulus, or stimulus A as different from stimulus B) is already to behave discriminatively. We say that that awareness behavior occurs under the respective alternative environmental conditions. The *knowing* of the distinction, which is but one class of discriminative behavior, can manifest only as discriminative behavior (that is simply the nature of knowing per se). That is, we are constrained to behave our knowing

just as we are constrained to behave our elbow bends. When we posit environmental reality beyond the *behavior* of knowing it, that reality is necessarily a speculative *inference* (i.e., just more of our private verbal behaving). Our *knowing* of a remote mountain (or of a private feeling) consists of discriminative behavior, and our further insistence that either of those events is “really there” is but more behavior in response to that behavior. Thus, the closest that we can come to the *environment* is our own discriminative behavior, *presumably* in response to that posited environment. We are trapped on one side of those posited functional relations, because “we” *are* but one side of those functional relations.

A person’s verbal behavior has many characteristics that can evoke that individual’s own further discriminative verbal behavior. For example, we have discussed how people respond overtly to the covert nature of their private verbal behavior (e.g., the audibly vocalized statement *I am thinking about you*). In addition, people often respond to characteristics of the functional relations that control their behaviors, verbal or nonverbal. For instance, the currency of their behavior may evoke *I am running*. They may also respond both to the historical nature of their behavior (*I ran yesterday*) and to the environmental factors that determine the probability of their future behavior (*If a fire starts, I will run*).

In the case of a statement that is rendered in the present tense, the identification of the evocative stimuli by a listener typically presents relatively few if any analytical problems. For instance, when another person says *There’s a car*, we look around in ways that, in the past, have resulted in car-seeing behavior, and often, as a result of looking, we experience the behavior that is described as *seeing it*. That contact (of a sort) is the basis for our subsequent conclusion that the vocalizer’s statement (*There’s a car*) was valid. Obviously, the car is *known* only in the sense that we have behaved it.

However, the evocative stimuli for statements cast in the past and future tenses can seem more illusive. A statement such as *I ran yesterday* is often described as a *memory*. However, the independent variables remain unidentified. Those functional independent variables must be present currently, because current behavior is evoked only by current stimuli. However, the body that is currently vocalizing in the past tense about running is not currently exhibiting the behavior that is being described. The stimuli that shared in defining yesterday do not leap forward in time to evoke the future behavior that shares in defining today. At best, they are links in chains of functionally determined events that account for what has become the current environment.

The behavioral events of yesterday produced, at that time, structural changes in both the body and its environment that may remain in place to capacitate the cur-

rent evocation of the statement *I ran yesterday*. For example, a current stimulus pertinent to running may now evoke a covert vision of yesterday’s running episode, because the body has been left, since yesterday’s conditioning episode, with the structural capacity to produce that kind of seeing behavior in response to certain stimuli that may remain available a day later. However, although triggered by a current stimulus (i.e., by an element of the current environment), the constituent events of that vision are out of context in the current environment as a whole (in the sense that the current environment is not evoking running behavior, but is evoking only a vision of yesterday’s running behavior).

We are linguistically conditioned by our verbal community to speak of such visions, which are incongruous with the current environment, in the past tense, just as we are conditioned to call them *memories*. That conditioned grammatical nuance along with our subsequent responses to it, constitutes our *knowing* that such currently re-stimulated visions pertain to originals that have occurred in prior contexts. That is the essence of our sense of *past*. Behaviorally, we exist only in our present, and current behavioral re-visitations of our past are actually always new behaviors that are occurring in our present in response to stimuli that also are present. Thus, the *reality* of the past is always necessarily a currently produced inference that is evoked by the kind of current behavior-controlling circumstance that is described above.

The residual issue for analysis is why some current running-related stimulus so readily evokes a new vision similar to a vision that occurred in the presumed past. That, of course, is not a difficult question, at least at the theoretical level, because it is answered by explanatory recourse to the physiological implications of the basic model of operant conditioning: The original vision of the behavior was reinforced, which left the body reconfigured, at a microstructural level, to more readily behave in that way whenever an appropriate evocative stimulus is again contacted.

Thus, today, contact between a body and a running-related stimulus is, to describe it more precisely, a running-related stimulus in contact with a body that is now better configured to reproduce a similar episode of visual awareness. A response now occurs in the presence of the running-related stimulus, which by its very manifestation defines the *currency* of that vision-type of response, but the context of the vision that is now being evoked is not current (i.e., is not now present in the sense that that context would evoke behavior different from that evoked following current looking and other environment-sampling posturing of the body). That is, the environment that, if contacted, would evoke the current vision differs from the environment that is contacted through current attending behaviors. In common par-

lance, what one is now seeing is not what one would be seeing if one were alertly to look around and pay attention to what currently is there.

That kind of on-going vision, or private seeing behavior, which is discrepant with respect to the current environment, may then, on the basis of that discrepancy, evoke the statement *I ran yesterday*. When such a past-tense verb form manifests, is little more than a description of some current private behavior that is now occurring in the absence of most of its typical evocative thematic events. That is, in response to a current although isolated or fragmentary stimulus, one may re-see or re-feel oneself running while, at the same time, reacting to one's currently non-running body as well as to an environment that does not currently evoke running. Casting the description of the visualized running in the past tense is a response to that kind of *incompatibility* between (a) one's current visual awareness of the motive state of one's body relative to a running-compatible environment and (b) other immediate attention-directed responses to the motive state of one's body in relation to the current environment. That is, one is seeing oneself running in an environment that would evoke running, but it is an environment that differs from the alternative environment that is seen when one exhibits inspection behaviors pertinent to one's immediate environment.

As described in common agential terms, if one snaps out of one's reminiscence and pays attention to what is currently happening, the behavior being recalled would be out of place in the immediate situation. Given that those classes of responding differ, the test for the currency of the *remembered* behavior thereby fails, and the present tense is *not* evoked when describing it. The person could explain what is happening by saying something like this: *I have been experiencing a vision of myself running in a realistic context. That vision has been evoked in a way that did not anticipate (i.e., prompt) its contents. However, I have also then contacted (a) the current state of my body and (b) the environment in which it currently exists, and, when I did so, the inspection-induced vision my body was not running in either a manner or context that comports with the initial vision of myself running. Therefore, I am conditioned to regard the running in my initial kind of vision as having occurred previously, and I have been conditioned to describe any such running in the past tense.* (If one remembers running yesterday while running today, that situation would be subject to the same kind of analysis, but the distinctions to which the analyst would have to respond would be more subtle.)

Note, however, that the behavior of sensing the past is happening in the present and is actually evoked by current (not past) events. The behaviors that are commonly classed as memories, recollections, or remembrances occur exclusively as a function of current events (as do *all*

behavioral reactions). That is, everything behavioral happens in the present, and we must account for our behavioral senses of both past and future in terms of *present* evocative events. A sense of the reality of the past, by its nature, is often said to be an abstraction that is derived from past tacts, visions, and other nonverbal reactions, that have accumulated, but those are all behaviors, which are processes, not entities, so they do not really *accumulate*. They happen transiently and can have no status of endurance beyond their durations. Thus, memories cannot be reiterations of stored behaviors.

When occurring initially, however, behavioral reactions to the environment, including tacts, result in consequences that physically change the body that has mediated that behavior of contact—a kind of molecular scale change that renders that body more or less behaviorally susceptible to such contacts¹¹ on similar future occasions. On such future occasions of contact with environments that share stimulus elements with the present occasion, that kind of contact behavior, or a fragmentary version of it, may be re-evoked. However, that will be happening in a future context that differs from the current context. On such future occasions, it is that contextual disparity, between currently re-evoked versions of earlier contacts and on-going contacts of current events, that controls the casting of descriptions in the past tense. (Such evocations of specific tense forms, which depend comparatively on the properties of behavior-controlling relations, represent another large class of verbal behavior, called *autoclitic* verbal behavior, that will be discussed in the next major section of this chapter.)

Thus, what is called *a sense of the reality of the past* is necessarily always a current behavioral manifestation. It can be said that one *behaves* the reality of the past, but one must always be doing so in the present. Thus, the past can have no essence beyond current behavior and how it is being controlled. The so-called *reality* of the past necessarily inheres only as an artifact of *current* behavioral phenomena. *Past* is a current behavioral reaction to some currently encountered behavior-controlling relations and to the *relations among those relations*.

Although, upon analysis, these controls may seem complex and subtle, the time-related verbal behaviors that denote the past tense are typically produced with a natural ease, largely because one comes so often under contingencies to speak of the past that the necessary relations are strongly conditioned and kept so. While an accounting for grammatical tenses as natural phenomena can quickly become complex, the contingencies under which tense forms are produced are encountered frequently. Thus, within verbal communities, especially those in which verbal behavior is presumed to be the manifest will of a mystical self-agent, the intuitive gram-

mathematical skills of the members quickly outstrip their capacity to provide a rational account for those skills.

The statement *I will run tomorrow* must also occur under current stimulation. Future events, being virtual or potential, are necessarily unreal and cannot function as evocative stimuli for current behaviors such as that statement. An assumption that a future event is controlling a current statement is classed as a teleological error. In general, during past behavioral episodes of operant conditioning, we have seen ourselves repeating behavior that has been reinforced. In particular, in the past we have repeated previous behaviors on later occasions when reinforcement was possible or probable (*occasions* that were defined by the presence of appropriately strengthened evocative stimuli).

Given such a conditioning history featuring, for example, the reinforcement of running behavior, if currently I contact events that, in the past, have preceded, by about a day, the evocative stimuli for running—current events that, after about a day, have in the past led to the presentation of stimuli that evoke running, I am conditioned to respond now to those *current* precursory circumstances by saying something like *Tomorrow, I'll have an opportunity to run, and I will run*. If I have not run recently, the evocative capacity of those current stimuli may be further increased by the effects of deprivation.

If, instead of a history of reinforcement, one has had a history of aversive stimulation with respect to events now encountered, a corresponding analysis of the controls on tense forms can be made with respect to avoidance and escape behaviors. Suppose that one contacts stimuli that reliably have preceded a punished behavior. One may then describe those stimuli as *threatening*. In addition to evoking reviews of past sequences of behavior and its punishment, those currently encountered stimuli may also evoke a vision, or other kind of sensation, of one engaging in avoidance behavior that one has not yet exhibited.

The avoidance behavior may take a familiar form that has never before been associated with this *particular* kind of aversive stimulation, or it may represent a new instance of a familiar way of avoiding the impending kind of aversive stimulation. The critical aspect is that the avoidance behavior featured in the current neural iteration is either a repeated version of a specific pattern of behavior that is occurring under a *new* aversive stimulation (new kind of threat; old means of avoidance) or a *new* combination of behaviors that are occurring under a familiar kind of stimulation (familiar threat; new set of avoidance behaviors).¹² If one then comes under contingencies to describe the situation, the description will be rendered in the future tense (e.g., *Upon seeing that bully approaching, I am going to leave the area before he arrives*).

Casting the verb in the future tense is a response to the relation among some behavior–controlling relations.

In the above example, a current event reliably evokes an awareness and recognition of previous behavior along with its punishment. The current event, along with this evoked neural behavior, may together also evoke a vision of one engaging in an alternative to the previously punished behavior. The imagined episode is not an *exact* reiteration of a past episode (i.e., not an imagined copy of some previous behavior). That is, either the evocative stimuli or the combination of responses is new. Members of a verbal community has been conditioned to describe the imagined manifestation of that different potential relation in situations of this kind as what one is *going to do* (i.e., in the future tense).

In any case, a predictive statement such as *I will run tomorrow* or *I will say something nice* does not imply a magical functional contact with a future event, but is instead actually a response to some *current* events. Neither does it imply the reality of a knowledgeable self. The grammatical form of the verb in such a statement, which is said to represent the future tense, has been conditioned on such occasions by the linguistic practices of one's verbal community. The linguistic forms indicative of tense then manifest automatically under control of some nuances among the controlling relations on some private neural behaviors in the class to which people refer as one's *imaginings*.

The imagined future episode may manifest in the elaborate detail of a daydream or it may recede to the level of a sketchy, fleeting, and fragmentary glimpse. Only temporal and associative factors pertaining to its controls discriminatively evoke the tense–indicative forms. Thus, a person may describe a behavior in the future tense in the absence of a complete imagined version of that behavior, because the future tense forms are controlled by non–thematic details of the imagined episode—namely, by relations among the controlling relations of its elements. When one says *I will go to the store*, for the tense to be correctly rendered, one need not first imagine in detail a complete trip to the store. Those tense forms need only be under control of relations among the controls on the elements of such an imagined story. Thus, the appropriate tense form can manifest quickly, and the imagined story per se need not actually unfold in detail for references to it to include forms that denote futurity.

Note that a *sense of futurity* inheres in *current* circumstances. That sense of futurity manifests in the form of statements being cast in the future tense. However, *futurity* is always a current behavioral product. Again, with respect to our futures, as with respect to our pasts, the reality of past and future can manifest only as *current* behavioral phenomena, with the critical distinction inhering in the nature of the controlling relations. We behave our sense of future as we behave our sense of past, with both occurring as aspects of our present behavior. The essence of the

distinction between past, present, and future (including tense-indicative constructions, and any other aspects of our so-called *sense of time*) inheres in some different ways in which *current* behaviors are being controlled.¹³

Responding to Temporal Relations

Suppose that people are sensing their own behaviors. Further suppose that those behaviors are occurring in a context that does not share in defining the current ambient environment. That is, such people are witnessing self-behavior that is occurring in reaction to virtual environments that differ from the environments that are revealed when "they start paying attention to what actually surrounds them." In such cases, the behavior that they sense themselves exhibiting is virtual too. Neither the environment nor the behavioral responses to it will pass tests of reality.

Let us further assume, in this case, that the virtual behavior is occurring in a context that, relevant to real time, places it in the past. People, in situations of this kind, can normally specify whether such neural activity represents *memory* or *imagination*. Future events must be imagined necessarily, and consciousness of past events also may be imagined (i.e., past events that have not actually occurred). However, a current consciousness of past events may also represent reiterations of previous behavior that actually occurred in the past.

We distinguish (a) the virtual behaviors that we regard respectively as representing actual past behavior and (b) imagined behavior when we tact the former as a *memory* and the latter as a *daydream*. We seldom confound a memory and an episode of imagination. If one is asked whether one is *remembering* a real party or merely *imagining* an alternative to what actually occurred, in most cases a valid report is forthcoming with ease. At issue is the question of what enables peoples' normally easy discriminative reactions to a memory and an imaginary recasting of history.

During a memory of a sequence of events, each neurally reviewed event evokes the next one *without the addition of new supplementary stimuli that add to, or enhance, either the behavior that is being recalled or the context in which it occurred*. That is, for an *accurate* memory, nothing about the circumstances and the behavioral events that occurred under those circumstances must change during the process of remembering.

However, the current environment differs from the environment in which the original behavior occurred, so one must sense again not only the original behavior but also a functional equivalent of the behavior-controlling environment that produced it. That is, to remember is to engage again in some previous neural behavior. However, in an episode of memory, although those sensations (awareness, recognition, comprehension, etc.) must hap-

pen again as they happened before, this time they must be evocatively initiated by current events instead of the events that evoked the original neural behavior (of consciousness). Thus, some aspect of the *current* environment must initiate the review—perhaps an evocative verbal prompt, or an encounter with other kinds of stimuli in common with those that defined the previous episode that is to be remembered.

If the privately reiterated behavior was strongly conditioned by consequences that ensued at the time of its initial occurrence, the current memory, once initiated, may chain in a self-sustaining manner. However, a weak memory may have to be probed, but effective probes for memories do not add to, or subtract from, the context of the revisited episode. The conservative probes merely function to narrow or confine the range of the constituent stimuli that will share in evoking the next sequential moment of private reiteration.

For example, one may be having again a vision of a party that one attended a few days earlier, but suppose that one is re-seeing aspects of that party that do not saliently feature all of the guests. If one is under current contingencies to identify each of the guests who attended that party, an appropriate probe may take the form of a simple instruction: *Identify all persons who were in attendance*. Functionally, such an instruction has the effect of narrowing the composite stimulus of a general party scene to the human figures within it, and the subsequent party scenes tend to feature the people who attended the party in more salient ways that enable nominal tacts of those people. Importantly, such a probe, while exerting its focusing function with respect to a particular class of stimulus elements, does not otherwise alter the overall stimulus array that is re-presenting as the memory.

To ask, simply, *who was present* avoids the presentation of specific stimuli that may have strong capacities to evoke visions of certain people. For instance, the presentation of a probe such as *Was George at that party?* may inadvertently prompt a George-seeing response that is sufficiently strong to intrude into the on-going neural reiteration. That is, one may then experience a George-seeing response in the context of the party when, in fact, George had not been in attendance. What are intended as probes must be constructed conservatively lest they miscarry by functioning as prompts—a point not lost on devious inquisitors who may inject subtle prompting elements into what are otherwise disguised as thematically neutral probes.

Imagination behavior pertaining to past events that have never actually occurred must manifest as neural behavior that could not have been strengthened by past consequences *in the thematic context that is currently being produced*, so sequential manifestation during imagination is not facilitated by that kind of special strength. While

the behavioral elements in the theme of the imagined episode produce reinforcing outcomes, the sequencing of those behaviors is new and is thus controlled differently from the sequencing in a memory.

Note that in a memory, a given neural behavioral event tends to be followed by a specific subsequent event on the basis of a microstructural susceptibility that was established through consequence that occurred during the past behavioral episode that is now the theme of the memory. That is true of the control of *each* subsequent event, so that the unfolding events in a memory share the unbroken sequential predetermination that we liken to a preexistent chain.

In contrast, during the imagined coalescence of some virtual history, a given neural behavioral event is not already linked to a *specific* next event by such thematic preconditioning. In an imagined historical episode, one event follows another on the basis of preconditioning that was never constrained in a thematic way. That is, in an imagined historical episode, while that next event is predetermined by past conditioning, that conditioning history may have occurred in thematic isolation from the conditioning that strengthened the other elements of the imagined sequence. Thus, during the imagination of a fictitious past episode, neural behavioral elements strengthened during disparate historical episodes can fall into place in the *new* sequence.

The person in whom both of these two classes of private neural behavior (memory and imagination) can manifest can usually *tell the difference*, as they say. That is, the individual can usually respond discriminatively to the kind of control on the sequencing, tating one as a *memory* and the other as a *bout of imagination*. When such control is too weak and the discriminative responding fails, a familiar self-probe may emerge: *Did this really happen, or am I just imagining it?* On the other hand, descriptive features that cast the episode merely as belonging to the past are controlled by two factors: (a) by the predetermined fix of the sequencing, and (b) by thematic or contextual clues.

Let us consider an example. When one imagines that one is sailing aboard the H.M.S. Beagle with Charles Darwin during the 1830s, no matter how vivid and realistic the unfolding scenes of that daydream, they were *never* originally stimulated, even to the slightest degree, by direct energy inputs from that historical environment. Furthermore, when one imagines an alternative reality, that daydream is not occurring under strict stimulus control of the current environment, and may be occurring in the absence of *any* control by the current environment.

However, during some bouts of imagination, some of the imagined behavior may actually be occurring, as, for example, when a person who is imagining being in battle exhibits some of the bodily motions that characterize

combat. Also, while the current environment would not precisely evoke the behavior being imagined, some aspects of the current environment may actually tend to evoke some of the behavioral elements of the imagined activity. For instance, the person who participates in an imaginary battle may wield a real weapon of a kind that suits the theme, or an approximation of such a weapon. That is why an imagined episode often seems more vivid, and hence more reinforcing, when the person is in a setting in which such an imagined episode may actually tend to occur.

For a person to distinguish between memory and imagination, the person must respond discriminatively to the nature of the controlling relations in which that private neural behavior occurs. The neural behavioral events that constitute a memory originally occurred under tight and precise control by an environment that, at that time, would have passed tests of reality. At that time, precise linkages among the sequential elements of the original neural behavior were conditioned. Later, on an occasion of the kind of private reiteration to which we refer as *the memory of that episode*, the order of the neural behavioral elements is predetermined through that conditioning, which occurred during the original episode, and the original sequencing conservatively reoccurs. In contrast, the events in a bout of imagination feature private neural behavior the elements of which are coming together for the first time. Each is some fragment from the person's general conditioning history, but the sequencing is new.

A verbal community imposes strong contingencies on each member to respond discriminatively to the differences in the controls on memory and imagination. However, an intuitive level of responding generally suffices, so although nearly everyone can exhibit that discrimination rather accurately, few people outside of behaviorological circles have been conditioned to account for how it happens.

Unlike a remembered environment, the imaginatively constructed environment, never having had to exist in reality, is free to violate temporal constraints and thus may be interpreted as a past, present, or future setting. A daydream—whether a recasting of the past, indulgence in an alternative present, or a virtual preview of future events—rather than being teased into manifestation with conservative probes (as may be necessary with a memory) can be prompted constructively as necessary to maximize its reinforcing qualities.

The initially evoked scene of a daydream may be contrived through prompting or may arise through naturally encountered stimulation, and further evocative supplementation may not be necessary. That is, the subsequent episode of daydreaming may then proceed through a generally reinforcing chain of scenes in a relatively automatic way that is sometimes described as *free-flowing imagination*. In that mode each scene is said to evoke the

next scene. The kinds of thematic behavior that are featured in a daydream are respectively well conditioned as a result of their respective histories of reinforcement, and therefore they tend to be consciously reiterated in the daydream. However, because the sequence is new, a new kind of environment would be required to produce it, so along with the neural reiteration of the thematic behavior, the daydreamer must behave a kind of environment that would tend to produce it. In an imagined sequence, the environment-behavior function that characterizes reality works backwards in the sense that the emergence of strong behavior is evoking a neural iteration of the environment that in reality would control that behavior.

Note that in imagination, the conscious iteration is the *only* real behavior that occurs to take the effect of any operant and respondent conditioning. That is, if, for example, reinforcement occurs, it pertains only to the on-going neural behavior of imagining. The imagined thematic behavior per se never really occurs, so it is never really reinforced. Any reinforcement thus pertains to the behavior of imagining, not to the thematic behavior that is being imagined.

This distinction is important in the analysis of fantasies that feature thematic events the reality of which would probably be intolerable to the daydreamer. In the historical absence of a science by which to analyze the issue effectively, human culture has featured an ancient and reoccurring debate about whether antisocial fantasies are likely to be "acted out." For example, suppose that over a long period a person is mercilessly tormented by another individual. The tormented individual may often fantasize about revenge, perhaps by imagining scenes that feature the persecutor being burned at the stake.

The imaginary immolation is entirely reinforcing simply because only those thematic aspects of the neural behavior that are reinforced will survive. Whereas a real environment continues to impose its aversive stimulation as long as contact is maintained, any aversive aspects of an imagined environment are subject to extinction and suppression. In a fantasy the only real behavior is the neural behavior of imaging, and that neural behavior includes both the thematic behavioral events and the environment that would be necessary to elicit and evoke those events.

If the imaginatively constructed environment were to be replaced with its real and behaviorally unsanitized counterpart, the fantasizing person would probably be repelled by the spectacle of a person really burning to death while tied to a post. That is because the real environment would inclusively be imposing a wide variety of aversive stimuli that could not be subtracted directly from the real environment by operant extinction or suppression. To rid a real immolation of its intrinsic aversive features, nor-

mally one must avoid contact with it, either by departing the scene or preventing the whole episode before it begins.

In a real immolation, a piece of sizzling flesh melting away in the flames is generating the energy that triggers the spectator's consciousness of the event. That energy continues to impinge on the spectator regardless of the aversive nature of its behavioral effects on that spectator. In contrast, during a fantasized episode, the corresponding environmental events are being generated behaviorally and are therefore under the operant control of their own aversive effects. In a fantasized version, if a piece of sizzling flesh melting away in the flames is aversive, the behaviors of consciousness that are generating that aversive aspect of the overall spectacle are suppressed, and that feature is thus behaviorally subtracted from the on-going scene (all of which is occurring only in the sense that it is being behaved in response to energy that is circulating internally rather than impinging from without).

A daydream is susceptible to continual self-prompting, which typically occurs in ways that maximize the reinforcing thematic and contextual effects. That occurs as thematic aspects of an on-going daydream evoke brief thoughts about potentially reinforcing thematic variations any of which may initiate a new chain of daydreaming along the contextual and thematic path of that variation. On the other hand, in accurate remembering, one is under contingencies to reproduce an unchanged version of some private neural behavior that has already occurred. If one is privately to behave again as one has behaved previously, then the stimulus controls on the privately reiterated version of that behavior must conservatively re-present as a functional equivalent of the controls that prevailed in the original episode.

Accurate memories are important to a verbal community, so its members are taught how to engage in the kinds of self-probing practices that are least likely to alter the content of the reiterations that they share in evoking. For example, a person who is challenged to recall the mode of transportation that that person used to get from town A to town B may find that the response is not forthcoming. One approach is to follow a self-instruction to describe the contingencies under which the trip was undertaken, if that is possible. If the reason for the trip can be reiterated, then the selected mode of travel would probably have been the one that best afforded the kind of travel-related experiences that comport with that contingency. Such a sequence of thinking may share in strengthening the current identification of the travel mode that was used.

Suppose, on the other hand, that one were first to select arbitrarily any travel mode that would have been available to a traveler at that time (for example, a bus) and then ask, "*Might I have taken the bus?*" The prominent manifestation of the term *bus* may evoke memories of past bus trips that could then be mistakenly associated

with the trip in question. If one actually made the trip by canal barge under contingencies to scout for scenes that could serve as the subjects of landscape paintings, then the advantage of the non-committal probe for the travel mode, based on a review of the contingencies under which the trip was undertaken, becomes obvious.

Thus, in a sophisticated verbal community, each member may be taught to probe with a thematically neutral self-question whenever the person is challenged to recall the details of an event. That kind of question is devoid of intrinsic qualities that may directly evoke details that could then be reported as invalid memories about that particular journey. In the legal sub-community, accurate recall is especially important. In a courtroom, an attorney's question, posed to his or her own witness, that explicitly suggests a particular potential answer tends to evoke an objection from opposing counsel on the grounds that that attorney is "leading the witness."

Note the differences in the controls on memory and imagination. Both classes represent currently evoked behaviors, but in the case of memory, the contextual controls remain functionally similar to those that prevailed during the original episode, so that one behaves now, in a private neural way, as one behaved previously in that same private neural way. One cannot behave again if one did not previously behave that way in the first place. Thus, one cannot remember (i.e. cannot re-behave) a behavioral event that one did not originally behave (i.e., an event of which one was not initially conscious, as they say) However, in the case of original imagination, the controls on the private neural behavior do not functionally match the controls that prevailed during a prior episode.

Note that the behavioral reiteration that we call a *memory* consists of private neural behaviors. Note also, that the behavior that is now reoccurring as a memory is a *re-occurrence* of some behavior that originally occurred as the private neural behaviors of consciousness. That is, the behaviors that reoccur in a memory, consist only of repetitions of the original behaviors of consciousness, not repetitions of any other kinds of behaviors of which the person may have been conscious. It is only the behaviors of consciousness that repeat during a bout of remembering.

For example, suppose that one is recalling one's flipping the light switch that turned off the ceiling light as one was leaving a room on a particular occasion. The behavior being recalled is the muscle-driven flipping of the switch, but the behavioral mode in which that memory manifests consists only of private neural behavior, and, furthermore, it is a reiteration of what originally was only private neural behavior. The behavior of recall manifests in, and pertains only to, behaviors in the class called consciousness. If, during the original behavioral episode, the motor behavior of reaching toward the light switch and flipping it did *not* evoke concurrent behaviors of con-

sciousness (i.e., awareness, recognition, comprehension, etc.), then later memory of that switch flip will be impossible, because that memory would have to occur as a reiteration of original private neural behavior that had not occurred in the first place.

Absent an evocation of that kind of neural behavior of consciousness during the initial episode, a reiteration of it cannot later reoccur. Thus, behaviors that originally occur under direct stimulus control cannot be recalled, because the kind of behavior that would have to repeat does not happen in the first place.

Note, however, that daydreaming and other kinds of imaginings can, in theory, be recalled, because they originally manifest in the neural behavioral mode that is necessary for recall to pertain. However, the neural micro-structuring that was established (i.e., conditioned) during the original bout of imagination is, of course, subject to the kind of on-going natural degradation that is responsible for forgetting. Thus, the thematic content of either a bout of imagination or an environment-induced bout of consciousness can be rendered progressively unrememberable (i.e., unreviewable) as a result of the forgetting process. However, the thematic content of an interaction with a real environment that fails to evoke the concurrent neural behaviors of consciousness cannot later be reviewed in the memory mode because no capacity is being established to support that later kind of neural re-behaving (as in the previous light switch example).

A person distinguishes between the memory and imagination classes of private neural behavior on the basis of differences in the controlling relations on some current private neural activity. The distinction per se thus involves some further behavior that does not always emerge, thus leading, perhaps, to the familiar self-probe "*Am I remembering or imagining this episode?*"

Imagined behavior can be interpreted as an alternative past, present, or future. The designation of tense that emerges under the control of an on-going episode of imagination can be evoked by either of two classes of events, or both.

The first is contextual and pertains to the temporal implications of the thematic content. If the activity pertains to events that are correlated with points on a time line, then the daydream can be classified temporally. For example, virtual characters that are dressed in the clothing of earlier times and who work with old-fashioned tools evoke a designation of *past*. If the imagined events rely on the solutions of problems that are as yet unsolved, that circumstance evokes designations of *future*. Absent such contextual clues, the time frame may remain ambiguous.

The second class of controls on temporal designations pertains to the contingencies under which the episode of imagination is occurring. For instance, if one is under an explicit contingency to imagine what daily life

will be like 500 years in the future, the ensuing bout of imagination would involve temporal specifications that can denote *futurity* in exclusive response to the kind of contingency under which that bout of imagination was initiated. For instance, an imagined scene that includes a common wall calendar in some detail would feature a calendar that is labeled with a future year. The verbs in verbal descriptions of the scenes being imagined would be rendered in tense forms that indicate futurity.

Responding to The Nature of the Controls on a Tact

If the utterance of a tact is impending because of contact with its evocative stimuli, the vocalizer may also be in a position to respond to the number, strength, and other properties of those stimuli as well as merely exhibiting the descriptive tact that they tend to evoke. For example, suppose that a potential verbalizer is in visual contact with a bird flying overhead. The bird can present as a variety of different bird-related stimuli, but those stimulus elements, which collectively define that particular bird, become respectively salient in a differential way depending on the duration, viewing angle, and other circumstances of their presentation to that vocalizer.

Suppose that the bird zips past so rapidly that the verbalizer hardly catches a glimpse of it. Only a very few of its properties exert stimulus control over the vocalizer's verbal behavior. If those are properties that, in the past, have been associated with ravens, they may evoke the raw tact *raven*. However, that set of behavior-controlling stimuli is also small, and some of those properties may also have been present during past contacts with other kinds of birds. These historical facts too are aspects of this behavior-controlling situation, and they too may affect the verbal utterance. The verbalizer is likely to say *It could have been a raven*. The term *raven* is a composite tact of the few properties of the bird that shared in exerting functional control during the brief fly-by. The term *could* is controlled both by the paucity of the evidence and by the previous appearances of at least some of those same characteristics in other species of birds.

Suppose, on the other hand, that the same bird had soared slowly past the verbalizer. Assume that it had remained in view for an extended interval with favorable lighting while wheeling so as to present different viewing angles. In that case, several additional properties of the bird would be likely to gain stimulus control over the speaker's verbal behavior, and those well presented properties would tend to establish their respective conditioned evocative functions to a greater extent. In that case, the tact *raven* could again be evoked under that broadened stimulus control, but the vocalizer is also in a position to respond to the relatively large *number* of bird-related properties that are sharing in the control of that tact plus

the circumstances of their near optimal presentation. In that case, the verbalizer may say *I'm sure that that was a raven*. The *sure* is a response to the richness of the evidence, including its variety as well as the special circumstances that insured the behavior-controlling effectiveness of its elemental presentations.¹⁴

In the past, when a speaker said either *It could be a raven* or *I'm sure that it is a raven*, it has often been asserted that the verbalizer is responding to the probability that the primary tact *raven* is valid. However, the vocalizer in such cases did not contact a "probability" in the sense of an environmental entity. Instead, the vocalizer contacted sets of stimuli, each of some relative salience, the elements of which were presented in ways that differentially exploited their respective conditioned evocative capacities. The class of responses that are evoked by those kinds of features of the situation are related to the primary tact insofar as such responses are evoked by certain qualities of the controls on the primary tact. When a vocalizer says *It could have been a raven*, a mediator tends to respond with less raven-related behavior than when the vocalizer says *I'm sure that it was a raven*.

Consider that *relation* refers to two variables, one of which exhibits change that bears an orderly correspondence to on-going changes in the other variable. While either of the two variables acting independently can evoke verbal responses, so can the relation between them. Note that a verbal response to a behavior-controlling relation occurs as a response to two on-going classes of change, one occurring among some independent (in this case, environmental) variables and the other among some dependent (in this case, behavioral) variables. That is, changes in the contacted environment correspond in an orderly way to changes in a behavioral variable. That is, the order in the behavioral change is defined by the nature of the on-going environmental change.

Those two kinds of on-going changes are all that is available to be contacted (we do not really contact a relation or a correspondence), and although that is all that can be contacted, such a pair of changes, with one reflecting the other in some orderly way, collectively evoke the inferential tact *relation*, which chains to the subsequent verbal behaviors that we call its comprehension. Such an extended tact reifies certain aspects of what, fundamentally, are processes. The compound adjective *behavior-controlling*, which modifies *relation*, is evoked by the orderly reflection of environmental change in the corresponding change to the *behavioral* variable.

Many such responses to aspects of the controls on other verbal behaviors manifest, not as tacts, but as a wide variety of other linguistic nuances. Such subtle responses to the properties of the controls on other verbal behaviors are so important that they command their own major classification of verbal behavior. The next main

section of this chapter is devoted to that special class, which is called *autoclitic* verbal behavior.

[Part 3 continues in the next issue.—Ed.]❖

Footnotes

¹Note that we do not speak technically of this conditioning history in terms of *the child having learned these things*. That is because there is no agential child that presumably inhabits the body as an agent who, through its own initiatives or allowances, *learns* what to do. There is only a body to be operantly conditioned, and that conditioning occurs automatically as a result of external events. People do not *learn* (because the people—agents that would have to do it, do not exist). Instead, conditioning *happens* to bodies. When such conditioning has happened to the body of a person, that person then has an altered body structure that, thereafter, responds differently to its environment. Persons who believe superstitiously in autonomous self—spirits that control behavior then interpret those changes in behavior as evidence of changes in the putative will of the responsible agent, who is then said to have *learned*. The behaviorological definition of the verb *to learn* is merely *to exhibit change in behavior in the presence of a given stimulus as a result of an appropriate history of conditioning*.

²The relation between the textual stimulus and the vocal production of the word “house” is traditionally said to represent a “point-to-point” correspondence, but the correspondence is more accurately described by “range-to-range.” The smallest functional increment of the textual stimulus is a whole letter, which presents as a far broader range than a mere point. Likewise, during the vocal pronunciation of the word, it is not possible to specify a single instant of sound production that corresponds exclusively to any one point in a printed letter of the text version. That is, the vocal sounding that is controlled by a single letter, consists of a broader range of sound than a single point of sound (whatever that would mean). At best, a range of sound production corresponds to a letter, or letter combination, within the printed word. Consider, for instance, the control exerted on a reader’s vocal behavior by the printed letters ...*ough*... in the printed word *thought*.

³In everyday agential language, it could be said that the child must already have learned the spoken name for a house or the written label for a house (i.e., the child must know what that word means when spoken or written). Note, however, in the previous sentence, that substantial conceptual errors are implicit in each of the four terms *child* (as an agent), *learned*, *know*,

and *means*. This illustrates what is wrong when common language descriptions of even simple behavioral events are left unchallenged.

⁴If a box dumper in the aircraft were able to dump the disks in such a way that they would flutter to the ground in an array determined by how they had been dumped, that skilled disk dumper could then insure any desired ground pattern of white dots by dumping the disks in a particular manner. For example, that disk dumper could dump a box of disks in a way that would predictably result in the word *cow* being spelled in a sequence of dot patterns that respectively suggest the letters c, o, and w. In that case, the reader would be responding to verbal stimuli that had been produced by an author who had a curious way of writing text.

⁵A *sound* being heard is a behavioral response. Such a behavior can occur directly—for example, in the sense of privately hearing a word that is being read silently. Light waves from the printed text enter the eyes and are transformed into corresponding neural impulses that are transmitted to the neural body parts that have the capacity to behave the corresponding sound. The private audition occurs under direct stimulus control of the visually appreciated text in the absence of any sound waves that would typically evoke that hearing response. That is, upon contacting the printed word *book*, the reader privately hears the sound of that word even though the reader’s vocal system has not produced the corresponding sound waves in the ambient air. The behavior of hearing the word *book* can also occur indirectly when such a vocalization does occur—that is, when the vocal musculature responds to the printed text by producing some corresponding sound waves in the ambient air. Those waves then travel outside the body from the mouth to the ears, where they stimulate the aural system of the body. That aural system converts the sound waves into electro—chemical neural impulses that are transmitted to the neural body parts that have the capacity to behave the corresponding sound, whereupon the behavior of audition occurs. It may then be said, incorrectly, that “the person hears his or her own voice saying *book*.” However, the natural occurrence of that audition—type of behaving is a part of the behavior that defines the concept of *person* in the first place. The *person* does not exist independently apart from the behaviors that define it. The hearing behavior *is* a part of the person.

⁶The basis of such a statement is that no one seems able to exhibit both kinds of behavior at the same time, which increasingly implies that the same body part is exclusively required for each kind of behavior. Just as a person’s right hand cannot concurrently scratch the

top of that person's head and rub that person's stomach, some neural body parts cannot concurrently exhibit two distinct kinds of private neural behavior, and no program of behavioral conditioning can make that happen.

⁷This subclass of intraverbal behavior has been called *duplic* behavior, a term derived from the verb *duplicate*.

⁸This subclass of intraverbal behavior has been called *codic*, a term derived from the noun *code*.

⁹The term *repertoire* does not refer to the contents of an archival mental storage facility for behaviors, but to the neural capacities to reproduce them upon occasions of appropriate environmental stimulation. Every response is produced anew, and is never an old one retrieved from mental storage in mystical archives. Conditioning does not put behaviors in storage; it produces the microstructures that represent the capacity to behave in a certain way, given the necessary stimulation. Upon the arrival at such a specific structure of such a specific transmission of energy, the incipient stage of a particular behavioral response is automatically initiated.

¹⁰Recall that the bodily structure develops in response to its genetic code and may do so with a structure that is already capable of specific respondent reactions to specific environmental stimuli. In contrast, behavioral conditioning is a subsequent process of *restructuring* the body, which capacitates new kinds of environment-behavior relations. Whether capacitated through (a) genetics, (b) respondent conditioning, or (c) operant conditioning, *all* behavior manifests as a dependent variable in structure-to-structure functional relations (structure of environment to structure of behaving body). Respondent-operant distinctions are based on when and how bodily structures become configured for their functional participation in such environment-behavior relations. Manifestations of such relations require that the behavioral variable be triggered by energy that may impinge from without (e.g., light, sound, or energy imparted by impinging projectiles). The energy that triggers behavior may also be released from storage within the body (as when a person's hand moves back and forth in contact with a stationary surface thus making possible the person's feeling behavior).

¹¹Note that the term *contact* really refers to a behavioral reaction. *Contacts with...* manifest as *behavioral reactions to...* As will be further explored in the next chapter, the reality of the environment, as determined by our contacts with it, is an inference (i.e., a subsequent kind of behavioral reaction) that is based on prior behavioral reactions that presumably were evoked by an *environment*. Thus, our own behavior is

as close as we ever get to the reality of what we call "our environments."

¹²Recall that, if the current neural behavior is entirely a restimulated rendition of a prior one, it is called a *memory* and described using indicators of the past tense. If, on the other hand, it features a composite of behaviors from different earlier episodes that have never occurred together, all evoked by a current event that, in the past, has preceded punitive stimulation, one describes the avoidance behavior as impending insofar as it is cast in the future tense. The forms that indicate futurity are thus controlled antecedently by a current event that restimulates neural reiterations of past behavioral reactions that originally occurred as parts of different episodes. An example is when, in response to a current event, one imagines one taking some composite action the elements of which have, in the past, occurred on different occasions. "Different past occasions" are discriminatively distinguished as different on the basis of how elements of current neural behaviors (called *recollections*) are being controlled.

¹³*One* is confined within the prison of one's own behavior and serves a life sentences exclusively in the functional present.

¹⁴Note that, as functional accounts for such nuances of verbal behavior accumulate, the apparent need for explanatory reliance on a body-managing self-spirit is proportionally diminished. That is, the self-agent retreats with the advance of functional accountings. Thus, the relative certainty reflected in this vocalizer's statement does not reflect the increasing resolve of a comprehending self-agent. Instead, the inclusion of the phrase *I am sure that...* is merely a functional response that is determined (evoked) by special properties of the set of stimuli that evoke the raw tact *raven*—namely, the large number of its stimulus elements, the quality of their presentations, and their endowments of evocative strength from their previous respective episodes of operant conditioning.

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