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FINDING THE PHILOSOPHICAL CORE: A REVIEW OF STEPHEN C. PEPPER'S WORLD HYPOTHESES: A STUDY IN EVIDENCE[1]

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Behavior analysis has always had significant conflicts with other psychological perspectives. At their most fundamental level, these conflicts are often philosophical, concerning such issues as the nature of the human and the purposes of science. Why are *these* the conflicts? What, if anything, can we do about them? Can we resolve them? Can we avoid them altogether by simply abandoning philosophy?

To answer these questions, we must be clear about the philosophy underlying behavior analysis compared to those of other perspectives. To be clear is difficult, however, because the assumptions and postulates of the position are not deliberately and unambiguously laid down. Fundamental assumptions, specific theories, and historical accidents are too often discussed concurrently and without adequate differentiation in behavior-analytic expositions. Skinner's philosophical writings are especially prone to this difficulty, perhaps because he is so extensively involved with so many nonphilosophical aspects of the field.

In 1942 Stephen C. Pepper, a philosopher and aestheticist, published *World Hypotheses: A Study in Evidence.* His central insight was that philosophical systems cluster around a few core models, or "world hypotheses," drawn from common sense. His strategy was to ignore details and personalities, and instead to present the central tenets of each world view in a general way. He used his own terms to describe most of these tenets, avoiding excess or parochial meanings. He quoted and cited very little. His style permits an understanding of the grand scheme of philosophy, abstracted from the details of particular positions.

The book is at once simple and difficult. In some areas, Pepper focused on the debates of his own time and particular history, and thus emphasized distinctions that do not seem to have withstood the test of nearly half a century. In general, however, the book is amazingly contemporary. It is like a series of colored spotlights cast on a complicated scene. Irrelevant details of various philosophical positions disappear like so many shades of blue under a blue spotlight. Fundamental differences leap out, now from one angle, now from another. Although the book is not about psychology, it exposes the philosophical sources of current conflicts within behavior analysis and the nature of its conflicts with other psychologies.

To make Pepper's position understandable, we must summarize some parts of the book fairly extensively. To show its value for a field he never analyzed, we must interpret it and extend it. Our purpose is not to promote the use of Pepper's conceptual categories per se; it is to use them to illuminate the conceptual categories of modern behavior analysis and of competing psychological systems.

THE NATURE OF WORLD HYPOTHESES

A world hypothesis is a model of the universe of observations and inferences. (We will also use the term "world view" as a synonym for "world hypotheses" to emphasize that Pepper's use of the term "hypothesis" in this context is not precisely what psychologists mean by a "hypothesis" in a scientific context.) World hypotheses differ in scope (i.e., the range of events incorporated) and precision (i.e., the scarcity of alternative interpretations made of the events incorporated), and their

[1] Pepper, Stephen C. (1942). *World hypotheses: A study in evidence.* Berkeley: University of California Press. vii + 348 pp.

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adequacy is a matter of the degree to which each obtains. Ideally, a world view has unlimited scope and is so precise that it permits one and only one interpretation of every event. In practice, all reasonably adequate current world views fall short of this ideal. Scope and precision tend to be inversely related: A model that specifies precisely how to interpret a given event will tend not to incorporate as many events as a model that permits viewing a given event in a number of different ways.

Pepper argued that each world hypothesis is autonomous. As an attempt to provide a complete view of the world, each world hypothesis creates its own field of play. Within that field of play "competing" world views can be interpreted but cannot compete directly. This argument anticipates the similar views of Kuhn (1962) among others (there are good reasons to believe that many of Kuhn's ideas were derived from Pepper's work; Efron, 1980) and has several implications. First, using the categories of one world view to analyze and criticize another is illegitimate and inherently useless. Second, no world hypothesis can be strengthened by revealing shortcomings in another. The weakness of one world view in no way implies strength in another. Third, eclecticism, if it involves combinations of distinct world hypotheses, is inherently confusing. Each world hypothesis entails a different set of conceptual categories, many of which are mutually contradictory across different world hypotheses. No coherent combination of currently popular world views seems likely and none has yet succeeded. This does not mean that forms of integration are not possible, but if Pepper were correct, successful integration could come only by combinations based on yet another coherent world hypothesis. A single exception exists in strategic integrations of world views subordinated to a single world view. As discussed later, such an integration is possible in only one of the relatively adequate world views.

According to Pepper, world hypotheses are derived from "root metaphors." A root metaphor is a common sense conceptualization of a domain, in accordance with which categorical concepts have been constructed. The root metaphor structures an understanding of the technical categories. A technical construct sustaining no conceptual contact with its underlying metaphor becomes empty and meaningless.

THE RELATIVELY ADEQUATE WORLD VIEWS

Pepper identified four relatively adequate current world hypotheses: mechanism, formism, organicism, and contextualism. Mechanism and formism are analytic: The whole is reducible to its parts. The parts are basic, the whole derived. Organicism and contextualism are synthetic: The whole is basic, the parts derived. Formism and contextualism are dispersive: Facts are related when they are found to be so, not by assumption. Chance, therefore, is not denied in these hypotheses. Mechanism and organicism are integrative: Facts are related by assumption and order is categorical. As such, chance is denied. Dispersive world views tend to be higher in scope than in precision; integrative world hypotheses tend to be higher in precision than in scope.

Describing psychological systems in Pepper's terms organizes them into coordinated sets of related propositions and concerns. The likely conflicts between particular psychological systems may then be derived, and solutions to these conflicts proposed. For this reason, examining each of Pepper's four relatively adequate world views seems potentially worthwhile to an analysis of psychological systems.

Mechanism

The root metaphor of mechanism is the machine. Any common-sense machine is composed of discrete parts related to other parts in some systematic way. Relations among the parts do not change the nature of the parts, however, because the parts exist independently of those relations. Further, in any common-sense machine, some sort of force or energy is exerted on or transmitted through the system to produce predictable outcomes.

A simple example is the lever. A lever is composed of two discrete and independent parts—a lever and a fulcrum. When they are related in a particular way (e.g., the lever is placed on the fulcrum), a force exerted on one end of the lever produces a predictable effect at the other end according to the amount of force, length of the lever, placement of the fulcrum, and so on. In more complicated

machines, the history of forces applied may also be relevant to the operation of the machine. In this context, history means that one part may not function until other parts have functioned, or that various parts have worn down. For example, a clock does not strike until the spring controlling the hourhand has been wound and has operated for a predetermined period of time. To take a more contemporary example, a computer does not operate until a code has been placed in its "memory" chips and software in its read-only "memory."

According to the world hypothesis of mechanism, the entire universe is like a machine. Different machines yield different variants of mechanism. The hydraulic statuary of the Middle Ages leads to one theory, the computer model leads to another. Nonetheless, the key elements of common-sense machines and their means of operation are always present.

The machine metaphor extends to the knower as well as the known. The knower relates to the world by producing an internal copy of it, through mechanical transformation. This epistemological stance preserves both the knower and the known intact and basically unchanged by their relation—a requirement of mechanism. In some versions of mechanism, the internal copy is "mental"; in others it is "physiological." Regardless, the knower knows a copy of the world, not the world itself. Truth is a matter of how well the copy corresponds to the world, as evaluated by corroboration among independent knowers. Corroboration is required because the correspondence between the copy and the world cannot be observed directly.

Correspondence between what we say about the world and what we see in it is relatively trivial when the material described is immediately present. Correspondence of this limited kind is not adequate for the mechanist for several reasons. The mechanist's goal is to discover the parts and the relations among parts of the existent machine. Because mechanism is integrative, all the parts are assumed to fit together. Order is categorical. Thus, mechanists do not simply describe parts in the common-sense world; rather, they seek to discover the true nature of a given event by specifying what kind of part it really is and by placing it properly in the machine. Such a goal is aided by an a priori model or theory. Scientists cannot use the correspondence between a verbal construction of the machine and the facts as a test of the adequacy of the construction if the very same facts serve both as the source of the construction and as the means of its verification. Truth is best established by examining the correspondence between the verbal construction and a variety of new facts implied by the construction. In line with the integrative quality of mechanism, the more derived and indirect these predictions are, the better (Ericsson & Simon, 1984). Hypothetico-deductive research methodology exemplifies this logic; many mechanists gravitate toward it.

Formism

The root metaphor of formism is similarity. The kind of similarity implied here is the recurrence of recognizable forms: blades of grass, sheets of paper, rows of doughnuts, or the like. The position of immanent formism (one of two major variants) is as follows. The perception of any event involves contact with two aspects of that event—character and particularity—that are absolutely distinct but cannot be experienced independently. Character refers to the qualities and relations that are tied to a given object: This doughnut has the qualities of being soft, warm, and sticky; it has the relation of side-by-sidedness with the other doughnuts in this row. Theoretically, a given object may have an infinite number of characters.

A given character may occur in an infinite number of particulars. Still, this doughnut is this doughnut and no other. This doughnut is the particularization of a character, as well as the characterization of a particular. The doughnut involves the participation of one with the other.

A collection, or "class," of particulars participating in one or more characters is another categorical concept in formism. "Gorilla," for example, is neither a particular event, nor a character, nor a participation. It is all three together. Certain characters that participate in a particular object lead us to identify that object as "gorilla." Each other object that is characterized in the same way is also a "gorilla," and all these objects considered together are the class "gorilla."

Systematic organizations of facts are not assumed by formists, hence principles of op-

eration (such as "force") are not required to explain them. Indeed, if all facts were integrated by a set of formistic principles, then those facts would necessarily form a system (the integration itself) and formism would begin to have the character of mechanism. A causal law in formism is no more than a bridge from one set of characterized particulars to another. It is a form.

The truth criterion of formism, like that of mechanism, is correspondence. In formism, however, the simpler sense of this criterion (correspondence however derived) is adequate given its dispersive quality.

Organicism

The root metaphor of organicism is the process of organic development, as in living, growing, organic systems. In such systems, change is given and stability is to be explained. Versions of developmentalism that rely on stage models reflect this philosophy. For example, a person is assumed to move from one stage of growth to another in an orderly way. To explain the person's current stage we must explain the orderliness of changes from stage to stage. In other words, we must explain how the rules of change operate, assuming that change occurs according to rules of change that are themselves unchanging (Reese & Overton, 1970). The organicist notes "the steps involved in the organic process and . . . the principal features in the organic structure ultimately achieved" (Pepper, 1942, p. 281).

In organicism, the whole is not a synthesis of parts; the whole is basic, the parts meaningless except in the context of the whole. The organicist embraces teleology: "The structure achieved or realized is always the ideal aimed at by the progressive steps of the process" (Pepper, 1942, p. 281).

The truth criterion of organicism is coherence. When a network of interrelated facts converges on a conclusion, the coherence of this network renders this conclusion "true." All contradictions of understanding originate in incomplete knowledge of the whole organic process. When the whole is known, the contradictions are removed and the "organic whole . . . is found to have been implicit in the fragments" (Pepper, 1942, p. 283).

Epistemologically, organicists adopt constructivism. The knower actively construes the world—it is neither known directly nor mechanically transformed.

Contextualism

Contextualism is the most important world view for our purposes, so we here describe Pepper's analysis of contextualism in more detail. The root metaphor of contextualism is the ongoing act in context. Another term might be the historical act, but not as a dead description of a thing done. It is doing as it is being done, as in hunting, shopping, or making love.

Two fundamental categories of contextualism are *quality* and *texture.* Quality is the experienced nature of an act; texture is the details and relations that make up its quality. In contextualism, even these categories might change (if they do) because nothing is final or ultimate about our knowledge of the world—not even that the world will stay the same. In our present epoch, however, all events have quality and texture.

Each category is defined in terms of other categories. Quality, for example, is made up of *spread* and *fusion.* Spread refers to the extended present of an act in context. The past and future of an act exist in the ongoing act. The act spreads, as we say, both backward and forward. Fusion refers to the integration of the textural details of a given event. Lemonade has the texture of water, lemons, and sugar. The quality of lemonade is a fusion of these distinct ingredients—so thoroughly so that the ingredients are difficult to analyze separately. Cooking a meal is composed of many textural elements (e.g., picking up a pot, selecting ingredients, mixing the ingredients), all of which may be fused in the overall quality of cooking the meal. If one becomes more interested in the act of picking up the pot than in the act of cooking a meal, the fusion of the larger act dissolves. Picking up the pot becomes the experienced quality.

Texture is defined in terms of other categories, namely, *strands, context,* and *reference.* Strands are the interconnections among the details of an act that directly contribute to its quality. Context is made up of the interconnections among strands, contributing indirectly to the quality of a given act. The two cannot be fully distinguished because each contributes to the nature of the other. As an example, a cook prepares a dessert. The details

and relations of this act, that is, its texture, may be arranged in strands of various sorts. This act could comprise the strand we might call "entertaining a dinner guest," occurring in a context of the guest. It could be the strand we call "the performance of the cook" occurring in a context of other meals prepared by the cook. It could be the strand of "mixing in the eggs," occurring in a context of breaking the eggs, holding the bowl, and so on. The quality of the act in each case emerges in the interaction of the strand and its context.

The third category of texture, reference, is simply strands more intimately considered. Reference concerns the temporal relations or interconnections among the details of an act, specifically their point of initiation, course, and satisfaction. The concept of reference is worthy of note because it pertains to issues of similarity and novelty as contextualistically interpreted. Similarity, for example, is not a feature of events from a contextualistic standpoint: No two events in the world are inherently similar. Rather, similarity is an attribution made when different initiations converge on one satisfaction. Planting a garden and going to a restaurant, though formally dissimilar, are regarded as similar to the extent that they produce the same outcome, namely sustenance.

The quality of an act is necessarily threatened by examining its texture because any given strand of that texture might be experienced as a quality in its own right. This circumstance is a consequence of the dispersive character of contextualism: The parts, being derived, may be derived in any number of ways. As such, the texture of this new quality might be examined, one of its strands experienced as a quality, and so on. Were analysis made for its own sake nothing would prevent this process from continuing ad infinitum. For the contextualist, however, analysis is always for some purpose.

The truth criterion of contextualism is successful working. Analyses are true only in terms of the accomplishment of particular goals. No postulational provision is made for the evaluation of the goals themselves. Truth may thus exist with regard to relatively trivial goals. This pragmatic view of truth is quite radically applied: "The quality of blowing your nose is just as cosmic and ultimate as Newton's writing down his gravitational formula. The fact that his formula is much more useful to many more people doesn't make it any more real" (Pepper, 1942, p. 251).

A powerful implication of this truth criterion is that on contextualistic grounds one can adopt the analytic strategy of an alternative world view in a given situation if doing so is useful toward some end. For example, a philosophical contextualist might adopt a mechanistic theory because it is useful in identifying ways of "controlling" behavior. Strategic integration of this sort does not violate Pepper's warning against the destructive effects of eclecticism, because no integration of the underlying root metaphors is implied. The machine metaphor is merely used in the service of a contextualistic agenda; the truth of the analysis based on that usage is evaluated against a successful working criterion.

IMPLICATIONS FOR BEHAVIOR ANALYSIS

Pepper did not write *World Hypotheses* for psychologists, or even for scientists in general. Thus, the correspondence between his world views and philosophies underlying science is only approximate. Nevertheless, particular approaches to psychology do seem often to have the predominant character of one or another of Pepper's four relatively adequate world views.

Behavior Analysis as a Contextualistic System

The predominant character of behavior analysis, or at least what is central and distinctive about behavior analysis, is contextualistic. Among the particularly contextualistic features of behavior analysis are the concept of the operant, the criterion for truth or adequacy, the role of the scientist in scientific analysis, and the possibility of novelty.

The concept of the operant. Several characteristics of the operant correspond closely to the categorical concepts of contextualism. An operant is defined as a relation among behavior and stimulus events. The events participating in an operant cannot usefully be examined independently because their nature depends on their relations to the other participants. Similarly, for a contextualist, an act out of context is not an act, categorically speaking: "It is not an act conceived as alone

or cut off that we mean; it is an act in and with its setting" (Pepper, 1942, p. 232).

Because context must be included in the analysis of an act, contextualists analyzing an act quickly find themselves outside the confines of the original event of interest (the act) and in the domain of other events (the context). "The quality of an event is the fused qualities of its strands, and the qualities of its strands come partly out of its context, and there we are outside of the event" (Pepper, 1942, p. 249). The parallels to behavior analysis are obvious. For example, "We cannot account for the behavior of any system while staying wholly inside it; eventually we must turn to forces operating upon the organism from without" (Skinner, 1953, p. 35).

Membership in an operant class in no way depends on the formal characteristics of the behavior involved. Responses share membership in an operant to the extent that they produce common effects on the environment: "The consequences define the properties with respect to which responses are called similar" (Skinner, 1953, p. 65). This type of classification corresponds precisely to the contextualistic conception of similarity as derived from "convergence of action on a single effect" (Pepper, 1942, p. 255).

An operant has no fixed boundaries. For example, an operant may be anything from a thumb twitch to cooking a four-course meal. We might speak of the larger operant as a composition of smaller elements (in Pepper's terms, strands of texture), but speaking in this way does not exclude examining the elements as operants in their own right. Similarly, any aspect of a strand of texture may be examined and consequently become the quality of interest.

Finally, the behavior-analytic view of behavior emphasizes the verb-like quality of all behavioral interactions (e.g., Hineline, 1980). This emphasis parallels precisely the root metaphor of contextualism.

The criterion for truth or adequacy. As Pepper noted, "the analysis of an event consists in the exhibition of its texture, and the exhibition of its texture is the discrimination of its strands, and the full discrimination of its strands is the exhibition of other textures . . . and so on from event to event as long as we wish to go, which would be forever or until we got tired" (Pepper, 1942, p. 249). What saves contextualism from being paralyzed by its fluidity is its criterion for the adequacy of analysis, namely, successful working. Successful working always implies success with regard to the accomplishment of some potentially attainable goal. For this reason, the contextualist rather disparages analysis for analysis' sake. "Serious analysis for [the contextualist] is always either directly or indirectly practical . . . . If from one texture you wish to get to another, then analysis has an end, and a direction, and some strands have relevancy to this end and others do not, and . . . the enterprise becomes important in reference to the end" (Pepper, 1942, pp. 250–251). Likewise, Skinner commented: "It is true that we could trace human behavior not only to the physical conditions which shape and maintain it but also to the causes of those conditions and the causes of those causes, almost ad infinitum" but we need take analysis only to the point at which "effective action can be taken" (Skinner, 1974, p. 210). That point is the manipulable environment, because only there may successful working toward the behavior-analytic goals of prediction and control be achieved and evaluated (Hayes & Brownstein, 1986).

Several behavior-analytic positions are understandable in these terms. For example, behavior analysts object to analyzing private events as causes because an event "is useless in the control of behavior unless we can manipulate it" (Skinner, 1953, p. 34). Searching for private causes is thus a "tiresome and exhausting digression" (Skinner, 1953, p. 35) when considered in terms of the purposes of analysis.

The commitment of behavior analysis to successful working as a truth criterion is also demonstrated by repeated appeals to it in criticizing other positions. For example, "The objection to the inner workings of the mind is not that they are not open to inspection but that *they have stood in the way of the inspection of more important things*" (Skinner, 1974, p. 165, emphasis added), and "mentalism has obscured the environmental antecedents which would have led to a much more *effective* analysis" (Skinner, 1974, p. 165, emphasis added). Many such examples are available in the writings of Skinner and other behavior analysts. Skinner in particular has been explicit about this truth criterion: "[Sci-

entific knowledge] is a corpus of rules for effective action, and there is a special sense in which it could be 'true' if it yields the most effective action possible. . . . [A] proposition is 'true' to the extent that with its help the listener responds effectively to the situation it describes" (Skinner, 1974, p. 235).

As previously mentioned, a contextualist can make use of the categorical structures of other world views without becoming philosophically eclectic. Behavior analysts have done just that on occasion, although very likely without full awareness, and much to the confusion of others. For example, Skinner has talked of humans as complex machines: "We have discovered more about how the living organism works and are better able to see its machine-like properties" (Skinner, 1953, p. 47). He did not become a mechanist thereby, because his world view and the truth criterion it entails are contextualistic, not mechanistic. He merely borrowed mechanistic models when doing so seemed useful. Of course, whether doing so is in fact useful is arguable in any given instance.

The role of the scientist in scientific analysis. The importance of a scientific analysis of the behavior of the scientist has long been recognized within behavior analysis (Kantor, 1939; Skinner, 1945). Behavior analysts believe that scientists cannot stand apart from the world under analysis; they are, rather, a part of that world. Pepper made a similar point in describing a contextualistic perspective on this issue. Because analysis is itself an act in context, "the contextualist . . . does not make any exceptions to his analysis of analysis, not even for that analysis itself" (Pepper, 1942, p. 252). The value of any analysis, even of contextualism itself, is to be determined by its usefulness in the accomplishment of some explicit purpose.

Behavior analysts acknowledge the fact that science is, among other things, the action of scientists—action meaningful only by reference to its context. Accordingly, science is not assumed by behavior analysts to be directed toward the attainment of ultimate knowledge. Ultimate knowledge is, by definition, context-free. As Kantor (1953, pp. 9–25) pointed out, science is the work of particular individuals working at particular times in particular places with particular materials for particular purposes. The products of scientists' actions bear the unavoidable stamp of those particulars and cannot thereby be presumed to characterize the universe. Pepper summarized the contextualistic view of science this way: "[Scientific] schemes, such as maps, diagrams, formulas, functional equations, and symbolic systems . . . have been developed on the basis of past social experience, and their status is a good deal like that of a social institution. . . . They constitute what is called 'the science' of a period, and change from period to period" (Pepper, 1942, p. 267).

The possibility of novelty. A central tenet of contextualism is the possibility of novelty. At first glance, this position seems to disqualify contextualism as a scientific philosophy. The position, however, is not that events *will* be novel, only that they *may* be. If order be found, so be it. The only evidence for true novelty, that is, the utterly uncaused event, is "an absence of any evidence to the contrary" (Pepper, 1942, p. 260); and by this criterion, true novelty has never been demonstrated. As far as successful working is concerned, then, the possibility of true novelty can be ignored: It makes no difference (until and unless it does).

This aspect of contextualism does not seem to have obvious parallels in behavior analysis. Skinner, for example, has noted that although we may not be able to prove that behavior is "fully determined," the evidence points in this direction (Skinner, 1974, p. 189). The contextualistic concept of novelty does indeed show up in behavior analysis, however. Operant behavior is said to be "emitted," not "elicited." Its emission is "occasioned" by certain antecedent events, not "caused" by those events in the mechanistic sense of direct production. From a behavior-analytic standpoint, prediction and control pertain not to instances but to classes of behavior. Consequently, no attempt need be made to predict specific instances of an operant at specific times (Skinner, 1938, pp. 10–12, although see Skinner, 1957, p. 28).

Moreover, no attempt need be made by behavior analysts to explain variability in responding. Variability is assumed, and it may be ignored until not ignoring it makes a difference for some purpose. Much the same position is taken by evolutionary biologists. Genetic mutation and variability allow selection to operate, but mutations and vari-

ability themselves can be said to be "random." In this way, scientific forms of contextualism can make room for both orderly relations and unexplained variation.

Mechanistic Elements of Behavior Analysis

Even though behavior analysis can be understood as a contextualistic system, it has aspects that appear mechanistic. Some of these aspects may be understood as uses of mechanistic concepts subordinated to contextualistic criteria, but others may represent an intrusion of an alternative world view into behavior analysis.

Nonfunctional definitions. To a contextualist, acts and their context are inseverable. The contextualist who loses sight of this interdependence loses contact with the quality of an act, which ultimately leads to the dissolution of the contextualistic perspective: "To think of contexts as existing in addition to or apart from practices is like imagining smiles alongside or beside faces" (Bhaskar, 1983, p. 87). Skinner has emphasized a similar point: "Neither [stimulus nor response] may be defined as to its essential properties without the other" (Skinner, 1938, p. 9).

The mechanist does not deny the behavior of the whole, but asserts that it is derivable from the behavior of the parts. The meaning of a part is its role in the behavior of the whole. This role can change as the whole changes. For example, the role of a cogwheel depends on whether it is part of a clock or being used as a fulcrum. A cogwheel is a cogwheel in either case, but the meaning of the part is defined by its potential functions in relation to the potential functions of the other parts of the whole.

Functional definitions of behavior can thus be incorporated into either world view. For the contextualist, they are incorporated as an extension of the basic root metaphor; for the mechanist, as a reference to the functions established among the parts of the machine.

Nonfunctional definitions of behavior can be incorporated readily into mechanism as a description of the parts themselves, considered separately from their roles. For contextualists, however, nonfunctional definitions present more of a problem.

Consider the following nonfunctional definition of behavior: behavior is muscle movements and glandular secretions. The root metaphor of contextualism is an act in context. Accordingly, the experienced quality of an act is dependent upon context. Consequently, a contextualist would be hard pressed to abide by the above definition of behavior without losing contact with the contextualistic root metaphor. Such nonfunctional definitions occasionally show up in behavior-analytic writing. To the extent that they reflect mechanistic thinking, they threaten the philosophical consistency of behavior analysis.

Reductionism. Reductionism applied to psychology holds that psychological events are reducible to neural or other biological events. This position is incompatible with contextualism, not because biological events are of no concern but because in reductionism the parts are primary and the whole derived. In *The Behavior of Organisms,* Skinner (1938, pp. 418–432) argued against the reduction of psychology to neural events, asserting the legitimacy of a science of behavior in its own right. This position is contextualistically sensible. If an analysis works at the level of the whole organism interacting in and with a context, then it works. Analyses at the level of parts of the organism interacting with other parts are "truer" than other analyses only in terms of particular goals.

Nevertheless, many behaviorists embrace biological reductionism. For example, some argue a priori that thoughts or feelings are "really" activities of the nervous system. Skinner himself has said: "[The physiologist of the future] will be able to show us how an organism is changed when exposed to contingencies of reinforcement" (Skinner, 1974, p. 215). If he meant that physiologists may some day be able to give psychologists the "real" explanation of reinforcement, then the statement is incompatible with contextualism, because it is based on the primacy of parts over wholes.

This does not mean that reductionism is always mechanistic, nor that all mechanists are reductionists. The assumption that the whole is reducible to its parts is categorical in mechanism, but the assumption that psychology is (in principle) reducible to biology, for example, is not required. A mechanical conception of thinking based on the metaphor of the brain as computer does not obligate a concern with neurology. By analogy, if the lever is the root metaphor of a particular

mechanistic model, then the laws of the lever in mechanics provide the categories of the model and the question of whether these laws can be reduced to the laws of subatomic physics, for example, does not arise.

In contextualism, parts are abstractions, and therefore reduction of some parts to other parts is merely an analytic, conceptual tool. Reductionism of this kind does not imply that the whole is literally reducible to the parts, because the parts do not exist independent of analysis. Reducing parts to other parts is a fiction that may be useful in a given instance. Thus, a contextualist might suggest a biological explanation for a psychological event if it is useful in understanding the whole.

Mechanists may say similar things, but believe that the parts are real—the whole is the fiction. For the mechanist, the different scientific domains are hierarchically related and *must* fit together in an integrated and complete system of knowledge. Given this assumption, the reduction of one domain to another *is* the reduction of the whole to its fundamental parts (e.g., Bugelski, 1973, p. 62) and is thus mechanistic.

Causality. Some psychologists (e.g., Howard & Conway, 1987; Sarbin, 1986) believe that concern for efficient causality is mechanistic: "Efficient causality description is the goal for scientists working with one or another paradigm within the mechanist world view. Behaviorism and radical empiricism exemplify psychological and philosophical movements committed to this world view" (Sarbin, 1986, p. 6). Based on this belief and the behavior-analytic adoption of efficient causality, some have concluded that behavior analysis is mechanistic (e.g., Howard & Conway, 1987).

Whether the behavior-analytic treatment of causality is mechanistic depends on the purposes of this treatment and the criteria by which truth is determined. If one's goals are prediction and control, as are Skinner's, calling something a cause may be understood to mean that the analytic purposes of the scientist have been accomplished: Prediction and control have been achieved. Such a pragmatic interest in efficient causality does not imply mechanism.

Mechanists are interested in the primary parts of a system, their relations, and the forces that make them operate. An interest in efficient causality may lead one to say that "*this* caused *that*." Such a causal statement is mechanistic only if it is an extension from a system of parts, relations, and forces. Efficient causality per se is compatible with all of the world views except formism.

Causal talk may carry certain philosophical assumptions with it, however, especially for those who have not carefully articulated their philosophical assumptions. "*This* caused *that*" may lead to the view that *this* and *that* are discrete parts that exist independently of their relation, or of the scientist's act of analyzing the whole into parts. The construction of independent parts invites commentary as to the "force" by which this caused that. Perhaps some contextualists embrace only descriptive forms of science (e.g., Rosnow & Georgoudi, 1986b) in an effort to avoid the seductive effects of causal analyses. If such seduction is likely, then behavior analysts must be especially aware of their philosophical assumptions if they are to retain their contextualistic stance.

Reactive organism model. Many behavior analysts have argued that the organism is viewed as *active* in behavior analysis. However, it is not active in the sense usually intended by the phrase "active organism model," which is a mentalistic model in which the organism has purposes and exercises free will in seeking stimulation, selecting among stimuli, transforming (encoding) potential stimuli into forms that may function differently from the potential stimuli, and selecting which responses, if any, to make to the transformed stimuli. The organism in behavior analysis does not have these capabilities; rather it behaves consistently with a "reactive organism model" (Baltes & Reese, 1977; Reese, 1976, 1986a; see also Overton & Reese, 1973; Reese & Overton, 1970).

Conflicts Between Behavior Analysis and Other Psychological Systems

According to Pepper, world views are orthogonal to each other and therefore cannot conflict. Apparent conflicts are really pseudoconflicts, wherein criticisms of one world view are made in terms of the categorical concepts of another. These kinds of conflicts are illegitimate and cannot be resolved; they can only be recognized. Some of the most persistent conflicts between behavior analysis

and other psychological systems seem to fit this pattern.

In what follows we consider each world view in relation to contextualism, from the standpoint of adherents of these world views engaged in illegitimate conflicts with each other. We also consider specific arguments between behavior analysts and other psychologists to see if they conform to what we might expect if the arguments were between contextualists and adherents of some other world view. If so, they may provide evidence that behavior analysis is contextualistic. We intend, further, to evaluate whether Pepper's thesis makes sense of arguments among psychologists and the difficulties encountered in achieving their satisfactory resolution.

Arguments between contextualists and mechanists. When contextualists argue against mechanism, they are likely to question the "thingness" of the pieces of the mechanistic machine. They might ask: Are these things really concrete things? Can they really be known in isolation and is their nature really not changed by virtue of the relations into which they enter? Along these lines, a contextualist may attempt to show that the same pieces of the machine function differently given other histories or other contexts. To this challenge, a mechanist is likely to argue that historical and contextual arrangements of this sort change only the operation of the system, not the nature of its parts. For example, "The machine is built to execute an instruction only when it stands in a particular sort of relation to that instruction. . . . In human psychology, similarly, we assume that people are so constituted" (Stabler, 1984, p. 604). Contextualists, cognizant also of the quality of events and not just their textural details, might argue further that mechanistic theoretical structures prevent scientists from experiencing the world as it truly exists. Mechanists might answer that what is real or true is decided on other criteria. Finally, contextualists might attack whatever force is invoked to explain the operation of the machine, arguing that the force is inferred from the events it "explains" and is, thus, an instance of reification. From a mechanistic standpoint, however, a driving force of some sort is necessary; it is not a matter that depends on observation.

For their part, mechanists might attack contextualistic approaches on the grounds that they are vague and imprecise. The flexibility of possible units of analysis across various situations might be viewed as undisciplined thinking. Making a place for randomness might be seen as justifying ignorance. A mechanist might argue that contextualists are confused about the purposes of science and have no theory, at least no testable one. The post hoc quality of some contextualistic analyses might be cited to illustrate this inadequacy. Most especially, mechanists might be disturbed by the pragmatic truth criterion contextualists invoke, asserting that contextualists are merely technicians, more interested in changing events than understanding them.

The arguments between behavior analysts and other positions seem to fit the pattern just described. For example, stimulus–response learning theory is a classic example of mechanism within psychology. It has all the components of a mechanistic system: stable pieces (e.g., stimulus objects), elaborate models of the structural relations of these pieces (e.g., Hull's *Behavior System*), and forces (e.g., drives) to activate the operation of the machine. Truth is assessed by correspondence.

Behavior analysts have criticized this stimulus–response formulation, adopting, instead, the concept of the operant and an emphasis on selection by consequences (Skinner, 1974, pp. 222–225). The specific objections to stimulus–response learning theory are exactly what might be expected were the argument made by contextualists against mechanism. The stability of the elements in stimulus–response theory was challenged by showing contextual limits on their application. The need for such elements was challenged by providing explanations derived more directly from the relations among contextual and behavioral events. The various forces were viewed as mere reification. The theorizing was challenged on the grounds that it takes the scientist away from the real world and amounts to vacant construction (e.g., Skinner, 1950).

More recent arguments of behaviorists against cognitive psychology can be seen as arguments of contextualists against mechanism. Not all cognitive theorizing is mechanistic (Piaget was an organicist, for example), but the kind built on computer models and computer simulation (e.g., Ericsson & Simon, 1984) is clearly so. (Jenkins (1974) tried to develop cognitivism as a contextualistic po-

sition but without great success, because the categorical concepts were simply borrowed from Pepper without the development of an adequate psychological system per se.) As with stimulus–response theory, mechanistic cognitivists are criticized by behavior analysts as building unnecessary theories: "We can avoid hypothetico-deductive methods . . . by formulating the data without reference to cognitive processes, mental apparatuses, or traits" (Skinner, 1984a, p. 523). The stability of their categories is challenged. Explanations in terms of context are offered.

For their part, many cognitivists do indeed see behavior analysis as vague and imprecise: "The concepts of 'behavior,' 'response,' and 'reinforcement' appear to be used so broadly that . . . there is hardly anything they do not seem to encompass. Skinner has stretched these notions" (Kochen, 1984, p. 600). Similarly: "Skinner's proposals have a fundamental limitation. They . . . simply are not sufficiently precise" (Scandura, 1984, p. 603). Behavior analysts are also said to have misunderstood the purpose of psychology as a science: "The success of the behaviorist enterprise would leave quite untouched the scientific problem of accounting for how we are capable [of behaving.] . . . Only an account of the machinery within the skin can explain behavior" (Marshall, 1984, p. 637). And, finally, many cognitivists see Skinner more as a technician than as a scientist: "Skinner's emphasis on control is wrong. . . . The emphasis should be on understanding" (Millward, 1984, p. 528).

The nature of the cognitivists' reply to behavioral criticism is also illuminating. Behavior analysts usually criticize mentalism on pragmatic grounds. A typical reply to this criticism is to deny a reliance on immaterial entities and processes: "mental processes are synonymous with brain processes" (Ellis & Hunt, 1983, p. 11). These replies are at times explicitly mechanistic: "Mentalists are neither vitalists nor physiologists, but rather engineers concerned with discovering the type of machine that is man" (Marshall, 1984, p. 637), and "[Behavioral criticisms are irrelevant to] a form of cognitivism that is not teleological but mechanistic" because the "basic analogy—the computer—does not involve purposes but only mechanistically determined programs" (Furedy & Riley, 1984, p. 625).

Arguments between contextualists and organicists. Contextualists have different concerns with organicism. They might view the organicists' reliance on coherence as confusing the personal reactions of the scientist with the actual value of the scientific work. Likewise, the organicists' admission of final causes might be challenged by contextualists and is likely to yield sputterings about circular reasoning. The embrace of constructivism might be criticized because it ignores the context in which such construction takes place. Further, the organicists' explanation of events by an appeal to their orderly change is likely to be regarded as confusion of description with explanation.

The objections behavior analysts have to "developmentalism" show the nature of the last argument quite clearly. Skinner wrote that "developmental schedules are really schedules of changing environments. . . stages are changes in the way in which behavior acts upon and is reinforced by the (primarily social) environment" (Skinner, 1984b, p. 719). From Skinner's perspective, "We need to go beyond mere observation to a study of functional relationships" (Skinner, 1938, p. 8). Behavior analysts have attempted to reveal the shortcomings of organicism by manipulating contextual variables that accelerate or delay transitions through developmental stages (e.g., accelerating the acquisition of Piaget's object constancy through direct training).

Organicists should be completely undaunted by such data, however, because they presume that organic elements are subject to interference and believe that rejecting final causes is failing to admit the obvious. The operation of a final cause on an acorn inevitably produces an oak tree. If an acorn is eaten by a pig, it is no longer an acorn and the final cause of an acorn cannot operate upon it.

Some organicists attribute to behavior analysts a belief in a passive organism, pushed and pulled by mechanical forces in the environment. Behavior analysts might reply that the "organism is not . . . passive in the sense of submissive" (Skinner, 1984b, p. 719) but such a reply would probably not alter the organicists' conclusion. The pragmatic truth criterion of behavior analysis might be seen as contributing nothing to intellectual coherence and therefore as unimportant to sci-

entific understanding. Behavior analysts' interest in control might lead organicists to view behavior analysis as mechanistic (e.g., Howard & Conway, 1987).

Arguments between contextualists and formists. A contextualist might accuse formists of engaging in analyses that are of no use. What good is mere classification of events or cataloging of relations among them? Does this kind of activity make a difference? If it did, the contextualist might be reassured, but only in that specific instance. Formists do not have practical usefulness as a goal of analysis in general. A contextualist might be concerned that the very ground of similarity, upon which formistic laws are built, is shaky. For the contextualist, similarity is a functional rather than formal affair.

For their part, formists might challenge contextualists on the arbitrariness of their decision as to what makes a difference. What right has a contextualist to proclaim that only relations serving their purposes are worthwhile? Formists might also be baffled by the contextualists' refusal to acknowledge immediately obvious similarities among things. Contextualists might be criticized for constructing similarities on the basis of only one small aspect of the situation.

As an example, some of the work on personality types is formistic. A personality type is identified, its characteristics are explored, and its relation to other personality types is articulated. From a formistic standpoint, the analysis need proceed no further, and often does not. Behavior analysts respond to this research as contextualists might be expected to respond. They question whether the "similar" events are really similar, applying the contextualistic concept of similarity as a test. This point is the core of Skinner's criticism of the "formalistic error" (Skinner, 1969, p. 89). Behaviorists also challenge the usefulness of this kind of research. To a behavior analyst, relations among traits of personality cannot, in and of themselves, directly achieve behavior-analytic purposes, because to achieve those purposes one must have access to the contextual variables of which the relations are held to be a function (Hayes & Brownstein, 1986).

Chomsky (1986) provides another example. Although he may be viewed as an organicist (Overton, 1984), he may also be categorized as a "transcendent formist." Plato, one of the original transcendent formists, used the idea of norms to explain how persons know so much even though their experiential basis for knowledge is small. Chomsky (1986) has dealt explicitly with one form of what he called "Plato's problem": how persons know so much about language even though their experiential basis for this knowledge is small. Preexisting and nonexperiential norms provide the answer: Language emerges according to a plan or norm housed in a language-acquisition device in the "mind/brain," as he calls it (Chomsky, 1986). Underlying similarities in grammar occur as approximations to this norm. Behavior analysts question whether the regularities discerned by Chomsky are true (i.e., functional) regularities.

Chomsky's criticism of behavior analysis also fits with formistic concerns about contextualism. He considered the denial of structural similarity absurd; terms like "discriminative stimuli" are mere metaphors, with no direct relation to their laboratory referents. "We can account for a wide class of responses in terms of Skinnerian functional analysis by identifying the controlling stimuli. But the word stimulus has lost all objectivity in this usage" (Chomsky, 1959, p. 38). The pragmatic goals of behavior analysis are taken to confuse technology with science. For example, Skinner's *Beyond Freedom and Dignity* (1971) was said to show "a striking failure to comprehend even the rudiments of scientific thinking" (Chomsky, 1972).

Dealing with arguments across world views. The list of arguments mentioned above is not exhaustive. Moreover, many of the arguments are shared among world views. For example, organicists are as likely as mechanists to see contextualism as vague and imprecise. All others should agree that contextualists confuse technology with science. Most of this sort of overlap can be predicted from the dispersive and analytic qualities of the various world views. On issues relevant to the primacy of parts versus wholes, for instance, both formists and mechanists will disagree with contextualists.

The philosophical arguments between behavior analysts and other psychologists are pseudoconflicts among world views. Given that arguments of this sort are illegitimate and cannot be resolved, what can we do about

them? Pepper suggested three legitimate courses of action that behavior analysts can take. They can (a) increase the precision and scope of behavior analysis and make these improvements evident; (b) analyze the precision and scope of other systems, when taken on their own terms and with relevance to their own purposes (but recognizing that if such an analysis reveals weaknesses, the strength of behavior analysis is in no way increased); and (c) clearly articulate the assumptions and purposes of behavior analysis and note the differences in the assumptions made by others. For example, one can describe quite legitimately a pragmatic truth criterion and explain how to proceed if such a truth criterion is adopted; one cannot insist legitimately that it be adopted.

Pepper's advice is difficult to take. Weighing in against an intellectual opponent's categorical concepts in terms of one's own is far easier. After all, one is on well-examined territory in doing so, and if the battle is engaged on one's own turf, the outcome is certain. Unfortunately, intellectual adversaries will take the same stance, and each combatant will end up on a separate field of battle shouting at a distant foe. Such arguments are no more than elaborate bouts of name-calling and bravado. A much more difficult task is to develop the adequacy of one's own position, to analyze other positions from within, or simply to illuminate the nature of the philosophical disagreement. Difficult as it may be, in Pepper's view it is the only intellectually honest alternative.

Conflicts Within Behavior Analysis: The Costs of Conceptual Confusion

Scientific work always involves philosophical assumptions that influence the kinds of problems addressed, the methods employed for their solution, and the manner in which findings are interpreted. When properly articulated and organized into a postulational system, these assumptions serve as criteria against which the internal consistency and cross-disciplinary compatability of a given scientific enterprise may be evaluated.

Philosophical assumptions have their sources in cultural circumstances, and like those circumstances, they are not all of one piece. Unfortunately, philosophical assumptions influence scientific work even when individual investigators are unaware of them. When philosophical assumptions are *not* properly articulated and organized into a postulational system, scientific formulations based on them tend to be inconsistent and confusing (Parrott, 1986).

If behavior analysis rests on an unsystematic mixture of mechanistic and contextualistic postulates, it is in danger of being replaced by more consistent and less confusing psychological systems. Contextualism allows the strategic use of categorical concepts from other world views subordinated to contextualistic criteria. Skinner can be thought of as a contextualistic philosopher who at times uses mechanistic theorizing. Although such strategic mixtures are consistent with contextualism, they carry with them notable hazards.

First, avoiding the philosophical implications of foreign concepts is difficult. The mechanistic elements of behavior analysis, in particular, may be erroneously taken to represent the philosophical basis of behavior analysis. This is extremely dangerous to behavior analysis because, as a mechanistic system, it is not very interesting. The analogy of the computer is far richer and more elaborate, for example. Inevitably, the more elegant form of mechanism will prevail.

Second, borrowing concepts must be compared to the usefulness of developing concepts from within a contextualistic world view. Prematurely using foreign concepts may delay more consistent and effective system building.

Third, strategic use of other world views can degenerate into undisciplined thinking. A mere reference to "successful working" is no justification for intellectual chaos. If foreign concepts are to be used, they must be used deliberately and compared to the working of alternative domestic concepts. These hazards may be minimized, if not altogether avoided, if behavior analysts clarify their philosophical assumptions. Pepper's analysis may be helpful for this purpose.

The Natural Allies of Behavior Analysis

If behavior analysis is, in principle, a contextualistic system, who are its natural allies? Many other scientific systems share contextualistic postulates, including some forms of evolutionary biology (e.g., Dawkins, 1982), cultural anthropology (e.g., Harris, 1979), Marxism, ethology, and psychobiology. Yet

most contextualists think that behavior analysis is mechanistic; given the subtleties and inconsistencies of behavior analysis this is not difficult to understand.

Sharing the same world view does not mean that different theories will not conflict. Indeed, according to Pepper, all legitimate intellectual conflicts, like all forms of effective collaboration, occur among proponents of the same world view. Advocates of different world views will always either agree to disagree or will see each other as intellectual enemies. Thus, to the extent that behavior analysis is mistaken for a representative of a world view foreign to it, truly productive collaboration with other compatible scientific systems is impossible.

An example is psychobiology. Psychobiologists are contextualistic in their thinking. They are sensitive to the subtle interactions of ontogenetic and phylogenetic contingencies. They appreciate functional definitions and the role of context. Unfortunately, psychobiologists view behavior analysis as an enemy (e.g., Gottlieb, 1984). The confusion in behavior analysis about its own approach has made the identification and construction of alliances very difficult.

Because contextualism entails no stand on what the goal of analysis ought to be, any potentially attainable goal may be entirely consistent with contextualism. For example, many contextualistic findings are "specific, often taking the form of accounts justified by their coherence" (Fiske, 1988). Nonetheless, successful working may be evaluated with respect to some scientific goals more readily than others. Success with respect to the goals articulated by behavior analysts, namely prediction and control, is readily evaluated, at least insofar as these goals apply to concrete instances. Thus, these goals and contextualism seem especially harmonious (Hayes & Brownstein, 1986). In another sense, however, they are not. A constant threat is that analyses that help achieve these goals will be taken literally. When causes and effects are viewed as preexisting things in the world, the holistic quality of contextualism is threatened, and mechanism is but a short step away. The behavior analysts who have converted to cognitivism may present examples of the process. Given the lack of careful articulation of the philosophical base of behavior analysis, it is perhaps surprising that more behavior analysts have not become openly mechanistic. Seeing behavior analysis as a contextualistic system may permit a greater sensitivity to the crucial choice points between these distinct philosophies.

Other goals could also be completely consistent with a contextualistic world view. A contextualistic system directed toward goals other than prediction and control might appear alien or even hostile to behavior analysis (e.g., Rosnow & Georgoudi, 1986a), but it would be so only in the sense of being a rival. It would be a rival member of the same "family of theories," that is, theories derived from a single world view and therefore comparable with each other on empirical grounds (Reese & Overton, 1970). The antipathy between psychobiology and behavior analysis may be partially understood in this manner because the behavior-analytic goal of control is not embraced by most psychobiologists.

Behavior analysis is a contextualistic system. This conclusion significantly alters our view of what is central to behavior analysis and what is mere historical accident or theoretical preference. For example, when viewed as a contextualistic system, behavior-analytic emphases on functional definitions and a pragmatic truth criterion stand out in high relief. Pepper also provides guidance in difficult areas of system development. For instance, it becomes obvious that causal laws are ways of speaking, not representations of nature.

Behavior analysis is a position with a history of success in achieving its goals, but a position that fails to develop is a position that fades away (Reese, 1986b). How can behavior analysis find its way, while retaining the useful qualities that made it what it is? Pepper shows behavior analysts what is truly unusual and important about their position. His book helps put behavior analysts' hands on the tiller of their philosophical vessel. It may steer better from there.

REFERENCES

Baltes, M. M., & Reese, H. W. (1977). Operant research in violation of the operant paradigm? In B. C. Etzel, J. M. LeBlanc, & D. M. Baer (Eds.), *New developments in behavioral research* (pp. 11–30). Hillsdale, NJ: Erlbaum.

Bhaskar, R. (1983). Beef, structure and place: Notes from a critical naturalist perspective. *Journal for the Theory of Social Behaviour*, **13**, 81–95.

Bugelski, B. R. (1973). *An introduction to the principles of psychology* (2nd ed.). Indianapolis: Bobbs-Merrill.
Chomsky, N. (1959). Review of Skinner's *Verbal Behavior. Language,* **35,** 26–58.
Chomsky, N. (1972). Psychology and ideology. *Cognition,* **1,** 11–46.
Chomsky, N. (1986). *Knowledge of language.* New York: Praeger.
Dawkins, R. (1982). *The extended phenotype.* San Francisco: Freeman.
Efron, A. (1980). Pepper's continuing value. In A. Efron & J. Herold (Eds.), Root metaphor: The live thought of Stephen C. Pepper. *Paunch,* No. 53–54, 5–53.
Ellis, H. C., & Hunt, R. R. (1983). *Fundamentals of human memory and cognition* (3rd ed.). Dubuque, IA: Brown.
Ericsson, A. K., & Simon, H. A. (1984). *Protocol analysis: Verbal reports as data.* Cambridge, MA: MIT Press.
Fiske, D. W. (1988). Review of *Contextualism and Understanding in Behavioral Science: Implications for Research and Theory,* edited by Ralph L. Rosnow and Marianthi Georgoudi. *American Scientist,* **76,** 93.
Furedy, J. J., & Riley, D. M. (1984). Undifferentiated and "mote-beam" percepts in Watsonian-Skinnerian behaviorism. *Behavioral and Brain Sciences,* **7,** 625–626.
Gottlieb, G. (1984). Lingering Haeckelian influences and certain other inadequacies of the operant viewpoint of phylogeny and ontogeny. *Behavioral and Brain Sciences,* **7,** 688–689.
Harris, M. (1979). *Cultural materialism: The struggle for a science of culture.* New York: Random House.
Hayes, S. C., & Brownstein, A. J. (1986). Mentalism, behavior-behavior relations, and a behavior-analytic view of the purposes of science. *Behavior Analyst,* **9,** 175–190.
Hineline, P. N. (1980). The language of behavior analysis: Its community, its functions, and its limitations. *Behaviorism,* **8,** 67–86.
Howard, G. S., & Conway, C. G. (1987). The next steps toward a science of agency. *American Psychologist,* **42,** 1034–1036.
Jenkins, J. J. (1974). Remember that old theory of memory? Well, forget it! *American Psychologist,* **29,** 785–795.
Kantor, J. R. (1939). The nature of psychology as a natural science. *Acta Psychologica,* **4,** 1–61.
Kantor, J. R. (1953). *The logic of modern science.* Bloomington, IN: Principia Press.
Kochen, M. (1984). Problem solving as a cognitive process. *Behavioral and Brain Sciences,* **7,** 599–600.
Kuhn, T. S. (1962). *The structure of scientific revolutions.* Chicago: University of Chicago Press.
Marshall, J. C. (1984). Mechanism at two thousand. *Behavioral and Brain Sciences,* **7,** 637.
Millward, R. (1984). Cognitive science: A different approach to scientific psychology. *Behavioral and Brain Sciences,* **7,** 527–529.
Overton, W. F. (1984). World views and their influence on psychological theory and research: Kuhn–Lakatos–Laudan. In H. W. Reese (Ed.), *Advances in child development and behavior* (Vol. 18, pp. 191–226). New York: Academic Press.
Overton, W. F., & Reese, H. W. (1973). Models of development: Methodological implications. In J. R. Nesselroade & H. W. Reese (Eds.), *Life-span developmental psychology: Methodological issues* (pp. 65–86). New York: Academic Press.
Parrott, L. J. (1986). The role of postulation in the analysis of inapparent events. In H. W. Reese & L. J. Parrott (Eds.), *Behavior science: Philosophical, methodological, and empirical advances* (pp. 35–60). Hillsdale, NJ: Erlbaum.
Pepper, S. C. (1942). *World hypotheses: A study in evidence.* Berkeley: University of California Press.
Reese, H. W. (1976). Conceptions of the active organism: Discussion. *Human Development,* **19,** 108–119.
Reese, H. W. (1986a). Behavioral and dialectical psychologies. In L. P. Lipsitt & J. H. Cantor (Eds.), *Experimental child psychologist: Essays and experiments in honor of Charles C. Spiker* (pp. 157–195). Hillsdale, NJ: Erlbaum.
Reese, H. W. (1986b). On the theory and practice of behavior analysis. In H. W. Reese & L. J. Parrott (Eds.), *Behavior science: Philosophical, methodological, and empirical advances* (pp. 1–33). Hillsdale, NJ: Erlbaum.
Reese, H. W., & Overton, W. F. (1970). Models of development and theories of development. In L. R. Goulet & P. B. Baltes (Eds.), *Life-span developmental psychology: Research and theory* (pp. 115–145). New York: Academic Press.
Rosnow, R. L., & Georgoudi, M. (Eds.). (1986a). *Contextualism and understanding in behavioral science.* New York: Praeger.
Rosnow, R. L., & Georgoudi, M. (1986b). The spirit of contextualism. In R. L. Rosnow & M. Georgoudi (Eds.), *Contextualism and understanding in behavioral science* (pp. 3–22). New York: Praeger.
Sarbin, T. R. (1986). The narrative as a root metaphor for psychology. In T. R. Sarbin (Ed.), *Narrative psychology: The storied nature of human conduct* (pp. 3–22). New York: Praeger.
Scandura, J. M. (1984). New wine in old glasses? *Behavioral and Brain Sciences,* **7,** 602–603.
Skinner, B. F. (1938). *The behavior of organisms.* New York: Appleton-Century.
Skinner, B. F. (1945). The operational analysis of psychological terms. *Psychological Review,* **52,** 270–277.
Skinner, B. F. (1950). Are theories of learning necessary? *Psychological Review,* **57,** 193–216.
Skinner, B. F. (1953). *Science and human behavior.* New York: Macmillan.
Skinner, B. F. (1957). *Verbal behavior.* New York: Appleton-Century-Crofts.
Skinner, B. F. (1969). *Contingencies of reinforcement: A theoretical analysis.* New York: Appleton-Century-Crofts.
Skinner, B. F. (1971). *Beyond freedom and dignity.* New York: Knopf.
Skinner, B. F. (1974). *About behaviorism.* New York: Knopf.
Skinner, B. F. (1984a). Methods and theories in the experimental analysis of behavior. *Behavioral and Brain Sciences,* **7,** 511–523.
Skinner, B. F. (1984b). Reply to Catania. *Behavioral and Brain Sciences,* **7,** 718–719.
Stabler, E. P., Jr. (1984). Rule-governed behavior in computational psychology. *Behavioral and Brain Sciences,* **7,** 604–605.