

On the differences between Skinner's Radical Behaviorism and Kantor's Interbehaviorism¹

*Diferencias entre el Conductismo radical de Skinner y el
interconductismo de Kantor*

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ABSTRACT

Skinner's radical behaviorism and Kantor's interbehaviorism are compared and contrasted. Both consider their subject matter to be the behavior of organism in relation to their stimulating environments. However, while Kantor focuses on the relation between responding and stimulating as a unit of analysis, Skinner focuses on classes of responses as units. As a result, stimulus functions are regarded by Skinner as operatives, differentiated in terms of the kinds of control they exert over responding; while for Kantor stimulus functions are simply the actions of objects participating in interdependent relations with response functions. In short, Skinner's analysis is causal and explanatory; Kantor's is functional and descriptive. Explanation is achieved for Skinner by reduction to biology. An organism is said to be changed, physiologically, by operant conditioning. Ontogenesis in turn, is explained by way of natural selection: operant conditioning changes organisms because the capacity to be conditioned is biologically inherited, as in the capacity to be conditioned by some stimuli more than others. Kantor, on the other hand, assumes that an organism's ontogenic history is reflected in its current interbehavior. This is a purely descriptive account, and as such, no appeal to imaginary biology, as an explanation for psychological events, is required. It is concluded that these differences between Skinner's radical behaviorism and Kantor's interbehaviorism cannot be reconciled without violently transforming the views of both philosophers.

DESCRIPTORS: Radical behaviorism, Interbehaviorism, Skinner, Kantor, Philosophy.

RESUMEN

Se comparan y contrastan el conductismo radical de Skinner con el interconductismo de Kantor. Ambos consideran que su objeto de estudio es la conducta de los organismos

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en relación con ambientes estimulantes. Empero, mientras que Kantor se centra en la relación entre el responder y la estimulación como una unidad de análisis, Skinner considera a las clases de respuestas como la unidad de análisis.

Por consiguiente, Skinner considera como operativas a las funciones del estímulo, que se diferencian en términos de los tipos de control que ejercen sobre el responder; para Kantor las funciones del estímulo son simplemente las acciones de los objetos que participan en relaciones interdependientes con las funciones de la respuesta. En resumen, el análisis de Skinner es causal y explicativo; el de Kantor es funcional y descriptivo. Skinner explica mediante la reducción a la Biología. Se dice que el condicionamiento operante puede cambiar fisiológicamente a un organismo. La ontogénesis es a su vez explicada mediante los mecanismos de selección natural: El condicionamiento operante cambia a un organismo porque la capacidad de ser condicionado es heredada biológicamente, como también lo es la sensibilidad diferencial al condicionamiento con ciertos estímulos.

Kantor por el contrario, supone que la historia ontogénica de un organismo se refleja en su interconducta actual. La consideración de Kantor es puramente descriptiva, y por consiguiente no recurre a una biología imaginaria para explicar eventos psicológicos. Se concluye que estas diferencias entre el conductismo radical y el interconductismo no pueden reconciliarse sin transformar violentamente los puntos de vista de Skinner y Kantor.

DESCRIPTORES: Conductismo radical, Interconductismo, Skinner, Kantor, Filosofía.

In recent years, the influence of Kantor's interbehaviorism on behavioral psychologists has been illucidated (Morris, Higgins & Bickel, 1982) and a reconciliation of Kantor's and Skinner's philosophies has been proposed on the basis of certain similarities apparent in their work (Morris, 1982). While it is no doubt true that many behavioral psychologists have been wittingly or unwittingly influenced by Kantor's philosophy, it is my view that this influence is piecemeal and unlikely to provide for genuine change in psychological theory so long as it is simply laid upon or added to Skinner's formulation without a full appreciation of its nature and significance. The positions of Kantor and Skinner are fundamentally different, despite their similarities, and one cannot hope to merely attach some sample of Kantor's field theoretical notions onto a mechanistic framework, such as that proposed by Skinner, with good results. A reconciliation on philosophical grounds is not possible to accomplish without violently transforming the positions of one or the other philosopher for this purpose. The end product of such a procedure is contradiction and incoherence, not a systematic philosophy incorporating the valuable aspects of both positions.

The purpose of this paper is to compare Skinner's and Kantor's psychological systems in the interests of revealing their similarities as well as their irreconcilable differences. It is not my intention to suggest that Skinner's work is not in any way valuable to those adopting an interbehavioral philosophy. The investigative methods of the experimental analysis of behavior, from which Skinner's philosophy was derived, at least in part, are not without value, nor is the applied branch of this science. Instead, it is my intention to show that Skinner's philosophy of behavior science is incompatible with Kantor's interbehaviorism and attempts to reconcile their differences in this domain are misleading and fruitless.

The comparison which follows deals with the things and events isolated

by each as the subject matter of behavior science, and the constructs derived by each as a result of interacting with this subject matter. Fundamental differences concern the nature of stimulus functions and functional relations, and the role of history in psychological development.

Subject Matter

Both radical behaviorism and interbehaviorism consider their subject matter to be the behavior of organisms in relation to their stimulating environments (Skinner, 1938, p. 6; Kantor, 1938, p. 33). Behavior is further defined as the action of the whole organism, as opposed to the action of its muscles, organs, or glands considered separately. As Skinner (1938, p. 6) points out:

It is more to the point to say that behavior is that part of the functioning of an organism which is engaged in acting upon or having commerce with the outside world.

Kantor makes a similar declaration, distinguishing psychological behavior from the behavior of biological organisms and physical objects. Psychological behavior is not simply the unchanging operations of a fixed set of structures, as is biological activity. It is historical and developmental. Neither is it simply an interchange of energy, as is the behavior of physical objects. It is an interaction of organismic responding and environmental stimulation, having preservative as well as manipulative functions (Kantor and Smith, 1975, pp. 5-6). In other words, psychological behavior is adjustmental in character (Kantor & Smith, 1975, pp. 6-11). Skinner (1953, p. 90) makes a similar point, describing psychological behavior as "adaptive."

Despite these similarities in their approaches to behavior as a subject matter, there remains a difference in emphasis. Kantor criticizes the behavioral movement for its emphasis on behavior, rather than on behavioral fields. He says (1970, p. 105):

On the whole (the experimental analysis of behavior), is much more inclined toward the analysis of responses than behavioral fields, a circumstance influenced by the partial reflex-conditioning origin of the movement. Recall that Pavlov as a physiologist and a dualist looked upon conditioning as something pertaining exclusively to the physiological organism. . . . Although it is impossible to overlook the decidedly conspicuous stimulus objects, neither he nor his followers have been alert to the actual functioning of stimuli in

conditioning situations. It is not surprising, then, that the conditioners could not take into account situational or setting factors aside from the time relations between the organism's contacts with the unconditioned and conditioned stimulus objects. Yet it is certain that even reflex behavior is not exclusively organismic performances or movements. Organismic activities are only phases of larger adjustamental events. When analysing reflexes, account must also be taken of what is done by the stimulus object in connection with organismic acts, and still further of the many situational or setting factors, that is, enabling and impeding conditions.

Skinner's characterization of behavior, as the "action of the organism on the outside world" (Skinner, 1938, p. 6) is incomplete from Kantor's perspective, then, because behavior is not the action of an organism but rather the interaction of organism and environment. Behavior is mutually corresponsive not emissive (Kantor, 1970, p. 106).

A similar criticism is levied against the radical behaviorist's view of stimulus events, obviously. Kantor (1970, p. 106) argues that the experimental analysis of behavior "stops short at the surface notion of a stimulus as simply an object or condition that determines a response." Objects, stimulus objects, and stimulus functions are more clearly differentiated in Kantor's system. Prior to the establishment of an interaction between the organism and environing things, those things are simply objects. As an interaction is established those objects take on stimulus functions corresponding to specific response functions. Only at this point do objects become stimulus objects, having psychological significance in a particular setting for a particular organism. The matching functions between stimuli and response, thus established, constitute psychological adjustments (Kantor, 1970, p. 6).

What is missing from the radical behaviorist's view is the interaction of stimulus and response events. In this regard it is interesting to note a shift in Skinner's position since 1938. In *The Behavior of Organism* he describes stimulus and response events as follows:

The environment enters into a description of behavior when it can be shown that a given part of behavior may be induced at will (or according to certain laws) by a modification of a part of the forces affecting the organism. Such a part, or modification of a part, of the environment is traditionally called a stimulus and the correlated part of the behavior a response. Neither term may be defined as to its essential properties without the

other. For the observed relation between them I shall use the term reflex, for reasons which, I hope, will become clear as we proceed. (Skinner, 1938, p. 9.)

By 1953, *Science and Human Behavior*, the "correlation" between the interdependent variables, stimulus and response, has become a "functional relation" which is further taken to be synonymous with a "causal relation," for all practical purposes. He (1953, p. 35) says:

The external variables of which behavior is function provide for what may be called a causal or functional analysis. We undertake to predict and control the behavior of the individual organism. This is our "dependent variable"—the effect for which we are to find the cause. Our "independent variables"—the causes of behavior—are the external conditions of which behavior is a function. Relations between the two—the "cause and-effect relationships" in behavior—are the laws of science. A synthesis of these laws expressed in quantitative terms yields a comprehensive picture of the organism as a behaving system.

While the quotation marks, here, suggest some hesitancy on Skinner's part in describing stimulus-response relations in these more mechanistic ways, it nonetheless marks the beginning of a trend away from an interactive analysis. I am not implying that no further reference to the interaction of stimulus and response and the correlation obtaining between them is made, for certainly this is not the case (Skinner, 1969, p. 89; 1974, p. 73-74). Rather, I am suggesting that a change in emphasis has occurred. Reminders that the dependent-independent dichotomy is a matter of convenience, and the "functional" does not really mean "causal" are not to be found in more recent publications. This, I believe, is a fundamental error, which I shall discuss in more detail shortly.

In summary, radical and inter-behaviorists propose to study the behavior of organism in relation to the stimulating environment. Both further acknowledge the large number of other organismic and environmental variables which must also be taken into account in the study of these relations (Skinner, 1969, p. 78-81; Kantor, 1971, p. 77-80). For Kantor, however, the interdependent character of these relations must be recognized, while for Skinner this is not as important. To appreciate the differences between their approaches, we must look at what is made of this subject matter by each. This is to say, we must examine their constructional activities and the products of this work.

Comparison of Fundamental Constructions

Unit of observation. In order to isolate a distinct unit of observation from the continuous behavior life of an organism, Kantor (1924, p. 36) introduces the concept of the behavior segment. Each segment consists of a single stimulus and its correlated response. The actions of both constitute a single unit, in which stimulus and response are reciprocal factors, that is, one cannot be conceptualized in the absence of the other. In this sense, a response is something that the organism and the stimulus object do with respect to one another. The organism performs some action or movement. Stimulation, on the other hand, is an action performed by the object with respect to the organism with which it interacts. This stimulus action or stimulation can best be described as the "mutual and corresponding behavior of an object in the interactional field, along with the action performed by the organism" (Kantor & Smith, 1975, p. 32). Thus the formula for every psychological field or interaction is: $S \leftrightarrow R$.

How an object, which is usually regarded as an inert thing, performs actions is exemplified by Kantor (Kantor & Smith, 1975, p. 33) as follows:

It must be realized that when such an object is part of a psychological event it interacts with the organism as much as the organism interacts with it. Reflect upon how much the outcropping rock contributes, through its various properties, to the perceiving and judging behavior of the geologist. It may be helpful here too to consider that when physicists and astronomers study gravitational events they are compelled to describe the field in terms of the mutuality of the behavior of each "inert" body.

For Skinner (1953, p. 62-66) a comparable unit of observation is the three-term contingency, usually diagramed: $SD \rightarrow R \rightarrow SR$. Included in this unit are the three terms, discriminative stimulus, response, and reinforcer, and the relations between them, stimulus control and reinforcement.¹

The middle term of the three term contingency requires further elaboration. It is not just a response but a response class (Skinner, 1953, p. 64-65). It is always a response upon which a given reinforcement is contingent, and reinforcement is contingent upon properties which define membership in this class. The class is called an "operant," and "a set of contingencies defines the operant" (Skinner, 1969, p. 131). Thus, it is the circumstances under

¹ Punishment is not considered to be the opposite of reinforcement in Skinner's system (1953, p. 182-193). Rather it works by eliciting or evoking incompatible responses which are then strengthened by reinforcement, displacing the punished response. For these reasons only reinforcement contingencies will be addressed in this paper. Moreover, because even as early as *The Behavior of Organisms*, Skinner acknowledges his interest in operant behavior specifically, respondent behavior also will not be considered in detail.

which responses occur and their effects on the environment which define an operant class. The topography of responses making up this class may be correlated with this effect but this is not an essential feature. For example, ringing a doorbell and knocking on a door are both members of the same operant in that both occur under conditions of a closed door and produce the same consequence of getting inside the building.

Skinner's definition of an operant may be attributable to Kantor, at least in part. In discussing the problem of identifying a useful response class, Skinner (1938, p. 25) makes the following statement for which he gives credit to Kantor:

If the flexion reflex is allowed to be defined as a reflex having for its response a class defined by flexion, there is nothing to prevent an infinite number of reflexes on similar bases. For example, we could say that there is a reflex or class of reflexes defined by this property: that in elicitation the center of gravity of the organism moves to the north. Such a class is experimentally useless, since it brings together quite unrelated activities, (instead) we must be ready to show that all flexions are related in a way in which all geographical movements of the center of gravity are not, and to do this we must appeal to the observed fact that the flexions are elicitable by stimuli of a few classes.

The definition of an operant indicates a realization of the impossibility of defining a functional stimulus without reference to a functional response (and vice versa). Skinner does not pursue the implications of this "impossibility" as does Kantor, however. For Kantor, the fundamental implication of this realization is the double sided arrow in the formula for a behavior segment, signifying the interdependency of these events. It is on this issue that Kantor criticizes the behavioral movement, when he (1963, p. 531-32) says:

To regard the actions of the organism as dependent variables and the actions of the stimulating objects as independent variables is simply to plant oneself in the reference frame of traditional causal philosophy. The response effect is regarded as a shift from the inertial condition of the organism by the "causal" properties inherent in the object. Actually, of course, the stimulus is just as dependent on the reaction of the organism as the other way around.

Kantor does acknowledge the fact that the $R=f(S)$ formulation reflects the influence of laboratory investigation, but he suggests that such formulations are "only allowable in so far as they do not interfere with the production of data matching the original fields from which they come" (Kantor, 1963, p. 532). Failure to acknowledge the interdependency of stimulus response functions—the organocentric attitude, as it is called—is reflected in Skinner's emphasis on the "probability of a response" as opposed to the "probability of a stimulus-response relation," and the absence of a concept of "stimulus evolution," to which I shall return.

Abstracted from the behavior segment, as a unit psychological event in Kantor's system, are the concepts "stimulus function" and "response function." While these have already been discussed to some extent, further discussion here will facilitate a comparison of the constructions with similar concepts in Skinner's system.

Stimulus Functions. For Kantor, stimulus functions are the actions of the stimulating object as it interbehaves with the psychological organism. Stimulus functions arise through an organism's contact with stimulus objects, and until such contacts have taken place, objects do not have any stimulus functions at all for that organism. Three kinds of stimulus functions are identified: Universal, individual, and cultural (Kantor & Smith 1975, p. 39-44). Universal stimulus functions are based on "a) the natural properties of qualities of things, and b) the biological constitution of the reacting organism" (Kantor and Smith, 1975, p. 41). Functions of this sort are the same for all members of a given species, and further do not require multiple contacts between the organism and stimulus objects for their establishment. Kantor explains that "(b)ecause the organism consist anatomically of a protoplasmic, cellular structure it is sensitive to certain natural properties of things" (Kantor & Smith 1975, p. 41). Given this sensitivity, the very first time an organism comes into contact with such things a psychological relationship is set up. Individual stimulus functions, on the other hand, are based on the previous personal experiences of the individual organism with the objects in question. Finally, cultural stimulus functions are distinguished by the fact that they correspond to similar responses in groups of individuals. In all cases, stimulus functions are defined in terms of the response functions with which they are correlated.

For Skinner, stimulus functions mean something quite different. They are differentiated by the kinds of control they exert. There are three stimulus functions, corresponding to three kinds of control in Skinner's system: Discriminative, eliciting, and reinforcing (Skinner, 1953, p. 107-128). Skinner (1953, p. 112) distinguishes eliciting and discriminative stimulus functions as follows:

The eliciting stimulus appears to be more coercive.
Its causal connection with behavior is relatively
simple and easily observed. This may explain why it

was discovered first. The discriminative stimulus, on the other hand, shares its control with other variables, so that the inevitability of its effect cannot be easily demonstrated.

Reinforcing stimuli, on the other hand, "strengthen" an operant in the sense of marking instances more probable or, in actual fact, more frequent (Skinner, 1953, p. 65).

Skinner's stimulus functions are not of the same sort as Kantor's. For Kantor, stimulus functions are only the participation of stimulus objects in psychological events, abstracted from observed correlations of stimuli and responses. As such, stimuli have no special status in these correlations — "(t)hey are a phase or factor in the event, an essential part of it and not a preceding or antedating cause (Kantor, 1938, p. 45). All stimuli in Kantor's formulation, then, have roughly the same status as the discriminative stimulus in Skinner's system.

Response functions. Kantor & Smith (1975, p. 44-45) define response functions as the actions of the organism with respect to the stimulus function with which they are correlated. While a response refers to a topography, a response function refers to its relation with a stimulus object. There is no comparable construct in Skinner's system. While it might be possible to argue that the "operant" fits this definition, in that it is defined by a set of contingencies, technically the operant is a class of responses (Skinner, 1969, p. 131).

There are some points of agreement between radical behaviorists and interbehaviorists regarding stimulus and response functions, however. Both (Kantor, 1938, p. 47; Skinner, 1957, p. 227) acknowledge that a single response may be a function of more than one stimulus, and that more than one response may be a function of the same stimulus. Which function obtains on any given occasion depends on other factors in the interbehavioral field, for Kantor (1938, p. 47). Similarly, Skinner describes contextual factors of this sort as audience variables, where "control is always exerted in concert with stimuli determining more specific forms of response" (Skinner, 1957, p. 173).

Context of observation. The contextual factors mentioned above constitute a fundamental construct in both radical behaviorism and interbehaviorism, collectively called the "interactional setting" by Kantor, and not collectively nominated by Skinner since the term "drive" was abandoned sometime after 1953.²

Basically, the interactional setting is the background in which a behavior segment takes place. Features of the setting are called "setting factors." These factors may alter one or more of the 3 features of a psychological event: 1) the stimulus object, 2) the reacting organism, or 3) the total inter-

²It is interesting to note that Skinner claims it was Kantor who finally convinced him of the dangers in using the term "drive" (Skinner, 1966, p. x)

action (Kantor & Smith, 1975, p. 46-47). With regard to the first of these, if the stimulus object were a red square, its function could be altered by placing it on different background colors. From a radical behavioral perspective, setting factors of this sort are more likely to be interpreted as part of the stimulus object itself. For example, by placing red squares on different colored backgrounds, the function of the red square would not be altered, rather "complex" stimuli, including the square plus the background color, would be created. This difference in the two approaches is not particularly critical. What is critical however, is the fact that, for Kantor, among the factors altering the function of a stimulus are the consequences of interacting with it. "Rewarding or punishing are two types of setting factors among an indefinite number of other specific conditions to be observed in various sorts of behavior segments" (Kantor, 1979). For Skinner, as we have seen, reinforcement is not a condition altering a stimulus function—it is a stimulus function. The problem here has to do with the use of the term "function", to which I shall return.

With respect to the operation of the interactional setting on the reacting individual, Kantor includes factors such as conditions of fatigue, ill health, sleepiness, and so on. Such factors alter the readiness with which an individual reacts to things (Kantor & Smith, 1975, p. 46-47). There is no single term in Skinner's system to describe factors of this sort. Deprivation, fatigue, satiation, ill-health, and aversive stimulation are all considered separately and defined in terms of their specific operations.

Finally, in Kantor's system, setting factors may alter the total psychological interaction (Kantor & Smith, 1975, p. 46-47). For example, the entire verbal repertoire of a speaker is altered in the presence of French as opposed to English-speaking persons. In such cases, stimulus objects determine what sort of activity occurs, while setting factors determine that they should occur at this particular moment. Skinner's audience variable (1957) is relevant here. However, he makes little if any use of this construct outside of the realm of verbal behavior.

Media of contact. Kantor and Smith 1975, p. 32 state:

In order that any psychological interaction should occur it is essential that the organism come into contact with the stimulus object. . . . Light rays and air waves mediate contacts of interactions performed when the organism and object are separated in space. Another form of distance medium consists of the gaseous particles which must pass from the olfactory object to the organism when it performs smelling behavior.

In addition to distance media, Kantor includes a series of proximate media which operate when the organism and stimulus object are not separate in space. Taste reactions are mediated by liquid solutions of sorts, for

example. Skinner does not mention media of contact as such and, for most purposes, it does not seem to be a particularly critical feature of Kantor's system. There is one profitable outcome of differentiating media of contact from other events in a psychological field, however, having to do with the issue of seeing colors. More traditional views argue that because light rays are colorless, these rays must first operate on the eye with an after-effect in the nervous system of the organism in order for color qualities to exist. This is to say that the nervous system or the mind-creates the color qualities of objects. Color is thus a psychic product of biological structures. This confusion, Kantor explains, is produced by a failure to distinguish media of contact from stimulus events. Light rays are not stimuli, hence the fact that they are colorless presents no special problem for a naturalistic psychology. The color adheres in the object, not in the mind.

History of interactions. Both Kantor and Skinner have adopted the view that all psychological interactions are historical, calling for the concepts of "interbehavioral history," and "history of reinforcement" respectively.

For Kantor, the complete behavioral experience of an organism is its "interbehavioral history." He (Kantor & Smith, 1975, p. 59) explains:

It is through the behavior details of this interbehavioral history that the individual performs all of the responses that he ever performs. Whatever he can do, his capacities, knowledge, skills, and behavior powers, are engendered in his Interbehavioral History.

For descriptive purposes Kantor delineates two corresponding aspects of this history. When there is reason to stress the place of the organism in this history, he speaks of the "reactional biography;" what happens to stimulus events in this history is called "stimulus evolution" (Kantor, 1938, p. 51). The reactional biography, then, concerns the development of responses and their relations to stimulus events, while stimulus evolution refers to the development of stimulus functions by persons or other objects. It should be noted that the interbehavioral history is a history of stimulus-response functions, and that the reactional biography and stimulus evolution are response functions, it is psychologically meaningless to discuss either the reactional biography or stimulus evolution without reference to the other, since it is only by virtue of the relation between them that either concept has psychological significance. The behavior of an organism in the presence of stimulating conditions, at any one time, is a product of the interbehavioral history. What develops throughout the miliseconds of this history are stimulus-response relations.

Skinner has a similar construct known as the "history of reinforcement." For Skinner, behavior is always a function of current variables and a history of reinforcement. However, because Skinner does not emphasize the interdependency of stimulus and response, a concept of stimulus evolution is not

included in his formulation. The absence of this concept has serious implications which are revealed in Skinner's analysis of how this history manifests itself in the current situation. Recall that for Kantor what develops throughout this history are stimulus-response relations. For Skinner what develops is an organism. The consequences of action are said to "change the organism," increasing the probability that responses of the same sort will occur again (Skinner, 1969, p. 105-108).

In summary, radical behaviorists and interbehaviorists have arrived at similar constructs through their contacts with roughly the same subject matter. Missing from Skinner's formulation is the construct of contact media, however, this construct plays a relatively minor role in Kantor's system. Important differences between the two approaches include the nature of the relationship between stimuli and responses, the nature of stimulus functions, the nature of causality, and the products of behavioral history. These differences are the subject of the following section.

Irreconcilable Differences between Radical Behaviorism and Interbehaviorism

The nature of stimulus-response relations. Skinner does not emphasize the interdependency of the coordinates of functional relations, resulting in the misleading dichotomy of dependent and independent variables. It is sometimes argued that Skinner does recognize the issue of interdependency but takes it for granted. The following passage (or a similar one) is likely to be cited in this regard:

The relation between the controller and the controlled is reciprocal. The scientist in the laboratory, studying the behavior of a pigeon, designs contingencies and observes their effect. His apparatus exerts a conspicuous control on the pigeon, but we must not overlook the control exerted by the pigeon. The behavior of the pigeon has determined the design of the apparatus and the procedure which is used. Some such reciprocal control is characteristic of all science (Skinner, 1971, p. 161).

This example does not speak to the issue, however. What Skinner is suggesting here is that when a pigeon and a scientist interact, sometimes the scientist's behavior is the independent variable with respect to the pigeon's behavior, and sometimes the pigeon's behavior is the independent variable with respect to the behavior of the scientist. He is not suggesting that the behavior of pigeon and scientist are interdependent. Interdependent events don't "exert" anything. Furthermore, it is relatively easy to obscure the

issue of interdependency by discussing the reciprocity of relations involving two animate objects; that is why we find other examples concerning the slave and the slavedriver, the teacher and the student, the therapist and the client, and the mother and the child (Skinner, 1971, p. 161). Moreover, if Skinner were actually discussing the issue of interdependency, why do we not find examples involving such events as the red street light and the stopping car? The problem here is a result of asking the wrong question. The question itself is a product of two things: Focusing on only one coordinate of the functional relation at a time (that is, failing to appreciate the concept of interdependency), and assuming no difference between functional and causal variables. For Kantor, the relation between the red street light and the stopping car depends as much on the light as it does on the car; and further, neither coordinate can be abstracted from the function to account for the other factor-not to mention accounting for itself as well.

The nature of stimulus functions. The independent-dependent variable dichotomy is further complicated by the use of the term "function" and its presumed synonymy with the term "cause" in Skinner's system, constituting a second irreconcilable difference between radical behaviorism and interbehaviorism.

From a mathematical standpoint, "function" refers to a correlation of variables, and this is the sense in which Kantor uses the term then discussing functional relations. It is not clear that radical behaviorists are always using the term in this way, however, particularly with regard to the concept of reinforcement. In fact, in the context of reinforcement, functional relations are confused with cause-and-effect relations which, obviously, represents a shift in the meaning of the term "function." To illustrate this point, the conditions under which the term "reinforcement" is used must be reviewed. The meaning of the term "function" from a radical behavioral standpoint will, in this way, be clarified.

First, "reinforcement" is sometimes used as a noun referring to a stimulus change. Alternatively the term "reinforcer" is used to indicate the post-change event. These usages do not imply function in the mathematical sense of the term.

Secondly, "reinforcement" is used as an adjective, variously describing the kind of control exerted by a stimulus change, the effectiveness of a stimulus change in exerting this control, or to modify the noun "procedure." In each of these usages, no particular functional relation is identified, although one is implied.

Another usage has the grammatical status of a verb meaning "to strengthen" or "to make probable." In this case it is the object of the verb, rather than the verb itself, that is the functional relation. In other words, we may assume that, for these usages, the functional relation produced by the operation, "reinforcement," is that obtaining between the antecedent stimulus conditions and behavior. Functional relations of this sort are clearly correlational as the mathematical usage of the term "function" implies.

There are other uses of the term "reinforcement" which suggest other functional relations, however. For example, "reinforcement" occasionally refers jointly to a specific arrangement of events and the effect of this arrangement on the frequency of some behavior. A contingency and its characteristic effect might be described as an "example of reinforcement", for instance. What functional relations are implied by this usage? There are two possibilities. The first possibility is that in any example of reinforcement, there are two functional relations involved: That obtaining between the antecedent stimulus and behavior, and that obtaining between behavior and the consequent stimulus. This formulation is problematic, however, because the two relations are made to seem conceptually similar by the use of the term "function," but it is clear that there are two meanings of this term operating here. With regard to the functional relation obtaining between antecedent stimuli and behavior, "function" is used in the mathematical sense, meaning a correlation between two variables. With regard to the functional relation between behavior and its consequence, the term "function" suggests a less technical usage meaning "operation," "service," or, in other words, "that which it does." How else can we explain the role of the stimulus in one case as being "to set the occasion," and, in the other, "to strengthen"? From a strictly mathematical standpoint, "setting the occasion" is the only legitimate role for a stimulus participating in a correlation between two variables. Hence, to suggest that "reinforcement" refers both to the operation and its effect, implying a consideration of the functional relations, is misleading.

A second possibility is that in any instance of reinforcement there is, indeed, only one functional relation established, but it is not that obtaining between the antecedent stimulus events and behavior, but rather between consequences on one hand, and the relation between antecedent events and behavior on the other. By this analysis the vernacular meaning of function as "operation" or "service" is implied.

In summary, then there are two kinds of "functions" possible in Skinner's formulation which are not adequately distinguished, and only one kind of "function" in Kantor's system. This would not present any particular problem, except for the fact that Skinner insists that functional relations are not different in any important way from causal relations, which introduces a third fundamental and irreconcilable difference between radical behaviorism and interbehaviorism.

Functional vs. causal relations. Skinner (1953, p. 23) argues that the terms "independent" and "dependent" variable refer to the same factual core as "cause" and "effect," and that the old "cause and effect connection" becomes a "functional relation." The new terms, he (1953, p. 23) asserts:

do not suggest how a cause causes its effect; they merely assert that different events tend to occur in a certain order. This is important but not critical. There is no particular danger in using "cause" and

"effect" if we are always ready to substitute their more exact counterparts.

Having said this he then proceeds to use the terms interchangeably throughout his presumably "formal" writings.

A problem arises, when one attempts to classify events as independent variables and/or causes. We may begin by attempting to classify events participating in the functional relation obtaining between antecedent stimuli and behavior. In this functional relation the independent variables are the antecedent stimuli and the dependent variables are the behaviors. However, because Skinner contends that independent and dependent variables refer to the same "factual core" as causes and effects, we may assume that the antecedent stimuli are also the "causes," and the behaviors the "effects," in this situation. Unfortunately, Skinner would want to include only some antecedent stimuli among the causes of behavior, specifically those having an elicitation function. In fact, this is essentially the distinction Skinner (1953, p. 62) wishes to draw between eliciting and discriminative stimuli: Discriminative stimuli merely "set the occasion" for behavior, they don't "cause in to occur." What causes operant behavior to occur are the consequences of its past occurrence. These consequences are responsible for the behavior, as well as for the discriminative functions of stimuli. Clearly, the consequences of behavior are the true causes.

The radical behaviorist is now faced with the following dilemma: Discriminative stimuli are independent variables but not causes. This dilemma suggests to me that despite Skinner's claims to the contrary, we are not able to substitute the more exact counterparts ("independent" and "dependent variables") for "causes" and "effects" without changing the nature of the things described.

In summary, then, in Skinner's system, "cause" is assumed to be synonymous with "independent variable" but closer analysis reveals that some events which are independent variables are not also causes, making the terms not synonymous and precisely for the same reason that the new terms were introduced in the first place. This discrepancy is a direct result of failing to distinguish between two uses of the term "function." The common usage, as that which something *does* and which characterizes the nature of reinforcement, is closer to the traditional concept of "cause" than it is to the newer, and less objectionable term, "independent variable."

Skinner's failure to appreciate the interdependency of functionally related events, reflected in the dichotomy of dependent and independent variables, and the confusion of functional with causal relations produced by this dichotomy, is the source of even further difficulties. Instead of focusing on the development of relationships throughout organism ontogenic and phylogenic histories, he is obliged to focus on the organism itself. The result is organocentrism and reductionism.

The products of history: *Ontogenic development*. What evolves through-

out the course of a history of reinforcement, for Skinner, is not functional relations per se, but rather an organism. It is the organism that is changed by this history and thereby made able to react differently to stimulus events from one moment in this history to the next. An argument may be made that the "changed organism" analysis is simply a convenient way to deal with a difficult issue, and that he really intends to imply "changed functional relations." This is gratuitous, however, as the following passage indicates:

(The psychiologist of the future) will be able to show how an organism is changed when exposed to contingencies of reinforcement and why the changed organism then behaves in a different way possibly at a much later date. (Skinner, 1974, p. 215)

Obviously, Skinner is suggesting that contingencies of reinforcement change the organism physiologically. Furthermore, for such changes to be effective in controlling behavior at a "much later date," we must assume that these changes are of a permanent or lasting sort. This is not fundamentally different from more traditional analyses which account for current behavior by appeal to "stored copies" of organism-environment interactions. The only difference is that Skinner does not elaborate on the nature of the permanent changes in the organism, while more traditional theorists do.

The principal problem with Skinner's analysis, as well as with more traditional ones, is that they are not based on actual confrontations with events. Biological evidence to substantiate the belief in permanent changes in an organism's physiology as a result of exposure to contingencies or reinforcement does not exist. Furthermore, the suggestion that physiological evidence will explain "why an organism then behaves in a different way," is clearly reductionistic. It is tantamount to saying that a part of the organism determines the activities of other parts, or of the organism as a whole. Indeed, Skinner's general tendency to explain psychological phenomena by appeal to biology is apparent in several other contexts. For example, Skinner thinks that physiology promises an account of behavior that will be truly "causal," as opposed to "historical." He (1969, p. 282-283) says:

When we can observe the momentary state of the organism, we shall be able to use it, instead of the history responsible for it, in predicting behavior. . . . We should then know what it means to say that some part of such an account "explains" another part.

For Kantor this is a completely illegitimate form of construction. Psychological activity, in his view, is not the functioning of biological mechanisms, but the actions of the whole organism in interaction with stimulating conditions. Because an individual is a biological organism, biological factors are

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necessarily involved in all psychological activity, but biological factors are merely participating factors and have no special status as determiners or causes of psychological activity. He (1922, p. 40) says:

We must not be misled by the overlapping of some of the psychological data with biological facts into distorting such data by the indulgence in general physiological explanations; for in the first place, psychological phenomena are no more physiological than they are physical, and in the second place, the argument that psychology is based on physiology is no more valid than the argument that all sciences, because they are human phenomena, are based upon sociology. The only valid scientific procedure is to accord full recognition to any facts that we study without attempting violently to transform them into something else.

For Kantor, in contrast to Skinner, the product of interbehavioral history is not the evolution of an organism, but the evolution of stimulus-response relations. Unlike Skinner's hypothetical "changes in the organism," stimulus-response relations are readily observable. They are the subject matter of psychology.

Skinner's organocentrism and unwitting adoption of traditional causal philosophy is further evidenced by his analysis of phylogenetic evolution, to which we now turn.

The products of history: Phylogenetic development. Skinner argues that radical behaviorism is a thoroughly descriptive (as opposed to explanatory) philosophy. His argument rests, in part, on the fact that the relations studied by behaviorists are functional not causal. This argument is flawed, however, as we have seen. A second, and related issue, has to do with the fact that "reinforcement" is not a circular concept. Skinner (1953, p. 73) explains:

We observe the frequency of a selected response, then make an event contingent upon it and observe any change in frequency. If there is a change, we classify the event as reinforcing to the organism under the existing conditions. There is nothing circular about classifying events in terms of their effects: the criterion is both empirical and objective. It would be circular, however, if we then went on to assert that a given event strengthens an operant because it is reinforcing.

Indeed, we may agree that for a theory to be truly explanatory in the traditional sense, it must presume to address the issue of how a cause causes

its effect, or in radical behavioral terms, "why reinforcement strengthens." Skinner (1953, p. 81-84) readily acknowledges his unwillingness to address this issue for to do so would violate his avowed descriptive approach. Unfortunately, however, he can't seem to refrain from attempting to answer this question. His (1971, p. 114) answer takes the following form:

The process of operant conditioning presumably involved when those organisms which were more sensitively affected by the consequences of their behavior were better able to adjust to their environment and survive.

Organisms thereby inherit the capacity to be affected by the consequences of their actions. That is, the ability to be affected by consequences becomes part of the biological equipment of the organism. Furthermore, not only do organisms inherit this general capacity, but they inherit susceptibilities to particular consequences, for example, food, water, and sexual contact. The analysis seem specially convincing because it takes into consideration both the survival of the individual as well as of the species. Not quite so convincing, however, is the inherited susceptibility to reinforcement by signs of damage to others as an explanation for aggression (Skinner, 1969, p. 195) and inherited susceptibility to reinforcement of proximity to the mother as an explanation for imprinting (Skinner, 1969, p. 187). Presumably other susceptibilities may be invented as the circumstances dictate, for example, he mentions the possibility of a population-limiting instinct showing up in human beings when conditions become sufficiently overcrowded (Skinner, 1969, p. 199). In summary, according to Skinner consequences strengthen behavior because we're "built that way," and particular consequences strengthen behavior more than others, or to the exclusion of others, because we're "built that way."

It goes without saying that this analysis is not based on confrontations with events. Given that reinforcement implies nothing more than an observed correlation, and given that events always have consequences of some sort (from the standpoint of simple temporal sequences), one wonders what the evolution of the "process of operant conditioning" could mean. The implication is that at one time there were organisms that were "insensitive" to the consequences of their actions (Skinner, 1971, p. 136). Consequences, as consequences, are constructions, however; and as events they are nothing more than stimulus events with which an organism interacts. Are we to assume that at one time there were no temporal sequences of events and no stimulus-response interactions? Maybe, but there were no organisms at this time either, so the point is moot. Again, Skinner's problem is to assume that functional relations are not different from causal relations. Having made this error, he must go on to suggest why reinforcement strengthens and the only plausible answer seems to lie in the organism itself. Evolution, he (1971, p. 136) says is "directed" change: Genetically, a species becomes better and

better equipped to be operantly conditioned; historically, organisms become more and more sensitive to the consequences of their actions.

Skinner's solution to the problem of how a cause causes its effects is not plausible, however. There is no plausible solution to an illegitimate question. The question is illegitimate because it assumes that causal factors are singular things or events, as are effects supposed to be. A legitimate causal question is one that asks "how the constituent factors of things, their properties and conditions, are organized in an event situation" (Kantor, 1950, p. 156). For Kantor, causal changes are functions not of singular events, but of "mutual and reciprocal changes in every aspect of a factorial system" (Kantor, 1950, p. 157). Causal knowledge is simply knowledge of the interrelations of field components which, of course, include consequences but are not restricted to them.

Summary and Conclusion

Despite the similarities between Kantor's and Skinner's psychological philosophies, a number of fundamental differences prevail. These differences have their origins in the units of analysis selected by the two men. Kantor has isolated the functions obtaining between responding and stimulating as his unit; while Skinner has adapted a unit consisting of responses. This results in different views concerning the nature and operation of stimulus events, which, in turn, gives rise to other points of disagreement. When responses are considered apart from their relations with stimuli, as in Skinner's formulation, stimuli may be conceptualized as independent entities having a causal role with respect to responses. Accordingly, Skinner identifies three types of causal relations, including: elicitation, discrimination, and reinforcement. Having thus articulated a position of environmental determinism, Skinner goes on to account for this position by appeal to the authority of biology: the capacity to be operantly conditioned is held to be a product of natural selection. Likewise, the capacity to be conditioned by some stimuli more than others is due to "inherited susceptibilities to reinforcement." These inheritances are not sufficient to explain the details of ontogenic development, however, particularly as it relates to the issue of why an organism is able to do today what it learned to do yesterday. Skinner's explanation here is similarly reductionistic. Operant conditioning is said to change the organism physiologically, and the modified organism is thereby able to act in modified ways. In short, reinforcement emerges as a causal principle, operating by way of biological occurrences and explained by appeal to them.

Because Kantor has isolated stimulus-response functions as opposed to responses as his unit of analysis, these constructions concerning this unit are wholly at odds with those of Skinner. From Kantor's perspective, stimuli, as phases of a unitary phenomenon involving responses, cannot be abstracted from this unit to account for the occurrence of responses: stimuli do not cause responses, they participate, along with responses, in functional rela-

tions involving both. Causality, therein, refers to the configuration of setting factors in which such functions are imbedded, it is not a property of an isolated object or event.

Having simply described events as they are observed to occur, without attempting to explain them by appeal to any single factor, Kantor is relieved of the obligation to explain his explanation. There is no appeal to biological authority. From an ontogenic perspective, functions, not organisms are said to evolve. Interbehavioral history is an evolution of stimulus-response relations. The current relation is simply a point in that evolution. From a phylogenic perspective, organisms evolve, not their interactions with the environment, as Skinner would have it. Phylogenesis is a biological concern, certainly, but it is not an explanation for psychological events.

These differences cannot be reconciled. Skinner's radical behaviorism is founded on traditional causal philosophy, without which it would have no meaning or significance. The causal construct of reinforcement is too central to be abandoned. Nor is it possible to transform Kantor's field-theoretical position so as to give special status to particular events in the determination of other events. To do so would violate the principle of interdependency—the most distinguishing feature of interbehaviorism.

Efforts to reveal the similarities between radical behaviorism and interbehaviorism and to bring about their reconciliation on philosophical grounds serve only to conceal their very real differences. It also prevents their systematic application to problems for which each is particularly well suited. Radical behaviorism developed out of an interest in the prediction and control of behavior. As such, it is particularly well suited to local problems arising during the investigative phases of scientific work. Causal constructions may have some significance in this domain, although even here they refer not to events but to manipulations upon them, and care must be taken to avoid such confusions. For problems of broader scope, such as those encountered in the postulational phases of scientific work, radical behaviorism has little to offer. It has not been formulated in a systematic way and, as a result, inconsistencies go unnoticed and uncorrected. Neither is it sufficiently cognizant or critical of its philosophical heritage to serve as an useful foundation for behavior science.

Kantor's interbehaviorism does not suffer from these inadequacies. Kantor's philosophy is rigorously systematized, by which inconsistencies may be eliminated, and, further, a deliberate attempt has been made to avoid entangling cultural institutions of a metaphysical sort. It is this sort of philosophy that can provide a foundation for a natural science of behavior. Further, because events and constructs are more clearly distinguished in Kantor's system, it may serve a useful purpose in the descriptive work of science. Description is not an isolated or unimportant aspect of scientific work. It is the product of both postulation and observation, and serves as a starting point for investigation as well as theory construction. On the other hand, interbehaviorism has not been articulated in accordance with the

demands of an experimental science, and for this reason, it is not particularly well suited to problems arising in this context.

A reconciliation of fundamentally different philosophies, in which the essential characteristics of each are preserved, is not possible of accomplishment. It has been my goal to substantiate this claim, and to indicate, further, that attempts to reconcile radical behaviorism and interbehaviorism may not only bear no fruit but may actually constitute a disservice to the field.

REFERENCES

- Kantor, J. R. (1922). The nervous system: Psychological fact or fiction? *Journal of Philosophy*, 19, 38-49.
- Kantor, J. R. (1924). *Principles of psychology*. Chicago: The Principia Press.
- Kantor, J. R. (1963). The scientific evolution of psychology. Chicago: The Principia Press.
- Kantor, J. R. (1970). An analysis of the experimental analysis of behavior (TEAB). *Journal of the Experimental Analysis of Behavior*, 13, 101-108.
- Kantor, J. R. (1971). Preface to interbehavioral psychology. In J. R. Kantor (Ed.),
- Kantor, J. R. (1971). Preface to interbehavioral psychology. In J. R. Kantor (Ed.), *The Aim and progress of psychology and other sciences*. Chicago: The Principia Press. (Original work published in 1971).
- Kantor, J. R. (personal communication, November 12, 1979.)
- Kantor, J. R. and Smith, N. W. (1975). The Science of psychology: An interbehavioral survey. Chicago: The Principia Press.
- Morris, E. K. (1982). Some relationships between interbehavioral psychology and radical behaviorism. *Behaviorism*, 10, 187-216.
- Morris, E. K., Higgins, S. T. and Bickel, W. K. (1982). The influence of Kantor's interbehavioral psychology on behavior analysis. *The Behavior Analyst*, 5, 159-173.
- Skinner, B. F. (1938). *The behavior of organisms*. New York: Appleton-Century-Crofts.
- Skinner, B. F. (1953). *Science and human behavior*. New York: The Free Press.
- Skinner, B. F. (1957). *Verbal behavior*. New York: Appleton-Century-Crofts.
- Skinner, B. F. (1966). Preface to the seventh printing of *The behavior of organisms*. 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: Alfred A. Knopf, Inc.
- Skinner, B. F. (1974). *About behaviorism*. New York: Alfred A. Knopf, Inc.