

Science in Psychology: J. R. Kantor's Field Theory¹

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ABSTRACT

The implications of Kantor's concept of field theory in psychology are discussed. Points of compatibility between Kantor's theoretical program and Skinner's experimental program are indicated. The importance of Kantor's interbehavioral principle is stressed, and it is pointed out that Skinner and his followers have frequently failed to utilize the principle in their program. Finally, illustrative examples are given of the potential inherent in Kantor's field theory to resolve persistent problems in psychology.

RESUMEN

Se examinan las implicaciones en Psicología del concepto de Kantor sobre la teoría del campo. Se señalan puntos de compatibilidad entre el programa teórico de Kantor y el programa experimental de Skinner. Se subraya la importancia del principio interconductual de Kantor, y se señala que Skinner y sus seguidores, con frecuencia, no han sabido utilizar el principio en su programa. Finalmente, se dan ejemplos ilustrativos del potencial inherente a la teoría del campo de Kantor para resolver problemas persistentes en la Psicología.

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It is paradoxical that many contemporary psychologists tend to overemphasize the importance of the collection of data and to neglect that complementary and equally central aspect of the scientific enterprise designated as theory construction (Mountjoy, 1966, 1970). The paradox consists essentially of the fact that the highly developed enterprise of physics has long recognized that both theoretical and experimental physicists play an important and complementary role in the prosecution of physical investigations, while psychologists may be regarded as displaying a relative immaturity since they so slavishly devote themselves to the simple accumulation of data in restricted experimental paradigms. One detrimental consequence of this overevaluation of the observational and experimental component of psychological investigations has been a deplorable lack of correspondence between laboratory operations and the theoretical aegis under which those operations were ostensibly performed (Kantor, 1947, 1969). It should not be assumed that only dualistic psychologists fall into this error of discontinuity between procedures and postulates (although mentalists are convenient examples) while behaviorally oriented workers escape unscathed. The theoretical foundations of behavioral science must continually be assayed lest non-objective considerations become incorporated into the structure and thus delay the development of psychological science. Examples are not far to seek; a convenient and recent one is provided by Kendler and Spence (1971) who incorporated Wundtian psychism into their scheme of psychological science.

For more than 50 years, Kantor has served as a theoretical psychological scientist, tirelessly ferreting out deviations from objectivity in psychological formulations, and carefully formulating his own comprehensive program which points ceaselessly toward the emergence of psychology as a natural science in its own right (Mountjoy, 1972). It was not without trepidation that this author accepted the challenge of summarizing Kantor's activities, even with the suggested limitation that discussion be limited to Kantor's field theory, since his contributions to the recent past and to the future evolution of an authentic natural science of psychology are of such magnitude that this necessarily brief summary can only serve as a stimulus to the reading audience for further exploration and implementation of his program. The present paper consists of four major sections: Chronology of Publications; Field Theory; Realization of the Program; and Resolution of Persistent Problems. It is essential to indicate that his program emphasizes detailed investigation of psychological events and rejects utterly all doctrines which have arisen from social, political, religious, etc., circumstances of the past in favor of constructs which are the result of an impartial investigation of events (Kantor, 1975).

Chronology of Publications

Since Kantor's publications have covered a time span in excess of 50 years, a detailed examination of all of them is manifestly impossible. To

obtain an appreciation of the breadth and depth of his contributions one should consult *The Aim and Progress of Psychology and Other Sciences* (Kantor, 1971) which contains a representative sampling of 36 papers. Since 1971 numerous papers concerning current issues have appeared in the *Psychological Record*. For the purpose of the present paper, however, the basic thrust of publications in book format must be discussed.

The Principles of Psychology (Kantor, 1924, 1926) represents the first comprehensive analysis of psychological events in which description is limited to the actual components of those events (i.e., no appeal is made to an unobservable internal principle which "causes" the organism to behave and thus "explains" that behavior). The *Principles* is regarded as comprehensive because the complete range of psychological reactions was discussed, and all were encompassed within the same set of stimulus-response principles. To illustrate, Chapter 30 is entitled, "Abnormal reactions and psychopathic personalities" (Kantor, 1926). First, abnormal behavior was placed upon a continuum which included normal behavior, and then a psychological system of classification was presented. In brief, those behaviors which fell into the abnormal range of the continuum were categorized into three types: (a) those in which a behavior has been lost; (b) those in which a behavior has not been developed or unsuitable behaviors had been developed; and (c) those in which already developed behaviors either failed to occur or occurred to inappropriate stimuli.

The feasibility of describing social behavior within a stimulus-response framework was demonstrated in *An Outline of Social Psychology* (Kantor, 1929), which was followed shortly by an introductory text, *A Survey of the Science of Psychology* (Kantor, 1933a). In these he ruthlessly rejected such traditional constructs as the group mind (for social behavior) and the stimulus as "cause" and the response as "effect" (for perceptual behavior).

In 1936 Kantor published *An Objective Psychology of Grammar* in which he discussed language as adjustmental behavior. Linguistic theories of the time were critically examined, and the available data on language behaviors were placed into a stimulus-response framework.

Kantor then embarked upon an analysis of the nature of logic and its relationship to psychology, which constituted an important inflection point in his intellectual career since from that time onward problems of scientific systematization, especially in psychology, were of central concern. The two volumes *Psychology and Logic* were separated by five years (Kantor, 1945, 1950) and an intervening work *Problems of Physiological Psychology* (Kantor, 1947). *Problems* contains sophisticated analyses of the role of physiological factors in psychological events and presents a carefully developed argument for the autonomy of a science of behavior which is tively free of dependency upon biological science.

The Logic of Modern Science (Kantor, 1953) continued his treatment of the problems involved in the construction of scientific systems; the relationships between assumptions, cultural matrices, scientific procedures, and

constructs in major areas of science (physics, biology, psychology, etc.) were rigorously evaluated. Next he produced a book describing his system of psychology, *Interbehavioral Psychology* (Kantor, 1957) followed closely by a second, revised, edition (Kantor, 1959). In these volumes sets of propositions appropriate for the various areas of psychological science were presented.

Most recently, *The Scientific Evolution of Psychology* (1963, 1969) has traced the historical career of psychology from its inception in ancient cultures up into the twentieth century. The importance of these two volumes lies in their detailed exploration of the multiplicity of cultural variables which have operated in the recent past to prevent the development of an objective science of behavior and the presentation of guidelines which will enable such a natural science to emerge in a viable state.

It must be reiterated that various aspects of his field theory are presented in one or another of the works cited above, and the present paper is in no way a substitute for familiarity with the writings of Kantor himself. The purpose of this present overview can be accomplished only if it results in widening the group of psychologists who share an acquaintance with his publications, and hopefully such a consequence shall ensue as a result of this presentation of the implications of Kantor's field theory for the science of psychology.

Field Theory

Scientists in general have displayed a continual preoccupation with the methodology and logical foundations of their investigations. Such concern for the basic underpinnings of scientific work is laudable so long as it remains firmly connected to the actual events under consideration. During his long career Kantor has astutely observed the chaotic consequences of improper conceptions of the nature of psychological (behavioral) events. As a result he proposed a field concept which conceptualizes this large class of events in a manner which leads to successful analysis. Prior to an explication of Kantor's field theory, it is essential to separate his concept from other conceptualizations which also bear the title of field theory. These other field theories may be characterized as (1) scientific field theories and (2) meta-physical field theories.

Scientific field theories. Mathematicians speak of three types of fields: scalar, vector, and algebraic fields. Each of these is precisely defined and utilized in specific circumstances; e.g., among algebraic fields are the set of all rational numbers, the set of all real numbers, etc.

Physicists, historically speaking, developed physical field theories to describe situations which are basically referred to as action-at-a-distance phenomena. The origin of field theory may be traced to Newtonian mechanics, Kant's subsequent critical reaction to the Newtonian assumptions, and Kant's consequent insistence upon *a priori* principles; the empirical discovery which

ultimately led to modern physical field theory was Oersted's demonstration of electromagnetism in 1820. Davy and his disciple Faraday described this phenomenon in detail, and Maxwell (drawing heavily from Faraday's contributions) developed the set of partial differential equations known as Maxwell's equations which describe the relationship between an electric and a magnetic field (for a more detailed account of this development, see Williams, 1966). Since that time, many specialized applications have arisen and two examples should suffice to illustrate their nature. Projective field theories are theories of gravitation and electromagnetism in which five homogeneous coordinates represent fourdimensional time-space. Quantized field theories are theories in which both electromagnetic and matter fields are represented by specified operators. It is obvious that such theories are abstract mathematical expressions developed by physicists in order to describe certain physical relationships, and that the underlying mathematical assumptions are clearly specified.

Scientific field theories have also been developed in biology, most spectacularly in embryology (although evolutionary doctrines should not be neglected as examples of appropriate field theories —specifically population genetics as applied to evolutionary sequences of organisms in the geological record).

Metaphysical field theories. One must be cruel in order to be kind; most psychological field theories are metaphysical in the sense that their basic underlying assumption is that the human essence is a non-physical causative agent. An obvious example is the Gestalt field doctrine (Koehler, 1938) which purports to explain (among other things) why brain states and mental states are isomorphic. A more disguised version is that of Lewin (1935) who attempted an ill conceived marriage between mentalistic doctrines and the mathematical concepts of topological geometry.

Metaphysical field theories represent the last gasp of medieval theology and have no place in science. Nevertheless, for clarity it must be stated that in the metaphysical theories just castigated the term "field" was selected in order to obfuscate the non-scientific nature of mentalistic doctrines and to obtain the respectability of a scientific patina for transparently metaphysical (and fundamentally theological) doctrines.

Field. "Field" may be defined variously as (a) the space-time boundary of an event, (b) the factors which comprise an event, and (c) the interrelationship of the factors comprising an event within the space-time boundary of that event.

Kantor's use of the term "field" encompasses all three of the aspects which were just presented in separate but complimentary definitions. That "field" refers to a spatio-temporal locus of an event (definition a) is clear from the examples given of scientific field theories; that "field" implies the isolation and enumeration of the factors contained within an event (definition b) is implied by the analytic nature of the scientific enterprise; that "field" requires specification of the interrelationship among factors (defi-

dition *c*) is implicit in the systematic concern of scientists (no scientist is ever satisfied with the demonstration of an isolated factor, it must always be related to other factors within a specified space-time boundary). Only adherence to these specific definitional aspects in the use of the term "field" is acceptable; such adherence will assist psychology in obtaining its rightful place as a science among sciences.

Among the advantages accruing to the physicist who applies field theory to the events he is investigating are two which are readily specifiable. First, he is forced to explicitly state his guiding assumptions. Secondly, mathematical expressions describe the continuum of events more precisely than everyday language because mathematical terms are continuous whereas ordinary language consists of discrete expressions. In the present stage of development of psychological science the first advantage is primary, and a detailed explication of the assumptions appropriate for a psychological field theory are to be found in Kantor (1959), hence, they shall not be listed here.

However, it cannot be stated too strongly or frequently that events are distinct from constructs (although constructs must be derived from events). This distinction has been stressed repeatedly, and was carefully delineated in numerous publications (see specially Kantor, 1963, 1969). In a critical review Schoenfeld and Cumming (1963) have provided stark testimony to the grim consequence of failure to maintain this distinction in their discussion of paradigms for mediated generalization.

Events and constructs. The sciences, ideally, consist of a continuum of constructs (models, theories, etc.) which parallel the continuum of events, but which are distinct from events. Exposition of these two continua is difficult since it is essential to maintain the distinction between the events and the constructs which attempt to describe those same events without recourse to a language so cumbersome as to obscure the message being presented. The difficulty lies in the fact that the terminology of all sciences consists of words which refer only to selected aspects of the events, yet these very words may easily be taken to constitute the events themselves. Consider, for example, the term "response". On the one hand, this word refers the reader to the actual event in all its complexity, the organism's actual conduct at some specified moment in time, which would include not only such obvious actions as overt manipulation of environing objects but also more subtle components such as neural activity, changes in blood pressure, etc. On the other hand, "response" as a construct may simply refer the reader to the readily observable and recordable overt manipulation of a stimulating object, thus, leading the naive reader to infer that the recorded aspect of the response is the only reality.

The science of psychology is viewed properly as that specialized science which has selected a restricted region of the continuum of events as its subject matter. All sciences have chosen such specifiable regions, and individual sciences may be defined most appropriately by identification of the type of event which has been specified. Kantor's field theory localizes

psychology on the continuum of science, establishes psychology as a science among the other sciences, on an equal footing —neither subordinate nor superordinate, but upon an equal footing. The continuum of events (physical, biological, psychological) is paralleled by a continuum of sciences (physio-chemical, biological, and behavioral) and by an accompanying continuum of constructs.

The Event Continuum. The cosmos may be regarded as composed of events, but it is more accurate to state that the system which we refer to as the cosmos may be subdivided into events for purposes of analysis, and each event in turn is also a system (an organized whole, the parts of which are intimately related to each other). Systems (or events) are related to each other as well. The self-imposed task of the scientist is to analyze the cosmos, to discover and describe its multitudinous aspects, and to communicate these discoveries to other scientists. The complexity of the cosmos has dictated specialization among scientists, and for the purpose of the present essay, it is convenient to stress both the fundamental continuity among events while at the same time indicating major classes into which events have been classified. The task of emphasizing continuities without undue disregard of discontinuities is rendered exceptionally difficult by the nature of the Indo-European family of languages which consists of discrete words. Our linguistic histories are such that we regard each noun as corresponding to a fixed and discrete entity in the cosmos —whereas in reality any and all classes of events shade imperceptibly into other classes of events. For example, though it may appear that no distinction could be more secure than that between day and night it is clear that these shade imperceptibly into each other at twilight.

It has been found feasible to conceive of the cosmological continuum as composed of three major areas, and scientists have tended to concentrate upon one or another of these areas. In brief summary, the areas may be characterized and identified as the (a) physico-chemical, (b) biological, and (c) psychological classes of events. It must not be forgotten that the three areas do shade imperceptibly into one another. Nevertheless, this somewhat arbitrary distinction is useful as the continuum of events is so enormous as to require specialization in order that scientific progress may occur at all.

Inorganic events are studied by the physico-chemical sciences and their components constitute such objects as the planets. The classical examples of physical constructs are Newton's law of motion which described the relationships among these bodies in terms of mass and distance. For simplicity we may speak of equivalent energy interchanges, much as $F = ma$.

The biological sciences have selected that large class of events which may not be described solely in terms of equivalent energy interchanges, but which involve the evolution of organic substances in their incredible diversity. Consequently, it is necessary to consider the historical record of the specific species under consideration (phylogenetic evolution) in the development of biological constructs.

Psychological events are differentiated from physico-chemical and bio-

logical events by the dominant role of ontogenetic evolution (individual life history) in those events. The almost overweening devotion of psychologists to the study of learning testifies to the centrality of the life history of individual organisms in behavioral events. It cannot, however, be overlooked that all events are continuous; psychological events shade imperceptibly into biological events; in turn, biological events likewise merge into the class of physico-chemical (inorganic) events.

Nowhere is the continuous nature of events illustrated more strikingly than in the recent discovery of enormous quantities of a wide variety of abiotic organic chemical compounds in interstellar space. It is manifestly absurd to propose that even a single molecule of the more than 70 compounds (including alcohol, formalin, etc.) now known to exist extraterrestrially are the consequence of the actions of organisms. However, such abiotic molecules do not militate against the division of the continuum of events into physico-chemical and organic regions, with subsequent specialization by biologists in the study of the production of organic chemicals during the metabolic processes of organisms. In a similar fashion there are continuities between the biological and psychological portions of the event continuum — and these continuities do not indicate that psychological events are reducible to biological events. On the contrary, the psychologist may rejoice in the demonstration that psychological events evolve from ecological (biological) happenings since (1) the essential continuity of psychology with other sciences is thus established, and (2) the relative independence of psychology from the other sciences is similarly indicated.

In essence, psychologists are faced with the problem of the interrelationship between the referents for the terms “organism” and “environment”. The nature of the event continuum is such that it is evident that the dichotomy is both arbitrary and useful. Organisms are systems which are only temporarily differentiated from environment and which are in constant and dynamic interaction with environment. Indeed, the system which we designate as the “world” consists of aspects which may now be environment (nutrients), next organisms (once nutrients are absorbed) and finally environment once more (excreted waste products, and ultimately cadavers). It should also be remembered that organisms produced one of the important “inorganic” characteristics of the planet earth; the present atmosphere is a consequence of the metabolic activities of plants and animals. In a sense, then, the environment is a consequence of organisms just as organisms are a consequence of environment; the “dichotomy” between organism and environment is in reality a continuum.

The continuum of sciences. The position of psychology in the continuum of sciences is that of a relatively independent science which studies those activities of organisms in which their individual history plays a major role.

Field theory in psychology. In a manner similar to the situation in other sciences, field theory in psychology consists of (a) specification of the

space-time boundary of an event, (b) identification of the factors present in that event, and (c) a description of the interrelationships among those factors. Examples of approximations to field theory are becoming more common in the psychological literature, even though authors may not specifically identify their contributions as field theories. Some aspects of approximations to field theory are rejection of a simple single cause and single effect model, the disappearance of statements such as "other things being equal", and attempts to integrate a number of factors into the descriptions of an event. In 1941 Kantor presented an extremely concise, and yet informative, description of the nature of field theory in psychology and the other sciences. It is recommended that the serious reader consult that paper.

A conspicuous example of the shift from an older approach is the changing situation in psychophysics; it was originally assumed that the experimental task was to plot response as a function of increments in stimulus energy. The recent developments, however, emphasize the generation not of a single curve, but of a family of curves by manipulation of factors other than stimulus energy. Among these factors are signal to noise ratio, payoff matrices, etc. Goldiamond (1962) has not only summarized these developments but has related them to several other important classes of behavioral events. Kantor (1924) suggested that perceptual behavior was properly approached as a field of factors, and comparison of his program with these recent developments is instructive.

Perceptual behaviors, while serving as informative illustrations of the application of field theory, may appear to be trivial in comparison to the psychologists' equivalent of the physicists' action-at-a-distance phenomena. Whereas physicists were concerned with the spatial distance between events (the earth's orbit is dependent upon its mass, that of the sun, and the distance between them), psychologists have traditionally been concerned with the temporal distance between successive acts of a particular organism (although separated from a stimulus complex for a day, a week, a month, when that situation is again encountered the organism once again performs the response). Physiological psychologists especially have expended long hours in search of the "biological substrate of learning" (which phrase actually means the "organic cause of learning"). In addition to documenting the futility of the quest for the "neural trace" or "engram", Kantor (1947) in the development of field theory has demonstrated that clear specification of the factors in a learning field obviates the necessity of an hypothesized "organic trace" to bridge the time gap between successive performances of a learned reaction. In other words, when the factors of a previous field (including the organism and the envioning components) are reassembled, then that previous field has been reconstructed. To the extent that the second field departs from the first in composition (including the temporal dimension) the reaction component of the second field will also be different from that of the first field.

Quite recently a demonstration of the field nature of discriminative

operant conditioning was reported by Ray and Brown (1975). They proposed that discrete terms such as "reinforcement", "learning", and "motivation" be replaced with parametric specifications of organismic, spatial, temporal, and historical dimensions. Their suggestion is certainly congruent with the position taken in the present paper that meaningful scientific terms designate an area upon a continuum, and at the very least approximates the substitution of a continuous system of constructs for the discrete system of constructs presently in use. If this enterprise is successful, psychologists will share in the second advantage of field theory — constructs more nearly isomorphic with the continuum of psychological events. It is the case that the very use of discrete terms may result in an unfortunate tendency for both user and reader to regard the area designated by a term as an isolated point unrelated to nearby areas upon the broader continuum of events.

Realization of the Program

Earlier it was stated that Kantor is a theoretical psychologist, and it was indicated that theoretical scientists may be contrasted to experimental scientists. All such dichotomies are false when they are taken to represent irreconcilable differences; instead the distinction should be understood to indicate some degree of separation between points on a continuum. Thus, for example, the theoretician will have diminished laboratory involvement while the experimentalist would be expected to have lessened theoretical involvement. The distinction, then, is presented in order to clarify certain aspects of the scientific careers of specific individuals. The theoretical psychologist will tend to analyze those data generated by the experimental psychologist, who in turn may devote very little energy to theoretical analysis. It is convenient to characterize Kantor primarily as a theoretician and Skinner primarily as an experimentalist (while realizing that some violence is done to the careers of both, and to Skinner's specially). Nevertheless, it is the case that consideration of Kantor's theoretical program and of Skinner's experimental program as complementary aspects of a behavioral approach to the data of psychology holds considerable promise for clarification of a number of important issues. The complementary nature of the programs of Kantor and Skinner has been mentioned by Fuller (1973) and Lichtenstein (1973). Kantor (1970) has also commented upon the potential of the experimental analysis movement to meet his theoretical criteria.

Specific similarities between the theoretical positions of Kantor and of Skinner must be noted. Kantor stated that psychology is a relatively independent science and Skinner spoke of behavior as a valid scientific datum. Both emphasized the acts of an intact organism in active commerce with its environment and rejected hypothetical entities such as mind or instinct, properly regarding the task of psychology to be a description of the factors which may be analyzed out of behavioral events. For purposes of the present paper, great stress will be placed upon the similarities between the two men

while differences will be discussed only where it is felt that they are germane to the future development of an objective science of psychology. In addition, emphasis is given to the theoretical contributions of Kantor since it is assumed that this reading audience is sufficiently acquainted with the experimental program of Skinner.

Quite soon after its appearance in psychological literature Kantor (1938) objected to the use of the operational principle for maintaining and justifying psychophysical dualism within psychology. That this was no idle charge is illustrated both by the viability of that use of the operational principle (Kendler and Spence, 1971) and by a subsequent analysis of operationism (Kantor, 1975). Shortly after Kantor's 1938 paper appeared Skinner (1945) published essentially the same message. A recent theoretical paper has been devoted to the similarities between the positions taken by Kantor and Skinner with regard to the operational principle (Moore, 1975).

Both Kantor and Skinner have directed considerable attention to the problems of language behavior. In a series of four papers, the first of which appeared in 1921, Kantor developed his analysis of language as adaptive behavior rather than as symbolism of mental states. This early interest in language eventuated in the appearance of the first book devoted to the naturalistic analysis of language (Kantor, 1936). Several papers by Skinner on the topic of language appeared prior to the publication of his book (Skinner, 1957). Evaluation of Kantor's contribution to the understanding of linguistic behavior will be found in a sympathetic review by Schoenfeld (1969), while Blumenthal (1970) has provided an estimate of the historical importance of Kantor's theoretical position regarding language.

The third definitional aspect of Kantor's use of field, the interrelationship of factors, is especially deserving of discussion. Kantor has distinguished between central and peripheral factors in the behavioral event, and the present analysis will emphasize the central (stimulus-response) factors because more precise observations have been published concerning those factors. In other words, the responding organism and the stimulus object were conceptualized as each affecting the other. He argued that even as the stimulus object produced a change in the responding organism, the organism reciprocally produced a change in the stimulus object. Although this is an extremely general property of psychological events it has not been fully appreciated by psychologists. To be sure, in an early work Skinner (1938, p. 35) credited Kantor (1933b) with emphasizing the functional nature of both stimulus and response as Skinner embarked upon the important task of arguing that behavior could be studied in its own right and that biological justification for such study was not necessary. However, those who follow Skinner appear to have fallen into a grievous error in their zeal to demonstrate the scientific status of behavioral events; they have overgeneralized from a restricted experimental paradigm; they have stressed the criteria of control and predictions instead of understanding the interbehavioral principle involved in a particular scientific setting.

At first blush, the overall strategy appears appropriate; it is to emphasize the lawful nature of behavior by developing a deceptively simple model – the rat or pigeon in the operant test chamber. Many self-evident advantages flow from this approach, and they need not be described in this essay. Nevertheless, the approach also contains the seeds of its own destruction in the form of a fatal flaw; because of the selection of the model the inter-behavioral nature of the psychological event field is overlooked and it appears that there is a unidirectional cause-effect relationship in the psychological event. In actuality, there is a mutuality between the central factors in the event field, a mutuality which must be appreciated if psychology is to take its proper place in the continuum of established sciences.

This mutuality between the stimulus and response factors is most clearly evident in the special case in which the stimulus object is an organism (but ease of observation of mutuality should not obscure the fact of the generality of the principle which extends also to the general case in which the stimulus is an inorganic object).

Skinner (1971) and his followers (e.g., Davison, 1973) have touched upon the mutual interbehavior of stimulus and response under the rubric of “counter control” and unfortunately have tended to stress aggressive or aversive methods of counter control. At the present time very few data have been collected upon the interactional aspect of psychological fields, although every psychologist must have casually observed such incidents and would be able to report anecdotally upon various occurrences. Certainly every individual who has trained pets or reared children has observed instances of the phenomenon. But, the practice of analysts of behavior to require quantitative observations inhibits unrestrained reports of anecdotes.

Published collections of data (as would be expected) tend to be concentrated upon the unidirectional model in which one organism controls the behavior of another, with little or no appreciation of the fact that in the more general case both organisms exert control upon the other. Lindsley (1970) provided a refreshing exception when he recorded audience reaction to speakers during the Ninth Annual Institute for Research in Clinical Psychology. The major conclusion to be drawn from these data are that audiences do exert control over speakers, even as speakers exert control over audiences. Pennypacker (1974) described in exquisite detail the interrelationship between the teacher and classrooms of fifth and sixth graders.

A detailed analysis of bidirectional control was reported by Graubard, Rosenberg and Miller (1974), and it is especially germane to the argument since it clearly documents that the controller can be effectively controlled by the controllee. Given groups of “deviant” children, Graubard and his coworkers chose to train the “deviants” to modify behavior of both teachers and peers toward the “deviants” rather than to follow the standard procedure of training the “deviants” to conform. In one experiment, the “deviants” accelerated praise and decelerated negative comments by teachers. In another, acceptance by the teacher of noise level in the classroom was increased

in four repeated classrooms by an average of some 30 decibels. Two experiments modified the reactions of peers ("normal children") toward children in special education classrooms. It is noteworthy that the children who had been disadvantageously labeled as "deviant" became competent behavioral engineers; as their behavior toward "normal" individuals was modified they were, in turn, able to modify the behavior directed toward them by those "normal individuals".

Patterson and Reid (1970) have attempted to develop a descriptive framework for the interrelationship of two human organisms. They deserve especial credit for including "reciprocity" (i.e., presentations of positive reinforcers) within their description in addition to "coercion" (i.e., withdrawal of an aversive stimulus).

The papers of Lindsley, Pennypacker, Graubard, Rosenberg and Miller, and Patterson and Reid cited above were selected not only because they illustrate the interbehavioral mutuality between the central factors of behavioral events but also as indicators of the essential compatibility of the theoretical program of Kantor and the experimental program of Skinner. One final point of similarity should be cited. Kantor has emphasized that single behavioral events cannot be studied in isolation from the preceding and succeeding behavioral events in which the organism is involved (Kantor, 1924, 1926). Contemporary behavior analysts have also discovered the necessity of studying sequences of events, and frequently refer to them as chains of responses.

Resolution of Persistent Problems

Unresolved problems are one of the hallmarks of authentic science. Each new discovery uncovers promising leads for future research, and at times the process appears to stretch forward into an infinite progression. As Kantor (1953) has indicated this state of affairs is a consequence of the corrigible nature of the scientific enterprise and involves not only the slow refinement of methodology but also the gradual reformulation of the assumptive bases upon which investigations are prosecuted. Psychological events and the factors comprising them have always been open to inspection; yet at the beginning of the Christian era it became fashionable to ignore or denigrate the actual psychological field and its determinants and instead to expound that an inner metaphysical essence caused and hence "explained" behavior (Kantor, 1963, 1969). One of the tasks of the psychological field theorist is to disentangle himself from the aspect of our cultural matrix which specifies a discontinuity between sciences which deal with "matter" and those which deal with "life" and "mind". A major burden of this essay has been to establish Kantor's ability to detect metaphysical doctrines of this sort no matter how disguised they may be in their modern form. One modern survival has been variously referred to as "nature-nurture", "heredity-environment", etc. The pervasiveness of this dichotomous manner of

thinking is astounding, and it has led to numerous fallacious concerns among psychologists. Only three facets of this general problem shall be discussed in this paper, but they have been selected to illustrate both the type of fallacious problem this crippling presupposition raises and the manner in which Kantor's field theory would have prevented the posing of such problems and is capable of resolving them now that they have been raised erroneously.

Biology is basic to psychology. This doctrine occupies a broad area of contemporary thought ranging from claims that physiological changes in the brain are responsible for changes in behavior to recent arguments centering around biological "constraints" or "boundaries" of "learning" (Hinde and Stevenson-Hinde, 1973; Seligman and Hager, 1972). Discussion of the relationship between biology and psychology shall be limited to this most recent development since Kantor (1947) has exhaustively discussed brain dogma; the argument is cast in terms of abstract laws of learning versus genetic limitations even though alternate methods of exposition are available.

The current conflict between proponents of general laws of learning which are to be sufficiently abstract to apply to all organic species (Skinner, 1938), and advocates of the position that genetic limitations or constraints are placed upon behavioral events by species membership (Hinde and Stevenson-Hinde, 1973; Seligman and Hager, 1972) represents the culmination of an evolution of approaches to the data of psychology which began at least 2500 years ago in ancient Greece. On the one hand are the Platonic abstractionists who seek abstract models of a mathematical sort, and on the other, the Aristotelian thinkers who are impressed with the diversity of organic forms and emphasize the unique aspects of the different types of events studied by psychologists. It is obvious that scientific workers have quite properly sought abstract models of extremely wide applicability, and that such a search has frequently met with remarkable success. Equally obviously, the continuum of events contains phenomena of extraordinary heterogeneity, and that portion of the continuum which falls within the purview of psychologists is no different. Application of Kantor's views concerning the continuum of events indicates that the "conflict" may be more apparent than actual.

Biological events involve the derivation of individual species (phylogenetic evolution) as the important defining characteristics. Psychological events involve the development of individual behaviors (ontogenetic evolution). Consideration of these two classes of events as overlapping areas on the event continuum indicates the appropriate resolution of the apparent impasse. Psychological events are continuous with biological events; reactions which are directly rooted in phylogenetic development (e.g., reflexive withdrawal from tissue injury) come under the control of stimuli other than actual tissue injury. Kantor (1959) has formulated the change from essentially ecological events to essentially psychological events in terms of the importance of the reactional history of the individual organism. That is, if the species evolution is primarily involved then the event is within the biolo-

gical portion of the event continuum, while events in which the history of the individual looms large are within the psychological portion of that continuum.

The principle of a continuum, however, implies overlapping regions, places in which it is difficult to establish on which side of an arbitrary boundary a specific event falls. Such is the situation encountered by both proponents of general laws of learning and of genetic constraints upon learning. In actuality, there are fundamental scientific advantages to conceptualization of a class of events in which learning is heavily constrained by phylogenetic evolution, which events shade gradually into a class of events in which learning is not so constrained but instead is essentially a function of the behavioral history of the individual organism concerned.

Many years ago Kantor (1924) proposed such a scheme and has continually elaborated it (e.g., 1953, 1959, etc.). Stimulated by these same events Skinner (1938) proposed a distinction between respondent and operant conditioning. It appears to be fruitful to consider that the term "respondent conditioning" refers to a class of behavioral events in which phylogenetic history is of major importance, while "operant conditioning" refers to a different but overlapping class of events in which ontogenetic evolution has become the major factor. Additional examples of classes of events which lie either closer to or further away from the biological area of the event continuum could be multiplied indefinitely.

Skinner (1966, 1975) has considered the problem of behavioral evolution within the history of a species. These two papers may be regarded as attempts to indicate the manner in which events which appear to be so discontinuous from other events as to require speculations about some esoteric principle may be related in a continuous fashion to events whose properties are reasonably well understood. It is necessary to review frequently the principle of the continuum of events if one is to avoid gross theoretical errors. Examples of the overlapping nature of areas on the event continuum are not far to seek, and two shall suffice for the purposes of this paper. Hailman (1967) has described a particular interaction of organism and environment which eventuates in the type of behavior conventionally termed "instinctive". The very title of the monograph is instructive: "The Ontogeny of an Instinct". More recently, in a discussion of the plasticity of behavior which is designated as a "fixed action pattern" Abraham and Willows (1971) have cited Kantor's interbehavioral principle as being of utmost importance in work with non-human species.

Hereditary intelligence doctrines. The voluminous literature which has been devoted to this autistic doctrine testifies to innumerable wasted man-hours of labor. In one of his earliest papers Kantor (1920) took the position that all psychological tests consisted of samples of stimuli which allowed only an evaluation of the reactional histories of the individuals tested, i.e., were performance tests. He denied that tests measured an innate ability, but stated instead that tests were a means of determining the specific reactions

to specific stimuli which an individual had acquired during its life history. The consequence of this conceptualization was a prediction that it would be possible to develop specific tests which would evaluate an individual's preparation (or lack of it) for specific types of training. At the present time many psychologists have come to share this viewpoint. However, there are numerous psychologists who persist in regarding intelligence as an inheritable mental entity, and this pernicious doctrine is then used to justify undesirable social practices (Kamin, 1974). Recently Schoenfeld (1974) has vigorously protested the continued existence of hereditarian racial intelligence doctrines.

Man is unique among organisms in possessing thought and language. Attempts to isolate mankind from other organic forms on the basis of unique psychical endowment are ubiquitous in the history of science. To be sure, in recent times it has been proposed that non-human organisms possess mentality, but discussion here is limited to evaluation of similarities of the interbehavioral fields in which organisms may be observed. Emphasis shall be placed upon behavioral continuities despite organic diversity. The claim for man's possession of this unique psychic endowment is most usually justified on the basis of man's performance of thinking and language behaviors.

In an extremely general sense language is behavior which occurs in a bi-stimulational field, i.e., a speaker refers a listener to some stimulus (Kantor, 1936). In a series of papers by Ratner and coworkers the implications of this approach have been explored. After exposition of the speaking action (Ratner, 1957), the effect of the listener upon the speaking interaction was evaluated (Ratner and Rice, 1963), and lastly the variable of hearing oneself speak was investigated (Ratner, Grawronski, and Rice, 1964). These reports, and many others, illustrate the complex field involved in human speaking interactions.

The essential continuity between the behavioral fields of human and non-human organisms is presently being investigated by several workers whose reports may be interpreted as indications that close biological relatives of man (chimpanzees) are able to function in bi-stimulational fields (Fouts, 1973; Gardner, 1969; Premack, 1971). Ingenuity in arranging conditions have enabled these investigators to specify some of the factors essential for bi-stimulational adjustments between chimpanzee and human, and between chimpanzee and chimpanzee.

That man and non-man are labels which refer to overlapping regions on the continuum of interbehaviors is of great consequence as it obviates the necessity of postulating a unique psychic essence which is man's alone, and hence justifies the attempt to describe man's behavior within the confines of a natural science of psychology.

One stronghold of psychophysical dualism which metaphysical psychologists have held with great determination is the alleged privacy of thought and its uniqueness to mankind. By blending Kantorian theory and Skinnerian methodology Homme (1965) has been able to breach the ramparts

of privacy of thought. A novel procedure which enables patients to structure their own psychological fields in order to become happier and more productive individuals has eventuated (Zimmerman, 1975) from Homme's proposal that behaviorists take seriously Kantor's (1924, 1926) view that thinking is behavior. However, anyone interested in a sophisticated theoretical exposition of the manner in which Kantor's theoretical position allows behavioral psychologists to treat thinking behavior in a completely naturalistic manner should consult Lichtenstein (1971).

Concluding Remarks

What is the role of Kantor's formulation of field theory in contemporary psychology? On the surface it is a deceptively simple question, but investigation reveals that answering it is a formidable task indeed. The positive program he has developed has long been in the technical literature of psychology, his students and admirers are numerous, however, there is a deplorable lack of citations to his works in that literature. The most reasonable interpretation of this state of affairs is that already referred to tendency of the majority of psychologists to ignore the theoretical aspect of psychological science and to exult exuberantly the amassing of data. Hopefully this essay shall in some measure redress that balance by indicating the manner in which contacts with complex behavioral events have inexorably led to the accumulation of a body of data which indicates the essential correctness of Kantor's theoretical formulations. In one sense, this is the ultimate vindication of his program; the program has been derived from the scientific analysis of events, and the events themselves have slowly but steadily come to control the behavior of psychologists as over against the traditional metaphysical practices of psychology which Kantor has so carefully exposed to public view.

Interbehavioral psychology is an approach to behavioral data which has important implications for events close to the biological boundary of the event continuum (Lazar, 1974) as well as for events which are at a much greater distance from that boundary (Herrick, 1974). A special organ of communication has been established recently (*Interbehavioral Quarterly*) to promote the interbehavioral viewpoint. Evaluation of the interbehavioral program is entering the psychological literature (e.g., Smith, 1973). It is predicted that the investigation of psychological events will lead inevitably to acceptance of the interbehavioral field concept.

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