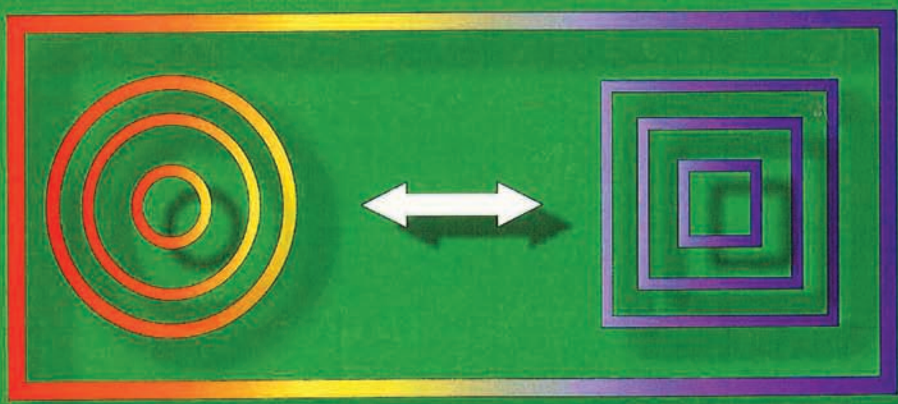
Modern Perspectives on J.R. Kantor and Interbehaviorism



Edited by
Bryan D. Midgley
Edward K. Morris

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Context Press
Reno, NV

Publisher's Note

Distributed in Canada by Raincoast Books

Context Press is an imprint of New Harbinger Publications, Inc.
5674 Shattuck AvenueOakland, CA 94609
www.newharbinger.com

The Library of Congress has cataloged the print edition as:

Modern perspectives on J.R. Kantor and interbehaviorism / edited by Bryan D. Midgley, Edward K. Morris.
p. cm.
Summary: "J. R. Kantor did not achieve the prominence of his contemporaries, however, he established the most naturalistic and conceptually systematic psychology since Aristotle. Today, his interbehavioral psychology is consistent with converging movements in the naturalization of the behavioral, developmental, social, and cognitive sciences. Kantor, his interbehavioral psychology, and these movements are the focus of this text"—Provided by publisher.
Includes bibliographical references.
ISBN-13: 978-1-878978-56-1 (pbk.)
1. Interbehavioral psychology. 2. Kantor, J. R. (Jacob Robert), 1888- I. Midgley, Bryan D., 1964- II. Morris, Edward K.
BF200.M63 2006
150.19'434092—dc22

2006007152

Dedication

To the memory of Paul T. Mountjoy,
Theodore R. Sarbin, and William S. Verplanck

Table of Contents

Introduction, Overview, Origins, and History............ix

Part I: Interbehavioral Foundations

Chapter 1 15
A Biographical Sketch of Jacob Robert Kantor
Paul T. Mountjoy, *Western Michigan University*
Donna M. Cone, *New England Gerontology Academy*

Chapter 2 39
The Evolution of Scientific Psychology
Debra W. Fredericks, *University of Nevada, Reno*

Chapter 3 63
The Nature and Value of Scientific System Building: The Case of Interbehaviorism
Michael C. Clayton, *Youngstown State University*
Linda J. Hayes, *University of Nevada, Reno*
Mark A. Swain, *State of Nevada Mental Health and Developmental Services*

Chapter 4 87
The Interbehavioral Field
Noel W. Smith, *State University of New York, Plattsburgh*

Chapter 5 111
Interbehavioral Research
Noel W. Smith, *State University of New York, Plattsburgh*

Part II: Converging Movements

Chapter 6 141
Converging Movements in Psychology
Dennis J. Delprato, *Eastern Michigan University*

Commentary on Delprato............165
Donald W. Zimmerman, *Carleton University*

Commentary on Delprato..........169
Robert W. Lundin, *University of the South*

Chapter 7 173
Developmental Systems and Psychological Science
Robert Lickliter, *Florida International University*

Commentary on Lickliter..........195
Sidney W. Bijou, *University of Nevada, Reno*

Commentary on Lickliter..........197
Dennis J. Delprato, *Eastern Michigan University*

Chapter 8 205
Cognitivism and the Schema of "Perception-and-Cognition"
Alan Costall, *University of Portsmouth*

Commentary on Costall 219
Vicki L. Lee

Chapter 9 225
The Narrative Turn in Social Psychology
Theodore R. Sarbin, *University of California, Santa Cruz*
Ralph M. Carney, *Defense Personnel Security Research Center*

Commentary on Sarbin and Carney..........239
Rue L. Cromwell, *University of Kansas*

Commentary on Sarbin and Carney..........245
Edward K. Morris, *University of Kansas*

Chapter 10 251
Q Methodology and Naturalistic Subjectivity
Steven R. Brown, *Kent State University*

Commentary on Brown 269
Parker E. Lichtenstein, *Denison University*

Commentary on Brown 271
Bryan D. Midgley, *McPherson College*

Chapter 11 277
Behavior Analysis
Edward K. Morris, *University of Kansas*

Commentary on Morris 295
Emilio Ribes-Inesta, *University of Guadalajara*

Commentary on Morris 300
James Fox, *East Tennessee State University*
William Brown, *University of South Carolina, Columbia*
Maureen A. Conroy, *University of Florida, Gainesville*

Appendix: Bibliography of J. R. Kantor's Published Work..........305
Noel W. Smith, *State University of New York, Plattsburgh*

About the Contributors 325

Introduction, Overview, Origins, and History

The founders of classical and contemporary behaviorism, John B. Watson (1878-1958) and B. F. Skinner (1904-1990), respectively, are renowned throughout psychology and the American culture at large (Bjork, 1993; Buckley, 1989; see Leahey, 2004; O'Donohue & Kitchener, 1999; Smith & Woodward, 1996). Each made seminal contributions to the science of behavior, established distinctive behavioral systems, extended their programs to human behavior, and spoke to issues of individual, social, and cultural importance. In his own way, J. R. Kantor (1888-1984) made similar contributions, but unlike Watson and Skinner, he did not achieve their prominence.

In a science that emphasized empirical research over theoretical clarity, Kantor did not gain renown as a grand theorist. In a discipline that exalted method over metatheoretical foundations, he did not gain renown as a critic of its philosophy (Parrott, 1984). And, in a culture that embraced common-sense appeal, practical action, and controversy over scholarship, he did not gain renown as a public intellectual. As a theorist, critic, and intellectual, he was mainly a systematist. His goal was to provide the foundations of a natural science of psychology that would integrate theory, research, and application—those that were extant and yet to evolve—within a common framework (Kantor, 1959, p. 244; see Delprato, 1995, p. 609).

The time is well past for Kantor and his interbehavioral psychology to receive the recognition they deserve, not just to set the historical record straight about the nature and extent of his contributions, but also to describe their implications for the future of psychology. He established the most naturalistic and conceptually systematic behaviorism and psychology known since Aristotle (Hayes & Fredericks, 1999; Moore, 1984; Parrott, 1984). Today, his interbehavioral psychology is consistent with converging movements in the naturalization of the behavioral, developmental, social, and cognitive sciences (see Delprato, "Converging Movements in Psychology," this volume). In the 21st century, interbehaviorism will be seen as prescient of the field-theoretic, naturalistic psychology of the future (see Morris, 2003). Kantor, his interbehavioral psychology, and these movements are the focus of this text, *Modern Perspectives on J. R. Kantor and Interbehaviorism*.

Introduction

Kantor's career extended across most of the 20th century. His first substantive papers were published in 1918; his last publication appeared posthumously in 1987. He called his system *interbehavioral psychology* or *interbehaviorism*—a system that is field-theoretic, not lineal-mechanistic, self-actional, or mediational; a system that is naturalistic, not dualistic; and a system that is comprehensive, not narrowly focused.

Interbehaviorism has profound implications for both mainstream behaviorism and psychology. Behaviorism, for instance, often took behavior to be a reaction (R) to the environment (S) in temporally linear sequence (S→R). Psychology, in turn, has generally taken mind or the organism (O) as its subject matter in a self-actional (O→R) or mediational mode (S→O→R). In Kantor's view, both perspectives are false (cf. Kantor, 1976). The first overlooks behavior's fundamentally interactional nature; the second fails, in addition, to recognize that arguments from complexity for mentalism ignore behavioral history and context. Let us elaborate.

"Inter"behavioral Psychology

The "inter" in interbehavioral psychology refers to interactions between individuals and environments, organisms and ecologies, or responses and stimuli, depending on the level of analysis. More specifically, "inter" refers to interactions among four classes of interactants: (a) the organism and its response forms and functions, (b) the environment and its stimulus forms and functions, (c) the media of contact between them, and (d) the setting factors in which they are embedded, all of the interactions contingent on their interbehavioral history. These interactants are defined and operate in relation to one another. They are "mutual."

On this account, the subject matter of psychology–interbehavior–is an irreducible field of interacting factors. It replaces lineal-mechanistic S→R, self-actional O→R, and mediational S→O→R chains with an indivisible R⇔S unit. Furthermore, interbehaviorism replaces the self-actional O and the mediating O with historical and current context. Interbehavioral history, the media of contact, and setting factors, both biological and environmental, explain variability and change in interbehavior that traditionally lead to positing cognitive mediators and mental representations. Interbehaviorism is thus neither mechanistic in its behaviorism nor dualistic in its psychology. It is naturalistic. If a metatheoretical term is needed to describe it, interbehaviorism is a variety of the worldview of contextualism (Pepper, 1942, pp. 232-279; see Hayes, Hayes, Reese, & Sarbin, 1993). Because behaviorism has been, in large part, dominated by lineal-mechanistic S→R chains and psychology has been either a mediational S→O→R version of mechanism (e.g., information processing) or a self-actional O→R system (e.g., dualistic, mentalistic), Kantor's interbehavioral psychology has gone largely unappreciated. As the contributors to this text describe, though, this may change as psychology evolves into a more field-theoretic and naturalistic science.

Inter"behavioral" Psychology

Turning to the "behavioral" in interbehavioral psychology, it denotes a common and comprehensive framework, one that is field-theoretic and naturalistic concerning its subject matter, as described, yet comprehensive in its coverage of psychology. In offering a common framework for all of psychology, interbehaviorism encompasses psychology's many seemingly independent domains, for instance, social, cognitive, emotional, and personality psychology. It encompasses them, not in their current disunity, but as nominal domains or subdisciplines of a common science, both a natural science and a historical science. Where psychology is now poised to evolve into a field-theoretic, naturalistic discipline, then interbehavioral psychology may be at its leading edge, along with a growing number of as-yet unorganized but interrelated movements. To delve further into these matters, however, would encroach on the work of the scientists and scholars who have contributed so much to this text. We will, though, provide a brief overview of the contents of their chapters.

Overview

Interbehavioral Foundations

The text comprises two main sections. The first, *Interbehavioral Foundations*, consists of five chapters that have been prepared by individuals who are interbehaviorists. Their chapters provide descriptions and analyses of Kantor's life, his main contributions, and the empirical implications of his system. In Chapter 1, Paul T. Mountjoy and Donna M. Cone offer a Kantor biography, an important contribution on many grounds, not the least of which is that so little is known about his life. In Chapter 2, Debra W. Fredericks describes Kantor's naturalistic history and historiography of psychology, a position not well represented among current histories of the field. In Chapter 3, Michael C. Clayton, Linda J. Hayes, and Mark A. Swain describe Kantor's efforts at system building, work that is not often recognized as important in either behaviorism or psychology. In Chapter 4, Noel W. Smith provides a systematic analysis of Kantor's interbehavioral field, the fundamental conceptual unit of analysis in interbehavioral psychology. Finally, in Chapter 5, Smith departs from Kantor's direct contributions to review the empirical research that has been conducted from an explicitly interbehavioral perspective. It illustrates the diversity of research that interbehavioral psychology has inspired.

Converging Movements

The second section, *Converging Movements*, consists of six chapters, eleven commentaries, and an appendix. The chapters have been prepared by scientists and scholars in domains of the behavioral, developmental, social, and cognitive sciences that have an affinity toward interbehavioral psychology. Their chapters, however, move beyond Kantor and interbehavioral psychology to describe movements in the life sciences that are converging on an interbehavioral perspective. In Chapter 6, Dennis J. Delprato explains these converging movements in general, reviews some of them in particular, and describes their shared assumptions. In Chapter 7, Robert Lickliter discusses developmental systems as an alternative to the nature-nurture dichotomy and contemporary evolutionary psychology. In Chapter 8, Alan Costall presents ecological alternatives, such as J. J. Gibson's, to the representational approaches to perception and cognition. In Chapter 9, Theodore R. Sarbin and Ralph M. Carney explore the narrative turn in social psychology as an alternative to mechanism and positivism. In Chapter 10, Steven R. Brown discusses Q methodology as an alternative to dualistic conceptualizations of subjectivity. And in

Chapter 11, Edward K. Morris describes the contextualism inherent in behavior analysis, as it contrasts with the field's presumed mechanism and reductionism.

The converging movements described by Delprato do not correspond one-to-one with the other chapters in this section of the book. For instance, no chapters address some of the movements he covers, in particular, radical phenomenology, behavioral cybernetics/feedback control systems, action psychoanalysis, and dialectical psychology. Moreover, some of the chapters address movements he does not review, although he does identify Q methodology as one among "other signs of progress in contemporary psychology." Q methodology is, in addition, consistent with the radical phenomenology he does review. What is and is not included as a converging movement remains open for discussion as psychology continues to evolve.

Finally, a number of scientists and scholars knowledgeable in interbehavioral psychology–some of them among its pioneers–prepared commentaries on the chapters describing the converging movements. They help clarify the interbehavioral characteristics of these movements and close the loop from interbehaviorism to the converging movements, then back to interbehaviorism. The commentaries have been prepared by Donald W. Zimmerman and by Robert W. Lundin on Delprato's chapter, by Sidney W. Bijou and by Delprato on Lickliter's chapter, by Vicki L. Lee on Costall's chapter, by Rue L. Cromwell and by Morris on Sarbin and Carney's chapter, by Parker E. Lichtenstein and by Bryan D. Midgley on Brown's chapter, and by Emilio Ribes-Inesta and by James Fox, William Brown, and Maureen A. Conroy on Morris's chapter. Finally, the appendix, by Smith, offers a bibliography of Kantor's publications–his articles, books, chapters, commentaries, and book reviews.

The Text's Origins and History

We conclude with a few personal comments on the origins and history of this text. For Morris, it is the culmination of a project he began with James T. Todd to bring modern perspectives to bear on the three primary behavioral programs of the 20th century–Watson's, Skinner's, and now Kantor's (see Todd & Morris, 1994, 1995). Various professional exigencies, though, kept this final volume from being published in a more timely fashion, all due to the editors, not the authors.

For Midgley, the book's origin extends back to his undergraduate psychology major at Eastern Michigan University and, especially, to a course on the history and systems of psychology taught by Delprato in which Kantor's (1963, 1969) *The Scientific Evolution of Psychology* was the main text. Delprato pointed out that the validity of Kantor's historical analysis was supported, in part, by the existence of some non-mainstream approaches in psychology consistent with Kantor's system. To psychologists willing to look for it, the evidence suggested that psychology was moving toward a more field-theoretic, naturalistic orientation, akin to Kantor's interbehavioral psychology. These interests were then nurtured and shaped in graduate school at the University of Kansas under the mentorship of Morris.

For Morris, the book's origin also extends back to his undergraduate psychology major, this at Denison University, where Kantor's own students were among his mentors–Irvin S. Wolf and Lichtenstein–along with Gorden McA. (Mac) Kimbrell. Their courses on advanced general psychology, the history of psychology, and physiological and comparative psychology, in which Kantor's texts and articles were assigned, established a repertoire that developed further in graduate school under the mentorship of Bijou and then later in professional relationships with Roger D. Ray, Mountjoy, and William S. Verplanck.

We thank the contributors to this book for their scholarship, their patience, and their support. Our hope is that their work will inspire others to delve into Kantor's interbehavioral psychology and to see still further relations among it and other field-theoretic, naturalistic approaches in the behavioral, developmental, social, and cognitive sciences. In the end, of course, the book is neither the first nor the last word on Kantor and interbehavioral psychology. It supplements other excellent treatments of this material (e.g., Mahan, 1968; Pronko, 1980; Pronko & Bowles, 1951; Ruben & Delprato, 1987; Smith, 1993, 2001; Smith, Mountjoy, & Ruben, 1983) and presages future work. Finally, we thank Emily Neilan at Context Press for her assistance and expertise in bringing the book to production.

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Chapter 1

A Biographical Sketch of Jacob Robert Kantor

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Jacob Robert Kantor (1888-1984) was a leader in certain aspects of 20th century scientific and philosophical revolutions, especially in what is commonly called the "behavioral revolution" (Weiss, 1925, 1929, p. viii), although to be more specific, his activities should be identified as the "interbehavioral revolution" (Smith, Mountjoy, & Ruben, 1983). Yet, he remains less well known than some of his peers (see Todd & Morris, 1994, 1995). One reason Kantor has been less visible than, for example, John B. Watson (1878-1958) (Watson, 1919) and B. F. Skinner (1904-1990) (Skinner, 1938) is because the latter pioneered research methods and equipment, and pursued formal laboratory studies, while Kantor concentrated on theoretical and philosophical aspects of psychology. Not fitting the conventional stereotype of the scientist as a laboratory researcher, Kantor has been less widely acknowledged for his role in reconstructing psychology from a dualistic (i.e., mind-body) enterprise into a natural science (Verplanck, 1983).

Kantor applied incisive thinking to his broad knowledge of science, history, and philosophy to conclude that psychology could not legitimately be the study of "soul" or, as it later came to be known, "mind," because "soul" is a concept not derived from direct investigation of things and events–which are the subject matter of science. He then developed a system of psychology predicated on the actual investigation of things and events, which the majority of his publications then elaborated. Also, in his philosophical and logical studies, he investigated concepts, which are the subject matter of the logic and history of science.

Kantor insisted that psychology study only observable, or potentially observable, contacts between biological organisms and stimulus objects, all localizable within a space-time frame of reference. Perhaps the most compelling evidence of Kantor's relevance and importance is the continuing influence of the mentalistic doctrines he eschewed and their repeated failure to produce a viable science even now in the 21st century. On that basis, we suggest that Kantor's contributions are not yet fully realized and that current psychology still has a long journey before it becomes an authentic natural science.

Born on August 8, 1888, Kantor began his career as a psychologist just as World War I was ending. He received his Ph.D., *magna cum laude*, from the University of Chicago (Kantor, 1917), founded *The Psychological Record* in 1937 (Bartlett, 1997; Mountjoy & Cone, 1997)[1], taught at Indiana University for 39 years, continued his productive scholarly life upon his formal retirement, and remained an active scholar until a few days before his death on February 2, 1984 (Mountjoy & Hansor, 1986; Ribes, 1984; Wolf, 1984). His output was prodigious, comprising 20 books and over 120 papers, as well as numerous presentations at professional meetings. In addition, his many book reviews encompass the breadth of human thought concerning science and philosophy (see Smith, 1993; the Appendix, this volume). During his 96 years, Kantor participated in enormous cultural changes that shaped psychology and the other sciences, as well as his own career. In one of his most important works, he taught us that this ongoing cultural evolution had begun over 2,500 years ago (Kantor, 1963, 1969; see Fredericks, this volume).

In this chapter, we discuss Kantor as a person, a psychologist, a teacher, and a philosopher of science. His long, prolific life and career are presented within the context of a vigorous, expanding American nation–a technologically daring environment that fostered the new science of psychology, even as it preserved aspects of the older mystical traditions that Kantor attacked. Kantor is revealed as a visionary worthy of study not only by psychologists, but also by other scientists and the educated public at large.

The Cultural Context

The cultural context we examine is the late 19th century and the early 20th century, which set the stage for Kantor's prodigious career. We touch on specific scientific developments, as well as on general changes in Western European culture, of which we, as scientists, are all members.

The Nineteenth Century

Many foundations of modern science were in place before 1900. The physical and chemical sciences were highly developed, radioactivity had been discovered, and the rapid development of atomic models was markedly changing both of those sciences (Einstein & Infeld, 1938/1942). In biology, the Darwinian revolution had begun (Darwin, 1859/1964) and was spreading apace (see Kantor, 1935, 1969; Smith, 1973).

Wundt (1832-1920) had established a psychological teaching laboratory in Leipzig in 1879, and this practice had spread to the United States (US) so rapidly that Kantor could begin his scholarly career at a psychological research and teaching laboratory that had been founded in the year of his birth. Also, James (1842-1910) (James, 1890) had published his influential *Principles of Psychology*, in which he treated consciousness as a sequence of mental events rather than as a psychic entity, although this did not solve the myriad problems raised by a non-spatial cause of behavior.

Changes in science were part of a more general attack on the established social order, as exemplified by the American and French revolutions. Indeed, the very establishment of a modern science of psychology threatened centuries-old religious doctrines separating humans from other animals because humans, created in God's image, were said to possess souls, which were not amenable to scientific study.

The Twentieth Century

In the early years of the 20th century, Albert Einstein's (1879-1955) relativity theory dominated science. When Kantor's personal papers were accessed by the Psychology Archives at the University of Akron, Ohio, the Archives found yellowed copies of the *New York Times* text of the acceptance speech Einstein gave when he received the 1921 Nobel Prize in Physics.

A hallmark of the 20th century revolution in science is its re-evaluation of units within scientific work. Prominent among these re-evaluations was Einstein's rejection of the absolute distinction between space and time, and the alternative proposal of a space-time entity. Similarly, the behavioral and interbehavioral revolutions rejected any absolute distinction between organism and environment, and established the stimulus-response unit (see, e.g., Dewey, 1896; Skinner, 1935). In fact, Skinner (1938) noted that "the impossibility of defining a functional stimulus without reference to a functional response, and *vice versa*, has been especially emphasized by Kantor… [1933]" (p. 35).

Only within the 20th century, however, had the socio-politico-religious concepts such as "mind" begun to be discarded from scientific psychology, especially in the US. Indeed, given the general iconoclasm of the US, it is no accident that the behavioral revolution began here. The country had been founded in large part as a reaction against the European tradition of the rigid hereditary determination of social, political, and economic status (Wood, 1992). It is not at all remarkable, then, that this culture, which had self-consciously rejected so many traditional conventions, would also give birth to non-dualistic psychologies. Kantor, a first generation American, looms large in efforts to redirect psychology to its naturalistic origins.

The Person

Family Background

Julius Kantor, father of Jacob Robert, was born in Germany in 1863. He pursued religious studies at a Yeshiva in Vilna, the medieval capital of Lithuania, which had been annexed by Russia in 1795. There he met his future bride, Mary, who had been born in 1866 in Lithuania. Following their marriage in 1879, a daughter was born and Julius immigrated to Harrisburg, Pennsylvania. Mary followed, and Jacob Robert, the eldest son, was born in Harrisburg, where the family rapidly increased to three daughters and four sons. While serving as Rabbi of Congregation Chisuk Emuna Bene Russia, the Orthodox synagogue in Harrisburg, Julius died of appendicitis on August 2, 1899, and is buried there (Bazelon & Friedman, n.d.). Mary died in 1944 and is buried in Baltimore, Maryland. A remarkable woman, Mary reared, nurtured, and educated all seven children despite enormous financial handicaps. Of Kantor's three brothers, one completed a degree in law and two received medical degrees. One sister was a talented poet.

The Early Years

The death of Kantor's father forced the 11-year-old boy to leave school and go to work. About 1900, Mary and the children moved to Chicago, Illinois, a burgeoning commercial, artistic, and intellectual center, which nurtured Kantor in ways that would have been unlikely in Harrisburg (see Anonymous, 1929-1932, p. 218). Chicago had hosted the 1893 Columbian Exposition; the population nearly doubled to over two million between 1900 and 1910 (U.S. Census, 1900, 1910).

One achievement, in particular, symbolizes the intellectual and civic ferment that surrounded Kantor during his early adulthood. Between 1892 and 1900, Chicago had completed one of the greatest engineering marvels of all time: reversing the Chicago River. Instead of draining into Lake Michigan and thence to the Atlantic Ocean via the St. Lawrence River, it now flowed from Lake Michigan to the Mississippi River drainage, and ultimately to the Gulf of Mexico.

Most important to Kantor himself were the University of Chicago (Goodspeed, 1916) and, 40 miles to the southeast, Valparaiso College. In 1910, only 10% of 20-year-old males graduated from high school (U.S. Census, 1910), and Kantor was not among them. He never obtained a high school diploma; however, he did remedial work at Valparaiso that enabled him to enter the University of Chicago as an undergraduate in the summer of 1911. Initially interested in chemistry, Kantor studied the sciences, among other subjects, at both Valparaiso and Chicago.

At Chicago, J. H. Tufts (1862-1942) was the Head of the Department of Philosophy (University of Chicago, 1915-1916) and J. R. Angell (1869-1949) was the Head of the Department of Psychology. Angell had held the position since psychology had become an independent department in 1905 (Bradburn, 1974). He had also been president of the American Psychological Association (APA) in 1906, and is credited with developing "The Chicago School of Functional Psychology" (James, 1904). At this time, the catalog statements-of-purpose for both the Departments of Philosophy and Psychology indicated that students in each were expected to take a concentration of courses in the other (University of Chicago, 1915-1916). Indeed, some faculty taught in both departments.

On March 17, 1914, Kantor received a Bachelor of Philosophy (Ph.B.) degree with honors in philosophy and in psychology. On March 30, 1914, he transferred into the Graduate School. Thus, late in his twenty-fifth year, Kantor had his bachelor's degree and was embarked upon graduate training, despite the interruption in and incompleteness of his educational process–this in only ten quarters at Chicago.

Kantor's graduate program was concentrated in philosophy (the department in which Kantor also became a Fellow, 1915-1916), taking 13 courses in all, including two in philosophy of science and two in research in philosophy. Kantor also took three history courses and was a "visitor" in calculus and qualitative chemical analysis. His Ph.D., *magna cum laude*, was conferred on August 31, 1917, by the Department of Philosophy, with Psychology as the secondary department. Kantor was recommended for candidacy by Tufts.

For the years 1915 to 1917, Kantor was an instructor in the University of Minnesota's Department of Psychology. From 1917 to 1920, he taught psychology full-time at the University of Chicago. Most of his teaching load was in introductory psychology, but he also taught abnormal and experimental psychology twice each. He was elected to the Society of The Sigma Xi on February 25, 1919.

Confronting the Establishment

In his 1920 paper, "Intelligence and Mental Tests," Kantor indicated in a footnote, "The thesis here presented constitutes the substance of a paper read before the Psychological Seminar in the University of Minnesota, 1916-17" (p. 260). Unfortunately, no trace of the oral presentation or of early publication drafts is to be found among Kantor's surviving personal papers, so the publication itself must serve as our datum.

This work is noteworthy because it appears to be the first public expression of Kantor's views. It is a remarkable challenge to the prevailing culturo-quasi-scientific interpretations of psychology's best known achievement of the time–intelligence testing. Kantor here launched the iconoclasm that would become his hallmark, arguing that intelligence was a matter of acquiring adequate reactions and "that it was through the definite study of actual environmental opportunity for development that the metaphysical belief in the preeminence of the civilized mind was dethroned" (p. 264). He also dismissed the claim for intellectual inferiority in women as compared to men. We can only imagine the stunned silence that must have greeted these statements. Kantor continued his attack by asserting that the entire history of the testing movement demonstrated "that the inferiority of intelligence in women and in so-called primitive people was not a fact observed, but a religio-politico-economic pronouncement concerning the relative values of souls" (p. 264). In one short speech, Kantor discredited Social Darwinism–an influential theory among scientists and policy makers, a theory that was used to justify bigotry and support immigration quotas, and, by 1927, a theory that would permit legal sterilization of the "unfit." Apparently, psychology has yet to accept Kantor's radical position (e.g., Herrnstein & Murray, 1994).

With this early paper, we see two practices that would characterize Kantor's entire life and work: (a) rigorous evaluation of, and reliance on, empirical observation and (b) careful separation of cultural assumptions from the conclusions derived from scientific investigations.

This seminal paper was not published until three years after its presentation at Minnesota (Kantor, 1920), an interval during which Kantor had four other publications (Kantor, 1918a, 1918b, 1919a, 1919b). This delay suggests that extensive revisions were needed before his controversial views were accepted by journal editors. The presentation itself appears to predate his dissertation (Kantor, 1917; Mountjoy & Cone, 1995), as well as his first publications in professional journals (Kantor, 1918a, 1918b). He had begun publishing book reviews in 1915, but no original articles until after the doctorate was conferred (see Appendix, this volume).

Parenthood

On September 2, 1916, Kantor married Helen Rich (1894-1956) of Minneapolis. She had received a B.A. in German from the University of Minnesota on June 8, 1916, where Kantor had been a psychology instructor from 1915 to 1917.

On July 19, 1919, the young Kantors became parents of Helene Juliette–known as "Bobby" within the family–their only child, to whom they were devoted (d. January 13, 1993). Helen educated Helene at home until Helene entered college at age 15. Upon receipt of her Ph.D. in Archaeology from the University of Chicago in 1945, Helene joined the University's Oriental Institute faculty and eventually became Professor of Archaeology at the Oriental Institute and Department of Near Eastern Languages and Civilizations. Helene became known internationally as an expert on Persia/Iran, relating, with a twinkle in her eye, that she had once been introduced in Iran as "the Dean of American archaeologists" (personal communication with D. M. Cone, Fall, 1973).

Helene had been diagnosed early in life with *amortus congenital myopathy*, an obsolete term for a type of muscular dystrophy. This rare disease would progressively destroy her muscle tissue. The Kantors subscribed to the popular view that rural living was beneficial for people with chronic health problems such as Bobby's. This consideration, coupled with Kantor's long-standing desire to own a farm, contributed to his accepting an assistant professorship in psychology at Indiana University in Bloomington in 1920. At the time, Kantor was also developing his first major book, the *Principles of Psychology* (Kantor, 1924, 1926; Hearst & Capshew, 1988).

An Independent Career

Indiana University. Bloomington, county seat of Monroe County, 50 miles southwest of Indianapolis, had a population of 11,595 in 1920 (U.S. Census, 1920). Separation of town and gown was exacerbated by the Ku Klux Klan's influential and widespread political activity. The Klan held rallies outside Bloomington and automobile cavalcades around the courthouse square (Davis, 1962). Indeed, the Klan was emerging as the dominant faction in state politics when a sex scandal destroyed its power (Clark, 1970).

The Indiana University Psychology Laboratory, organized in 1888 by William Lowe Bryan (1860-1955), was the first such laboratory in the Midwest, and the second in the US (Capshew & Hearst, 1980; Hearst & Capshew, 1988). Bryan built upon a long tradition of strength in natural science teaching and research at Indiana (Clark, 1970, 1973, 1977) and was himself a psychologist of international repute (Kantor, 1956). He was a skilled experimenter and published one of the first learning curves in the psychological literature (Bryan & Harter, 1897; see Hearst & Capshew, 1988; Keller, 1958). He also introduced the notion of a hierarchy of habits (Bryan & Harter, 1899), a construct derived from objective recording of behaviors, a technique which had become more common in the psychological literature as the 19th century ended. A charter member of the APA, Bryan was elected its president in 1903, after he had moved in 1902 from the department chair of psychology to university president. Kantor held Bryan in high regard (Kantor, 1956).

The status and vigor of the Indiana Psychology Department were clear: Department Chair William F. Book (1873-1940) boasted in 1921 that "more articles and pages were published from the Indiana University laboratory than [from] any other university in the country" (Hearst & Capshew, 1988, p. 39). The Indiana psychology faculty included several members whose accomplishments in laboratory research complemented Kantor's continuing attempts to develop a natural science of behavior.

Among Kantor's distinguished colleagues were Sidney W. Pressy (1888-1980), who devised the first teaching-testing machine; Winthrop N. Kellogg (1898-1972), best known for rearing an infant chimpanzee with his own infant son (Kellogg & Kellogg, 1933), and who developed the technique of chronic spinal preparations of the dog (e.g., Kellogg, Deese, Pronko, & Feinberg, 1947); and Roland C. Davis (1902-1961), a well-respected psychophysiologist, who was an innovator of cathode ray oscilloscope recording of muscle action-potentials (Estes, 1961). Kantor was promoted to Associate Professor in 1921, and to Professor in 1923. He was to remain at Indiana for 39 years, until his retirement in 1959.

Travels abroad. Following publication of the *Principles of Psychology* (1924, 1926), Kantor became eligible for a sabbatical leave. He took the first of many trips abroad, which exposed him to a spectrum of intellectually stimulating experiences and set a pattern for travel that would occupy approximately three of his 39 years at Indiana, as well as several of his retirement years.

Kantor, Helen, and Helene visited many of the major cities of Europe, the Near East, and Egypt. This nine-month tour provided Kantor a needed period of rest and reflection. He returned refreshed and resumed the preparation and publication of works that continued to enhance his development and reputation as a theoretical scientist. His amazing productivity during the early years of his career included 23 book reviews between 1915 and 1917, another 17 in the next ten years, 35 substantive papers, the dissertation (1917), and the *Principles of Psychology* (1924, 1926). From 1928 to 1930, he entered a period of lesser output, with only ten publications. These, however, included two papers in French (1929a, 1929c), as well as his first book devoted to social psychology (Kantor, 1929b). Later, he was to publish two papers in English in a Polish journal (1937, 1939) and two more in German (1955; see Appendix, this volume).

In 1936, the Kantors traveled again to Europe for a short spring-summer trip. They avoided Hitler's Germany and, by a circuitous route, visited Aleksandr R. Luria (1902-1977) in Moscow. Kantor respected Luria greatly as a psychologist and admired his courage in even meeting Americans, let alone entertaining them in his apartment, in view of Russia's climate of terror under Stalin. Luria's work on the restoration of function after traumatic brain injuries especially interested Kantor (see

Zusne, 1984, 1987). Because Kantor read Russian, he did not have to wait for the English translation to appear after World War II (Luria, 1948). From Moscow, the Kantors visited Finland and Sweden, and left for the US from England (Helene Kantor, personal communication, December 8, 1990).

World War II prevented further travels abroad until 1947, when Helene joined her parents in Paris. She recalled that this was "an austere trip." In 1956, Kantor and Helen again visited Europe. Shortly thereafter, in the fall of 1956, Helen died in Bloomington.

Helen Rich Kantor as collaborator. Helen Rich Kantor, who had earned a master's degree in philosophy from the University of Chicago following her marriage, was an active collaborator in Kantor's work. Helene spoke eloquently about her mother's intellectual ability, stating that Helen could have earned a Ph.D., but instead became a full-time parent and a part-time collaborator with her husband, often working with Kantor until late in the evenings. Kantor (1958, 1959) revealed his reliance on her devoted assistance in this dedication for *Interbehavioral Psychology*:

TO
THE MEMORY OF
H.R.K.
COMRADE-COLLABORATOR
THIS BOOK IS DEDICATED

The Retirement Years

Kantor retired from Indiana University in 1959. In January 1962, he moved from Bloomington to South Kimbark Avenue in Chicago, just off the University of Chicago campus. He would share this house with Helene until his death in 1984.

In 1960, Helene and her father took a long trip abroad, which included two months in Athens. We conjecture that Kantor was immersing himself in ancient Greek culture in preparation for the lengthy treatment of the Hellenic era in *The Scientific Evolution of Psychology* (1963, 1969). Kantor and Helene also drove through the Greek countryside, visiting Corinth, the Eastern Peloponesis, Sparta, Megalopolis, Olympia, Delphi, and then west to examine the Mycenean sites. During this trip, Helene detected her father's developing deafness. Upon their return to the US, Kantor went to the Central Institute for the Deaf in St. Louis, where he was diagnosed with Meniere's disease. This vexing inner ear disorder produces severe vertigo and tinnitus, as well as nerve deafness, and is not medically treatable. In subsequent years, Kantor suffered several falls as a result, fortunately with only minor injuries.

Kantor made his final trip to Europe alone and, according to Helene, after 1981, to see the Paleolithic Art in the famous caves of France and Spain. Over 90 years of age and still cognitively competent, Kantor overcame biological frailties that progressively curtailed his movements long enough to interact directly with evidence of early human artistic and cultural behavior.

The Psychologist

Principles of Psychology

Kantor's first major work, the two-volume *Principles of Psychology* (1924, 1926; hereafter, *Principles*), showcased remarkable analytic powers. This work is a *tour de force* in which Kantor described all available psychological data of the early 20th century with no resort to dualistic concepts, such as the unified soul, atomistic mind, or conceptual nervous system. He analyzed psychological events as a sequence of behavior segments, which consisted of factors within a space-time framework. He argued that each behavior segment could be treated solely in terms of three factors: (a) the current stimulus situation, (b) the life history of the organism, and (c) the details of the reactions currently performed. These factors were spoken of in conjunction, as producing coordinate stimulus functions and response functions (see, e.g., Kantor, 1924, pp. 54-71; Kantor & Smith, 1975, pp. 39-45).

Remarkably, Kantor included all major categories of events then accepted by psychologists, and he did so in a completely naturalistic fashion. Among these were sensing, perceiving, learning, remembering, and abnormal reactions, all of them targeted for highly controlled experimental study by German psychophysicists, as well as American psychologists and behaviorists. Kantor also addressed complex human events, such as ethical, economic, and religious activities. Throughout his career, he persisted in the assertion first put forth in the *Principles* that the most complex human psychological activities can be analyzed objectively, and understood without using reified mentalistic concepts or over-simplifying and over-controlling the event field—as American behaviorists did—so that external validity is lost.

Kantor's *Principles* represents both striking similarities and marked contrasts to the twin volumes of the same title by William James (1890). To the casual reader, both Kantor and James saw psychology as primarily the study of human activities. To the discerning reader, however, Kantor presented a systematic naturalistic treatise, whereas James (1890) presented an anecdotal and mentalistic treatment of human actions.

James, America's leading functionalist in 1890, viewed the brain as the major cause of all behavior, and presented his famous "stream of consciousness" concept, which became influential in literary circles (e.g., Boorstin, 1992; Joyce, 1922/1934). Kantor boldly discarded the brain as a metaphysical cause early in Volume I of the *Principles* (Kantor, 1924, p. 28) and ignored it thereafter. Instead of a Jamesian "stream of consciousness," he proposed what we might identify as a "stream of behavior segments." Thus, he preserved the dynamic nature of psychological events from becoming converted into the "abstract and contentless propositions" against which he had protested in his dissertation (Kantor, 1917, p. 5).

The Dissertation

During his long, productive career, Kantor explored the implications of the naturalistic position first expressed in his dissertation, *The Functional Nature of the*

Philosophical Categories (Kantor, 1917). For example, he argued (a) that philosophical categories were intellectual tools that changed and shifted during the evolution of Western European culture and (b) that science was applied philosophy, thus establishing the fundamental basis for the remainder of his life's work (Mountjoy & Cone, 1995). Also, the construct of the "event continuum" was implied in 1917, although a precise statement of it was not published until 36 years later (Kantor, 1953; see the section on Interbehavioral Philosophy). Furthermore, in his dissertation, the idealistic notion that the mind created external reality, as well as the materialistic notion that the external world created ideas, was shown to be inadequate for philosophical purposes. Kantor was later to formulate his own alternative to such notions with the assumption that things and events exist prior to the interaction of organisms with them, and that organisms are but a specific category of things and events.

At the time, at least three other major versions of the self-same things and events of psychology were extant Wundtian-Titchenerian Structuralism (Titchener, 1929; Wundt, 1912/1916), James' (1890) version of American Functionalism, and Watson's (1919) recently proclaimed Behaviorism. In later years, Kantor confided to intimates that he aimed to destroy all three, notwithstanding that Behaviorism was the least offensive (Fuller, 1973).

Major Influences in the Creation of Interbehavioral Psychology

In our opinion, the major influences that shaped Kantor's contributions include (a) field theory in physics, (b) Darwinian evolution and its extension into ecology, (c) functionalism's construct of the functional relation between organisms and their surroundings, and (d) behaviorism's rejection of psychophysical, mind-body, dualism.

Field theory has been exhaustively discussed by Mountjoy (1976) and Smith and Smith (1996), while Pronko and Herman (1982) treated the conjoining of space and time into a single concept as it is related to developments in psychology. Unifying two absolutely different space and time concepts into a single space-time construct is similar to Kantor's conjoining of responding organism and stimulating object into a single unit (i.e., the behavior segment; see Smith, "The Interbehavioral Field," this volume). Kantor himself wrote frequently about the psychological field (see Kantor, 1922b; 1924, pp. 54-71; 1938; 1942; 1946; 1950; 1957; 1958, pp. 96-97; 1959, p. 106; 1969, p. 377; 1980; 1981a; 1982b; 1984b; Kantor & Smith, 1975, pp. 39-45). Moreover, the field concept is useful in explicating the relations between interbehavioral psychology and modern physics (Zimmerman, 1979).

Darwinian evolution broke from the theological bonds of special creationism and established the development of organisms *as species* in terms of their environment and the historical course of changes in their organic structures and biological functioning. Two conflicting schools of biological thought arose: (a) the reductionistic view, which holds that "The true purpose of biology is to reduce the organism in terms of physics and chemistry" (Croker, 1991, p. xiii), and (b) the ecological view, which studies organisms in active commerce with their environment (Brewer, 1960).

Kantor rejected reductionism early on and argued for the legitimacy of relatively independent sciences. Ecology, which pursued both laboratory and field observations, was an independent science compatible with the psychology Kantor envisioned (Brewer, 1992). In a tribute to Darwin (1809-1882), Kantor (1935) wrote about the importance of evolutionary thought for the development of a natural science of psychology (see also Kantor, 1969, 1976, for his own accounts).

American functionalism was more holistic than atomistic in that it viewed organisms as units (albeit divided into physical and non-physical components) that fought for survival within an environment, instead of as collections of biological structures that functioned as machines. Functionalists were not bound to "consciousness" as a static entity, but viewed the "mental life" of persons as, in some way, a consequence of survival activities, and as a process rather than a thing or entity. This shift in viewpoint from static and purported mental entities, and physical bodies and stimuli was essential for the development of both American behaviorism and Kantor's interbehaviorism (see Morris, 1982).

American behaviorists–for instance, Meyer (1873-1967) (Meyer, 1911, 1922), Watson (1919), and Weiss (1879-1931) (Weiss, 1925, 1929)–were characterized, and bound together, by common attempts to demythologize the mentalistic psychological science of the late 19th and early 20th century. Although they did not approach the philosophical sophistication achieved by Kantor, behaviorists were also engaged in the fight to destroy mysticism in psychology.

Given the foundations laid in his dissertation and the *Principles*, Kantor gradually devoted more of his efforts to the distinction between events and constructs, as well as to explications of the proper nature of scientific constructs (see, e.g., Kantor 1945, 1950, 1958, 1959). He also moved on to examine many other aspects of the burgeoning field of psychology.

Major Topics in Interbehavioral Psychology

Social psychology. Kantor's second book, *An Outline of Social Psychology*, appeared in 1929. Before then, the major thrust of social psychology had been of two sorts: Wundtian-Titchenerian "group mind" (e.g., Titchener, 1929; Wundt, 1912/1916) and variations of McDougall's (1871-1938) (McDougall, 1908, 1920) attempt to connect social behaviors to biological predispositions via the constructs of "group mind" and "instinct." The group mind concept assumed that individual minds could coalesce into a group mind just as hypothetical mental atoms or elements could combine to form an individual mind. In contrast, McDougall, like Freud, attempted to explain human acts as resulting from "biological" factors that superseded non-biological factors in a person's experience and in the immediate environment. As "instincts," however, these purported "biological" factors were merely reified versions of the mind which, upon logical analysis, are seen to be circular explanations. That is, the instinct is never directly observed, but is a construct inferred from behavior and then used to explain the original observation.

Kantor re-analyzed the extant data of social psychology in a series of papers before he published his book (Kantor, 1922c, 1922-1923, 1923a, 1923c, 1923-

1924a, 1923-1924b, 1925). In all of these, he spoke of functionally shared social stimuli or, as he termed them, "institutional stimuli." Thus, he conceptualized social behavior as shared response functions to stimuli having shared stimulus functions. Sharing coordinate response-stimulus functions as a consequence of shared behavioral evolutions defined membership in a social group (i.e., a culture). This allowed Kantor to divorce social reactions from the physico-chemico-biological characteristics of many non-social reactions, and thus to accommodate the arbitrary aspect of many cultural reactions (Kantor, 1929b). Later, he produced an updated treatise on this topic (Kantor, 1982a).

Psycholinguistics. Kantor's (1936) *An Objective Psychology of Grammar* was published at a time when the predominant approach to language attempted to account for the transmittal of ideas from one mind to another (Pronko, 1946), despite earlier efforts by Meyer (1911, 1922), Watson (1919), Weiss (1925, 1929), and Kantor (1921, 1922a) himself to describe linguistic behavior without recourse to the autistic construct of "mind."

The essential point of an objective treatment of language, Kantor (1936) argued, was that speaker and hearer were stimulated both by linguistic stimuli (e.g., words) and by the stimulus object referred to or spoken about (e.g., a chair). That is, in the most general case, there was a social interaction between two persons and a simultaneous interaction with some other stimulus object. This general case could be generalized to individuals who spoke about something to themselves, even if they spoke *about* themselves. Kantor (1977) later re-analyzed the area of psychological linguistics (see Bijou & Ghezzi, 1994) and, over the years, both experimental research and practical applications have been informed by his psycholinguistic approach (see, e.g., Bijou, 1989).

Physiological psychology. Early in the previous century, Kantor (1922d, 1924) correctly diagnosed the view of behavior as a nervous system function as the invocation of a metaphysical principle rather than as a scientific discovery of an ultimate causal relation. Let there be no mistake: Purported data were inadequate to support claims that the brain perceived objects, felt emotions, reasoned, remembered, willed actions, and so on. Clearly, in Kantor's view, such claims represented the survival of a medieval notion–that ideas in the soul caused behavior (Kantor, 1922d, 1923b).

In *Problems of Physiological Psychology*, Kantor (1947) conducted an exhaustive literature analysis of the data and constructs of psychology and physiology from Hellenic times forward, and proposed abandoning the failed attempts to discover ultimate causes of behavior in the nervous system. Instead, he argued that the nervous system should be recognized as one of many participants in the psychological event field. The brain, he proposed, was an integrative and conductive biological organ rather than a surrogate for the soul or mind.

Actually, data supporting Kantor's interpretation of the role of physiology in psychological events have been available for many years. For example, Kantor (1947) cited the pioneering removal of the right cerebral hemisphere (Dandy, 1933), which evolved into a procedure used today in medical treatment. He also cited Leyton and Sherrington (1917; see Kantor, 1923b), who reported on the electrical stimulation of points on the cortex, loss of motor function following ablation, and the recovery of function over time for 22 chimpanzees, three gorillas, and three orang-utans. Kantor was especially interested in the recovery of function then, and remained so throughout his career. He interpreted these data as indicative of the failure of any atomic localization theory, and as evidence of the necessity of regarding the organism itself as a unit. As with intelligence testing, Kantor stated overarching psychological principles that would not merely survive later, more advanced, data-gathering techniques (e.g., CAT and PET scans), but would also sometimes stand as beacons to interpret validly these new data.

The Teacher

The Classroom

A master teacher, Kantor was not a lecturer who explicated facts to be memorized for tests. Facts were presented, but Kantor always required students to interpret facts in accord with his conviction that a clear distinction exists between events and constructs. This Socratic method, which requires that the student shift basic assumptions in order to arrive at valid interpretations, was emulated by many of Kantor's students when they became teachers (Wolf, 1984). Among them are John Bucklew, Parker Lichtenstein, and Irvin Wolf, all of whom became extremely able practitioners of the art.

Graduate Students

Directors of graduate psychology theses and dissertations at Indiana were not recorded systematically for some years after Kantor's arrival in 1920 (Hearst & Capshew, 1988). After records were kept, only two faculty–Roland C. Davis (1931-1961) and Winthrop N. Kellogg (1929-1951)–sufficiently overlapped Kantor in tenure for comparisons to be made. Kantor's production of nine M.A. and 11 Ph.D. degrees compares favorably with the records of these researchers, both of whom maintained active laboratories.

Chronologically, Kantor's graduate students were: 1934, Jerry W. Carter (M.A.); 1936, Paul M. Schroeder (M.A.); 1937, Ignacio T. Briones (M.A.); 1938, Ignacio T. Briones (Ph.D.), Jerry W. Carter (Ph.D.); 1942, J. W. Bowles (M.A.), John Bucklew (Ph.D.); 1943, Robert W. Lundin (M.A.); 1944, Annemarie Lehndorff (M.A.), Nicholas H. Pronko (Ph.D.); 1947, David T. Herman (Ph.D.), Robert W. Lundin (Ph.D.), D. Morgan Neu (M.A.); 1948, Harris E. Hill (Ph.D.), Irvin S. Wolf (Ph.D.); 1951, Marjorie P. Mountjoy (M.A.); 1952, J. W. Bowles (Ph.D.); 1953, Paul T. Mountjoy (M.A.); 1954, Solomon Weinstock (Ph.D.); 1957, Paul T. Mountjoy (Ph.D.) (Hearst & Capshew, 1988).

Other Activities

After officially retiring from Indiana, Kantor spent varying periods as a visiting professor at New York University with Charles Cofer, at Lynchburg College with Donna and Al Cone, and at the University of Maryland with Joseph P. Brady. He made shorter visits to other colleges (e.g., Western Washington College) until his advancing deafness prevented him from interacting with students. Thereafter, he devoted himself almost entirely to writing and spoke at only formal events.

Kantor visited his last Ph.D., Mountjoy, repeatedly at Western Michigan University in the 1960s and 1970s. In 1974, Emilio Ribes arranged through Sidney Bijou for Kantor to serve as Honorary President of the First Mexican Congress of Behavior Analysis at the Autonomous University of Xalapa, and to speak there on interbehavorial psychology. Kantor received a standing ovation and a gold medal. He revisited Mexico yearly between 1975 and 1978, and in 1980 and 1981 (Ribes, 1984).

The Philosopher of Science

The Dissertation

Although Kantor chose psychology as his focus, the philosophical assumptions on which psychology is based were always of abiding interest and concern. Unlike many of his contemporaries, Kantor recognized that sophisticated techniques for observing, collecting, and describing psychological data must be complemented by sophisticated tools for interpreting the findings (see Parrott, 1984). Kantor's (1917) dissertation dealt with the most basic assumptions guiding the human intellectual enterprises (Mountjoy & Cone, 1995). Kantor retained a copy of the dissertation until his death, and its well-worn state suggests he consulted it frequently.

From the first, Kantor displayed an uncanny ability to discern the basic assumptions—frequently unstated—that undergird intellectual systems, and he delighted in exposing them to scrutiny. His dissentient abilities seem to have been developed before he entered the University of Chicago. Cone once asked Kantor, "How were you able to scrape away the cultural and religious patina and see the difference between constructs and events when you, yourself, are a product of the Western European culture?" He replied: "When I was 8 or 10 years old, there was a scandal involving elected officials in Harrisburg. I was surprised to learn that trusted public servants were stealing from the people, so I became convinced that one must look below surface appearances to understand events" (personal communication with D. M. Cone, 1973). He also spoke to William Verplanck (personal communication, 1997) about his early exposure to the piety of his father's congregation. What his father taught him was contradicted by conversations he overhead between his father, the Rabbi, and supposedly devout Jewish friends who boasted of duplicity in business dealings. As Kantor was fond of saying, "Things are not always what they seem to be." Noel W. Smith had held a similar conversation with Kantor some years earlier, and Kantor (1976) contains yet another account of Kantor's personal recollections.

In his dissertation, Kantor displayed amazing skill in discerning inconsistencies (a) between words and actions of individuals, as well as (b) between words and the events that those words purport to describe, and (c) within systems of propositions. The last underwent further development, and is best expressed in his writings after 1935.

Looking back across eight decades, we marvel that the young Kantor was able to consider such an enormous amount of data, to report these data in a conventional, familiar fashion, and then to reorganize them in a new, creative manner. He not only retained useful elements from the history of philosophy, but also reevaluated the lessons to be drawn from that history: (a) speculation about unobservable entities such as "soul" or "mind" is futile and (b) to become a vital intellectual force, philosophy must apply itself to the analysis of actual things and events (Mountjoy & Cone, 1995).

The Logic of Modern Science

Kantor directly addressed the issues raised in his dissertation in the two-volume *Psychology and Logic* (Kantor, 1945, 1950; see Schoenfeld, 1969). In this work, Kantor argued for many possible systems of logic, just as mathematicians over 100 years earlier had argued for many possible systems of geometry. Application of his logical constructs appeared first in the book whose title is the heading of this section (Kantor, 1953), and then five years later in a system of scientific psychology, *Interbehavioral Psychology* (Kantor, 1958, 1959).

The Scientific Evolution of Psychology

The development of abstract philosophical and scientific propositions is difficult and time consuming. Consequently, Kantor's next major work did not appear for four years (Kantor, 1963). In Volume I of *The Scientific Evolution of Psychology*, Kantor applied the best of over four decades of carefully honed interbehavioral propositions to an historiographic analysis of the changes in psychology from Hellenic Greece to the late medieval period. Volume II appeared six years later (Kantor, 1969), where he resumed with the scientific renaissance and continued up to the mid-20th century. In total, the very beginnings of science in ancient Greece, the rise of mystical approaches to human behavior as Christianity became dominant, and the gradual rise of modern science are carefully delineated. Of course, the survival of mystical doctrines in modern science was mercilessly pointed out and criticized. It might be said that Kantor provided the only history of psychology from a broadly behavioral point of view (see Fredericks, this volume).

Interbehavioral Philosophy

Late in life, Kantor (1981b) returned explicitly to philosophy in *Interbehavioral Philosophy*. With characteristic attention to detail, he designed the first edition's dust cover, which offers a concise summary of the contents:

Philosophy treated
as the *acme* of human orientation
& evaluation of things
and events in nature & culture:
A radical departure
from the transcendental thinking
of traditional philosophy
& psychology

This book gives a general overview of Kantor's unique approach to things and events, whereas other works provide detailed analyses of specific sub-areas. Kantor explicitly denied that there was any evidential basis for both cosmological and psychological dualism. Philosophy did not deal with any sort of ultimate or absolute being or criterion. Instead, he stated, "The positive position of this work is that valid philosophizing consists of systems of attitudes derived from observations and inferences of actually occurring events, by methods similar to those of all the established sciences" (from the dust jacket).

Thus did Kantor return late in his career to a position stated in his dissertation 64 years earlier, namely, that science is intimately related to philosophy. To Kantor, the validity of scientific work depends on the basic assumptions that originally guided it. The best and most advanced experimental and mathematical techniques are wasted when deployed to justify a dualistic universe or any other ultimate or absolute construct (see Zimmerman, 1997).

Kantor placed psychology firmly within the family of natural sciences. He did this by discarding ancient constructs, which tethered investigation of psychological events to religion, and by replacing them with constructs directly derived from events. In this stunning reconstruction, Kantor altered the most basic categories of Western European civilization. He replaced the scientifically untenable dichotomy of "mind" vs. "matter" with his event continuum construct, in which all things and events range across a continuum from (a) events studied by physics and chemistry, to (b) events studied by biological sciences, to (c) events studied by the science of psychology. These areas shade into one another, but cut-off points can be drawn by investigations that focus on the entire field of interacting components. For example, in psychology, the organism is simply one component of the event-field, and the cut-off point from biology is the development of an interbehavioral history of contacts with specific stimuli, and the consequent development of specific coordinate stimulus and response functions by an individual. Kantor also reworked Aristotle's naturalistic (or pre-religious) concept of "potential" to handle changes in capacity of both stimulus objects and responding organisms to interbehave–and he did this, of course, without recourse to engrams or other structural alterations in the brain.

Evaluation of Late Twentieth Century Psychology

Conventional evaluations of late 20th century psychology posit two warring camps: (a) dualists, who deal with the "proper" subject matter of psychology, to wit, the "mind," and (b) behaviorists, who–having "lost" their "minds"–are unwitting dualists. The reason Kantor rejected the former should be self-evident, but the reason he rejected the latter requires some explanation.

Kantor did not consider himself a "behaviorist" and viewed behaviorism as an inadequate solution to problems that had been imposed upon psychology by the politico-culturo-religious bifurcation of the universe into a natural (matter) and an unnatural (psychic) component. To him, behaviorism had retained some mentalistic notions, such as the conceptual nervous system as the master organ of the body [e.g., Pavlov (1849-1936) (Pavlov, 1927/1960); see Kantor (1947, 1969)], and thus, had simply salvaged the natural component (body) while discarding the nonnatural component (mind). That is, it had used the natural component to support the nonnatural concept of the soul in its many variations. Kantor (1969, p. 228, Table IV) lists 21 historical attempts to localize psychic processes in the nervous system, ranging from Digby's (1603-1665) to Wernicke's (1848-1905). He did so in the context of an extremely lengthy quotation from Eccles (1903-1977) in which Eccles attempts to account for mental functions with neural tissue functions (Eccles, 1953; see Kantor, 1969, pp. 227-229). Kantor believed that the only way to solve the mind-body problem was to discard almost the entire edifice of intellectual enterprises and start over again. He finally settled upon "interbehavioral" as the label for his new system. Kantor's system was not simply a system of psychology alone, but a new approach to the entire scientific enterprise.

In the late 20th century and the early 21st century, we are more directly affected by science and its technologies than were any preceding generations; thus, we are more in need of education about these undertakings. Kantor is the teacher *par excellence* of what science and technology actually are and could become.

Conclusion

The aim of this chapter has been two-fold: first, to describe the essential biographical facts of Kantor's life and, second, to summarize the most salient aspects of Kantor's contributions to psychology, science, and philosophy. These contributions, or accomplishments, have been discussed in some detail; however, they might be clarified by restating them differently. For this reason, we conclude with a list of six of Kantor's most basic achievements.

1. He distinguished between events (data) and constructs (statements about data) and explicated the impact of our dualistic culture on scientific work and constructs.
2. He proposed that the organism and object *in interaction* comprise the basic unit of psychological investigation.

3. He indicated the fundamental bases for the proper conduct of the various sciences and argued that they could proceed in a relatively independent manner.
4. He introduced the concept of the psychological event field, a restructuring of the twin concepts of cause and effect from their traditional metaphysical status to conform to the latest empirical and theoretical developments in the non-psychological sciences of physics and biology.
5. He extended the four advances listed above into a new psychological science by explicating the first naturalistic *system* of psychology since that of Aristotle (384-322 B.C.E.).
6. He analyzed the empirical and theoretical bases of the sciences, as well as the foundational status of the non-empirical science of logic and the basic intellectual enterprise of general philosophy.

These six accomplishments represent both the introduction of innovative constructs and the conservation of viable traditional ones. Kantor's life work exemplifies the ideal of scientific activity: the corrective and continuous actions of a person who valued both the empirical and the analytic aspects of science.

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Endnote

[1]Kantor founded *The Psychological Record* in 1937 (Mountjoy & Cone, 1997), and retained a close connection with it after ceding editorial control to Paul Swartz (Bartlett, 1997), who ceded it to Irvin S. Wolf and Paul T. Mountjoy, who ceded it to Charles E. Rice, the present editor. Kantor remained on the editorial board,

and contributed articles under his own name and, from 1968 to 1983, under the pseudonym "Observer" (Wolf, 1984). These latter commentaries were collected and published together (Kantor, 1984a). Between 1975 and 1981, Kantor also contributed 16 articles to the *Revista Mexicana de Análisis de la Conducta* (*The Mexican Journal of Behavior Analysis*), which are collected in Kantor (1984c).

Authors' Note

Our biographical account could not have been written without the unselfish assistance of many individuals. We cite those whose contributions loom largest, with our sincere apologies to many others who are here unnamed, since each contribution supplied its own unique and essential impetus to this essay.

The senior author is indebted to Dr. R. R. Hutchinson, President, Foundation for Behavior Resources, Augusta, MI, for his constant encouragement, and for office space and telephone use; and to Dr. Howard E. Farris, Chair, Department of Psychology, Western Michigan University, for his encouragement and for photocopying and postage.

The Archives of the History of American Psychology at the University of Akron, Ohio, preserves the surviving personal papers of J. R. Kantor. Dr. John A. Popplestone, Director, and Dr. Marion W. McPherson, Associate Director, were extremely generous with their time and assistance in making these resources available to us. Brad Cook of the Archives of Indiana University performed many services beyond the conventional obligations of his position, and we are grateful for his efforts.

Both of us have been guided in this writing by our personal affection and regard for Kantor, as well as by our professional conviction that he laid out the proper path to follow to achieve a natural science of psychology. From our many years of personal and professional contact with this gifted scholar, we have assembled many memories that inform this essay. We have also profited from our numerous interactions with Helene (Bobby) Kantor, both before and after her father's death. Albert Haas of Chicago generously shared his recollections of the Kantor family.

We thank personal friends, professional colleagues, and students, who shared with us Kantor's influence on their lives: Drs. Sidney W. Bijou, James H. Capshew, Al L. Cone, Dennis J. Delprato, Paul R. Fuller, Arthur Kahn, Louise Kent, Parker E. Lichtenstein, Edith D. Neimark, N. H. Pronko, Emilio Ribes, Noel W. Smith, William S. Verplanck, and Irvin S. Wolf.

Special thanks go to Allison W. Cone-Hurst and Jennifer Wasson for their labors in tracing out genealogical data. All errors of fact or interpretation remain, of course, the responsibility of the authors.

Chapter 2

The Evolution of Scientific Psychology

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Kantor published *The Scientific Evolution of Psychology* (1963, 1969) relatively late in his career. After over four decades of working to establish psychology as a natural science, he focused on history as a means of demonstrating how psychology had deviated from that course. He disagreed with traditional histories of psychology, which presented psychology's subject matter as qualitatively different from that of other sciences (Observer, 1983). According to Kantor (1938), the subject matters of all sciences, including psychology, are nothing more and nothing less than spatio-temporal events–natural events. For psychology, these events consist of the interactions of responding organisms with the stimulating environment. For Kantor, then, traditional histories of psychology had failed to understand its evolution because they had failed to appreciate its fundamental subject matter (Observer, 1983). Kantor sought to correct the received view of psychology by providing a history that traced the evolution of psychology as a *natural* science. Mentalistic thinking was analyzed as a product of cultural and nonscientific influences and not as an inevitable discovery of characteristics inherent to psychological activity. The result is a work of historico-critical scholarship tracing psychology's history from the early Greeks to the first three decades of the 20th century.

This chapter introduces readers to Kantor's historical perspective. *The Scientific Evolution of Psychology* (Kantor, 1963, 1969) is a work of such broad scope and deep scholarship, however, that it is impossible to provide a fully comprehensive treatment in the present context. A distinctive aspect of Kantor's perspective is his interbehavioral philosophy and psychology. Themes important to both of these–coherent system building, the interrelatedness of scientific postulates and cultural institutions, and antimentalism–are interwoven throughout *The Scientific Evolution of Psychology*. The reader is encouraged to explore primary sources for a more direct treatment of the fundamental basis of Kantor's philosophy and psychology (see Kantor, 1924, 1926, 1959, 1981). Nevertheless, readers unfamiliar with interbehavioral philosophy and psychology will be indirectly introduced to important themes of interbehaviorism in the present chapter because many of the distinctions between Kantor's and other historians' works reflect differences between interbehaviorism and other psychologies. This chapter is organized around two points of reference that will, hopefully, clarify salient distinctions: First, process considerations, or the definition, goals, and method of historical writing (e.g., Kantor's historiography), and second, Kantor's two-cycle analysis–the content of his history.

Kantor on History

History as Science

Traditionally, history was written as a narrative story of how past events may have unfolded. Although works of nonfiction, historical writings were generally viewed as fictional accountings, more in keeping with literature than scientific enterprises. History has been construed as an activity antithetic to science because, unlike science, history's subject matter no longer exists (Parrott & Hake, 1983). According to Kantor (1963), however, science is the interaction of persons with naturally occurring objects and events that produces products, for example, descriptions, theories, and laws. Likewise, products of the historian's interactions with concrete objects–albeit documents, manuscripts, and artifacts–are also descriptions, theories, and laws. Thus, the work of historians can be viewed as part of a continuum of scientific work in that its procedures of analysis and production of data are no less natural than the basic sciences. Parrott and Hake (1983) extended Kantor's argument, making the point that when history is viewed as the product of events instead of the event itself, a scientific history can be achieved, although, as with any science, dependent upon "investigative rigor and product utility" (p. 124). Investigative rigor of historical writing is the subject matter of historiography, to which we turn shortly. First, however, let us consider some special implications that the history of psychology has toward product utility or, as otherwise stated, the goals of history.

Goals of History

Two characteristics of psychology particularly affect an historian's interpretation and, consequently, the utility of that interpretation. First, psychology has suffered from an uncertain subject matter. According to Kantor (1963), psychological history faces unique problems compared to the history of other sciences because psychology has historically been confused about its subject matter. This confusion is the result of the superimposition of nonscientific assumptions, particularly transcendental and spiritualistic assumptions, which were later transposed into mentalistic assumptions. Histories of psychology, for instance, have focused on traditional philosophical views about the subject matter of psychology, such as faculties of the soul, processes or contents of the mind, and moral aptitude of the soul. Histories of science, in contrast, simply describe what scientists did "with respect to the concrete materials with which they work" (Observer, 1979/1984, p. 202). Kantor, himself a philosopher, focused a great deal of his work on traditional philosophical topics; however, he objected to the unquestioning superimposition of mentalistic beliefs on the writing of history and, for that matter, the conduct of scientists. As Kantor stated:

> What ordinarily goes by the name "history of psychology" is the indiscriminate collection of traditional beliefs about psychic processes.... There is no intellectual profit to be gained from pondering upon the putative gulf that separates the career of the unified and intuitive soul of Leibniz, Locke, Kant, or Reid versus the atomic sensations and associations of Berkeley, Hume, the Mills, or Wundt. (Observer, 1975, p. 583)

The second characteristic of psychology that affects the utility of history involves the cultural nature of science. As human enterprises, all sciences are inherently cultural and, thus, are subject to facilitating and hindering cultural conditions. Stable and well-organized communities favor scientific exploration; unstable and disorganized communities do not. Additionally, any contemporary scientific event is contextually interrelated with that science's first orientation to a particular subject matter and all scientific events that follow. Thus, science is not only subject to current cultural confines of exploration, but also to cultural biases. Again, psychology is placed in the unique situation because it is more deeply enveloped by cultural influences than are other sciences. The general cultural matrix of spiritualistic and mentalistic beliefs that accompanies our cultural conditions is more readily integrated into psychological constructions than into the constructions of the other sciences. This situation participates not only in the aforementioned confusion about psychology's subject matter, but also in historians' interpretations. Otherwise stated, the historian operates under cultural biases of the same sort that have prescribed acceptable scientific inquiry and, for psychology, these biases have been overwhelmingly spiritualistic and mentalistic. The superimposition of such influences on a historian's interpretations affects the utility of scientific history, in that science, by definition, cannot be non-natural in either the content or the process of historical writing. Kantor (1960) took seriously the work of historians as a scientific enterprise in that they should interact with products of historic events without cultural bias. Consequently, Kantor (1963, 1969) consistently placed psychological history within the context of general scientific culture and general culture of the time.

For Kantor, the primary goal of studying the history of psychology was to identify cultural biases affecting a scientist's activities.[1] Students of any science benefit from a study of the origins of doctrines and theories of their discipline (Kantor, 1963; Observer, 1976). By orienting themselves to historical origins, Kantor (1960) contended that a scientist's practices and theories can be evaluated on the basis of underlying preconceptions. Understanding these preconceptions is particularly useful for psychology since, at the level of historico-critical analysis, the historian not only examines the evolution of assumptions underlying current scientific activities, but also provides an analysis of whether or not these assumptions are within the domain of scientific inquiry. Kantor (1963) called this the "tertiary scientific level" of analysis (p. 7), as it provides a critique not only of historical events, but also of historians' interpretations of those events. Historiographers, such as Wertheimer (1980), concur with Kantor's perspective, stating that the primary goal of studying history is to develop a perspective that transcends sociocultural influences.[2] However, whereas both Kantor's method and philosophical orientation appear to be in concert with other historiographers', he differs somewhat with respect to his methodological criteria. Thus, we now turn to a brief analysis of Kantor's historiography within the context of historiography more generally.

Historiography

As mentioned previously, traditional historians take literary license in order to fill in the gaps with educated speculations and to make their story interesting to readers. The acceptability of this approach, however, has been changing as historians work to establish procedures and guidelines for a more reliable and valid accounting of history. The discipline of historiography as a scholarly, methodologically sound enterprise has emerged. Historiographic method provides criteria for a more accurate, less biased accounting of events.

Critical historiography involves both the methods for collecting data and a consequent scholarly analysis and synthesis (Woodward, 1980). Based on historiographic methods, a "new" history has emerged, the products of which are critical and contextualized verbal constructions, the lessening of subjective biases, and the correction of myths and misrepresentations found in "old" history (Furumoto, 1989; Morris, 1993; Woodward, 1980). Historiographic methodology approaches the writing of history with two basic concerns: data collection and interpretation. Data collection should follow from direct interaction of the historiographer with primary sources, thus avoiding the passing along of myths and misleading anecdotes (Furumoto, 1989; Woodward, 1980). Kantor's (1963, 1969) two-volume history satisfies this historiographic requirement for data collection. The ratio of primary to secondary sources in the bibliography of the first volume is approximately 1:1.5. Although more secondary than primary sources appear in the bibliography, the in-text ratio is approximately 2:1, indicating a dominance of primary over secondary sources for the actual narrative. In the second volume, the ratio of primary to secondary sources is approximately 3:1.[3] Overall, Kantor maintains a dominance of primary over secondary sources that more than satisfies standard historiographic criteria.

The second criterion established by historiographers is a fact-oriented and theory-free interpretation that maximizes objectivity and minimizes subjective bias (Pongratz, 1980). Historiographers have established five critical dimensions of interpretation: continuity-discontinuity, presentism-historicism, internalism-externalism, "Great Man"-Zeitgeist, and ceremonial legitimation-critical history (Hilgard, Leary, & McGuire, 1991). Kantor, in contrast, followed his own five recommended codes for scientific history writing (Observer, 1983):

1. History of any science should be focused on the evolution of the discipline and its advancement.
2. Early periods should be analyzed critically for clues to what is acceptable or rejectable from the standpoint of current investigation of things and events.

3. Scientific histories must be quality controlled on the basis of events and not by established opinions or beliefs of philosophers or reputed authorities.
4. Psychological historiography must include parallel developments in relevant scientific disciplines as well as allow for the freedom to discard or modify postulates and to formulate new ones.
5. Psychological events must be treated as they occur and not be replaced by other objects, procedures, or philosophies. (p. 138)

Kantor's (Observer, 1983) five "codes" of historiography, although different from the five aforementioned dimensions of historiography, are not necessarily in conflict with them. The first and second codes seemingly lend themselves toward an internalist and presentist perspective, respectively. However, the primary problem with internalist histories, or histories written from within the limited concerns of a particular discipline, is an exclusion of broad non-scientific cultural contexts (Hilgard et al., 1991). Thus, internalism is in direct opposition to Kantor's analysis of the interrelation of scientific and cultural matrixes and is also mitigated by his fourth code. Throughout *The Scientific Evolution of Psychology*, Kantor stressed the social, political, economic, and intellectual influences within and without psychology and other scientific disciplines.

With regard to presentism, or a backward looking history (Furumoto, 1989; Woodward, 1980), questions remain as to the nature and ramifications of presentist versus purely historicist approaches (see Fisher, 1970; Hull, 1979; Stocking, 1965 for contrasting views). Although Kantor's second code dictates that the historian reflect backwards, this may be somewhat unnecessary for product utility, as previously discussed. While a purely historicist approach can orient scientists to underlying cultural biases, scientists can only evaluate the legitimacy of their perspective by placing those earlier historic influences within the context of current thought.

In summary, although Kantor's history is "internal" to the discipline, in the sense that Kantor, a naturalistic philosopher and psychologist, is looking at a particular type of science (e.g., naturalistic psychology), it cannot be construed as "internalistic." Kantor's history can be construed as "presentist," however, *only* in the sense that he seeks a tertiary level of analysis. This tertiary level of analysis (e.g., historico-critical) is not in conflict with historiographic criteria. Depending upon one's goals, as long as a balance is maintained among historiographic dimensions, the "sins" of a methodologically unsound "internalistic" and "presentist" history are avoided. In fact, Kantor's (1960, 1963; Observer, 1975) goal of historico-critical analysis is a step beyond that of the historiographer's. Whereas the historiographer's interpretation strives toward a balance within the five dimensions, Kantor's historico-critical analysis also provides an analysis of the historiographer's interpretations. Given the confusion that mentalistic assumptions have provided to both the history of psychology and historians of psychology, Kantor's choice to trace the evolution of naturalistic psychology provides an important and illuminating read for contemporary scientists.

Our orientation now turns from these process considerations to content considerations, where a synopsis of *The Scientific Evolution of Psychology* follows, focusing on Kantor's treatment of those historic events salient to the uniqueness of his approach. Kantor's (1963, 1969) history is organized within the framework of an analysis tracing psychology's history through two cycles (1963, p. 161; see also Observer, 1976, p. 295). These cycles describe the initial emergence of psychology as a natural science, its decline into an era preoccupied with spiritualism, otherwise called the transcendental era, and finally, its re-emergence in the 20th century as a natural science (see Figure 1).

The Origin of Psychology's History

Kantor (1963) argued that all sciences emerge from early folk wisdom; therefore, it is an arbitrary practice to identify the beginning of any science. Nevertheless, he argued that psychology has gone through three distinguishable stages and these stages can provide a framework for deciding where to begin its history (1963, pp. 56-57). During the first stage, the "prescientific" stage, simple observations develop into an interest in a particular subject matter (e.g., interactions of organisms with one another and with objects). With the invention of writing, these observations were documented during the second stage, the "protoscientific" stage. Thus, poetry and stories became products of early science, recounting "acts of shame, rejoicing, thinking, suffering," and other psychological phenomena. Slowly, documented observations became more technical as "standards, operational tools, and procedures" are established. Such early systematization occurred during the third, "authentic" scientific stage and provided the basis for the whole of a science's postulational system (see Clayton, Hayes, & Swain, this volume).

Kantor selected the "authentic" scientific stage to begin his narrative of psychology's history. Two issues are relevant to this decision. First, *The Scientific Evolution of Psychology* traces the derivation and evolution of mentalistic constructions; therefore, it appropriately begins prior to their emergence. Second, from an interbehavioral perspective, the building of a coherent formal postulational system is vital to the success of any science (see Kantor, 1953). Thus, formal systematization, occurring during early Greek times and prior to the emergence of mentalistic constructions, marks the beginning of psychology's history.

The First Cycle: Naturalistic Era (500 BCE–700 CE)

Biopsychology: The "Authentic" Scientific Stage of Psychology

According to Kantor, the early Greeks originally established psychology as a naturalistic enterprise. Socrates (469-399 B.C.E.) provided the roots of cultural or social science, followed by Plato's (427-347 B.C.E) contributions to the "logic of science, systematization of scientific thinking,...[and] dialectic procedures" (Kantor, 1963, p. 101). Plato's contributions toward systematization notwithstanding, Kantor did not identify him as the originator of authentic psychological science, but rather conceptualized Plato's work as the culmination of a presystematic phase. Instead,

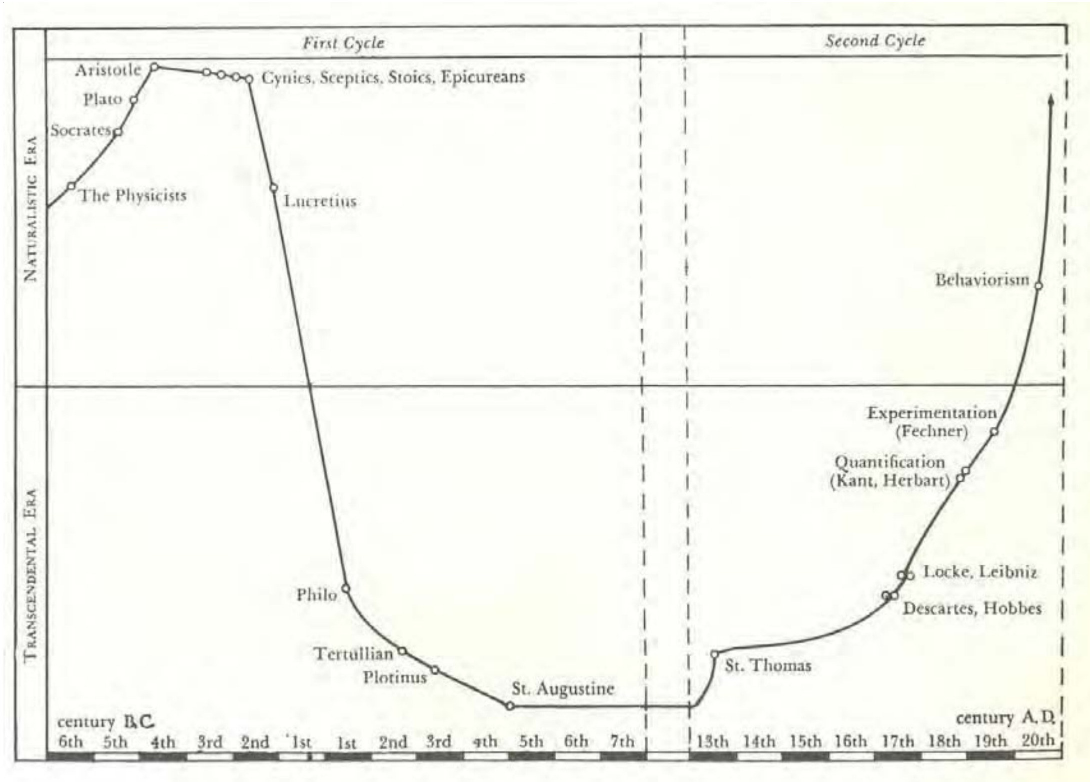

Figure 1. Kantor's depiction of the evolution of psychology from naturalism to transcendentalism and back to naturalism. Note. From The Scientific Evolution of Psychology *(Vol. I, p. 161), by J. R. Kantor, 1963, Chicago: Principia Press. Copyright by The Archives of the History of American Psychology. Reprinted with permission.*

Aristotle (384-322 B.C.E.) is identified as the "documentary origin" of psychological science. As Kantor (1963) stated:

> The psychological works of Aristotle, though they may be only lecture notes prepared by Aristotle or his students, are systematic descriptions of a number of basic and important psychological events...many of its propositions fall readily into the framework, first, of biology and, beyond that, of physics. (p. 57)

Plato was a "preparer" because he brought psychological events to a stage of proficient interest and organization. Aristotle, however, holds a special place in the history of psychology by treating psychology as a branch of biology, thereby treating psychological events as natural phenomena. Whereas Plato espoused a dialectic epistemology, suspicious of any sense data, Aristotle drew a sharp line between dialectics and the work of science–science being drawn from nature and its epistemology drawn from observation and sense data.

The corpus of Aristotle's psychology is found in *De Anima*. Aristotle treated all aspects of psychological events naturalistically and concretely. Everything living had a "soul," including plants. "Psyche" or "soul" was defined as a feature of psychological action (i.e., a quality)–the essence of potential action. In other words, the soul is the substance of function. As a function of the body, the soul was defined as inseparable from the soma, and subject to growth and decay, as is the body. Different actions had different functions, and thus differentiated the types of souls, as did different organisms.

Decline of Naturalism

The first era of naturalistic psychology was relatively short, lasting only a few centuries. Its end was occasioned by a cultural shift. When the center of scientific study shifted from Athens to Alexandria, the intellectual atmosphere changed from an interest in psychological events to the expansion of other sciences, such as mathematics, physics, and astronomy. Consequently, during the two centuries following the establishment of Alexandria, psychology lagged behind other sciences as the Roman Empire developed.

Being more sensitive to presuppositions of the general culture, psychology suffered from a change in perspective, reflecting tumultuous social and economic shifts. The independent Greek city states were transformed by the conquest of the Macedonians, resulting in an evolution from an individualistic, proud, secure civilization to a ruthless, selfish, colonial regime of the Romans. What resulted, according to Kantor (1963), was a cultural matrix conducive to mythology and superstition that discouraged independent, unbiased search for "objective scientific orientation" (pp. 156-159). Life had become unsure, with great material hardships and day-to-day insecurities. This literal and figurative poverty lent itself to subjectivism, transcendentalism, and spiritualism. Thus, the beginning of the end of the first cycle of naturalistic psychology developed in concert with overriding political and economic transformations. Instead of an interest in natural events, attention was turned toward the practical and moral psychological doctrines of the Cynics, Stoics, Epicureans, and Sceptics.

The Cynics, Stoics, Epicureans, and Sceptics (300 BCE-100 BCE). During the fourth and third centuries B.C.E., naturalistic procedures of inquiry changed little. The decline of naturalistic psychology, instead, is seen in a shift of subject matter. Given the dissolution of stable, traditional political and social institutions, attention turned toward humanistic concerns. Mankind[4] was demarcated from the rest of nature in an attempt to discover how "imperturbability" can be maintained despite social turmoil (Kantor, 1963, p. 164). Man's relation to society, as explored through the development of principles of political and moral behavior, became the locus of thinking instead of the Greek's concentration on the properties of events and objects. According to Kantor, this humanism led to mysticism. He argued that although humanistic concerns emphasize psychological events, the resulting separation of humans from non-humans and from the environment set the stage for a "denaturalizing" of man. Realism was replaced by cynicism and scepticism. Kantor (1963) characterized this philosophical position as "intellectual escapism...[of] subjective monism" (p. 165).

The four schools of thought that emerged during the fall of Alexander's empire reflected a new social order. Cynics responded to the fall of Athens and the loss of Greek security with total dissatisfaction for prevailing conditions and the belief that human communities are intrinsically bad, such that epistemological institutions arising from them become questionable. By extolling exile, the Cynics sought to achieve self-sufficiency via a most extreme independence of the individual. A second philosophy born during the trying times of Macedonian imperialism was that of the Sceptics. Their belief in a suspension of judgment arose from a distrust of science and other disciplines that required a stable, enduring social order to flourish. Sceptics rejected a fundamental cornerstone of Greek logic, the syllogism, arguing that conclusions could be no better than the premises. The third, most enduring escapist philosophical orientation was Stoicism, which constructed a universal cosmic order in which man, whatever his lot in life, could find solace. The Stoics replaced knowledge based on discovery of natural order with submission to uncertain and uncontrollable order.

According to Kantor, the fourth philosophy marking the decline of Greek naturalism, Epicurean philosophy, has been traditionally distorted by historians. Epicureans developed a hedonistic philosophy in which the means of adapting to changing conditions of life was a pursuit of pleasure. However, "pleasure" meant a type of knowledge. The basis of this knowledge was "sensory encounters with things, preconceptions, and the feelings" (Kantor, 1963, p. 174). Thus, the Epicurean maintained Greek naturalism within the context of humanism by stressing well-being through orientation to nature.

De Rerum Natura. The last evidence of Greek naturalistic thinking can be found in the work of the Epicurean, Lucretius (99-55 B.C.E.), a Roman who wrote *De Rerum Natura*. Its purpose was to save men from "the superstitions of religion and to free them from the unwarranted fear of death" (Kantor, 1963, p. 175). Written from the perspective of Epicurean naturalism and prior to the advent of dualistic thinking, Lucretius' work has been inappropriately linked to materialism. Lucretius' descriptions of atoms and of mind or soul maintain that mind and soul are "bodily and organic" (Kantor, 1963, p. 176); however, there was not yet any concept of a dichotomy of the spirit and material aspects of man. Therefore, Epicurean doctrines could not have shared the same rejection of an alternative to matter that post-dualism materialism did. Lucretius' treatment of psychological processes such as sensory processes, imagining, thinking, volition, language, and dreaming all speak to natural explanations for psychological phenomena. His treatise, however, suffers from a loss of Aristotelian systematization, and this marks its divergence from a fully objective psychology.

Interestingly, Alexandria established a culture that fostered other sciences for several centuries, but paradoxically, this same culture hindered the progress of psychology. Kantor (1963) speculated that three events participated in this: the influx of Eastern intellectual influences, a loss of security in social and economic situations, and the specialization and distinction of humanistic from non-humanistic studies. Restrictive Greek naturalistic thinking gave way to the freer, more speculative thinking of the Near East, while at the same time social instability turned that speculation inward. Constructions became farther removed from philosophical realism. Humanistic science became concerned with "allegory, symbols, and general linguistic constructions" (Kantor, 1963, p. 189) instead of with observers' direct contact with their environment.

The First Cycle: Transcendental Era (700-1200)

Spiritualism

From the first century B.C.E. until into the thirteenth century C.E., psychology became preoccupied with transcendent processes, for instance, with means of contacting a reality above and beyond that of ordinary life. As Alexandria gained prominence but then declined, cultures intermingled and shared their writings. This resulted in an interest in language and grammar and, consequently, in a preoccupation with the written word. A tradition was established whereby psychological phenomena were studied from documents far removed from direct observation. Verbal constructions evolved and assumed an independent reality and authority. Descriptions of natural events were subsumed by constructions of dualistic, spiritualistic concerns as the early Christians established a new culture, one that was imbued with concepts heretofore thought impossible, such as the existence of a non-natural dimension. This dimension or universe lent itself to a reality that provided escape from poverty and bondage. More importantly, it laid the foundation for later constructions of consciousness and mind because it established a belief in the dualistic nature of man. This, of course, had profound effects on psychology and other sciences as it established intellectual, philosophical, and scientific assumptions of the duality of spirit and matter, in addition to the intellectual institutions of teleology and predetermination. The psyche, now translated as a non-natural soul, was the center of processes such as sensations, mental images, consciousness, experience, intelligence, and other native or acquired powers. Ultimately, the brain would take over these processes and powers. Psychology did not begin to emerge from this era until after many mentalistic doctrines became well-established assumptions that continue to influence contemporary thinking. Kantor stated that the early Christian period of this transcendental era cannot be overly emphasized because it established a new and durable cultural matrix, the influence of which can be found in all sciences.

Personalism. The transformation of Rome into the Holy Roman Empire provided a social order that fostered the intellectual institution of personalism. Personalism is more than a subjectivism or the turning inward of humanism; rather, it signifies a complete loss of interest in the natural world and the creation of "spirit" as the substantive source of existence. Tertullian (165-220), the Roman-African Church Father, exemplified an extreme form of personalism, stating: "The fact that Christ rejected an earthly Kingdom should be enough to convince you that all secular powers and dignities are not only alien from, but hostile to God," to which he added, "...there can be no reconciliation between the oath of allegiance taken to God and that taken to man" (Kantor, 1963, pp. 218-219).

The Church Fathers rejected allegiance to the Roman government and established themselves as representative of the governing power of a spiritual embodiment of a transcendent reality. After five centuries of strife, the transcendentalism emerging from personalism established a reality outside of devastating political and social circumstances and took the form of doctrine in the hands of the Church Fathers. A new "science" of theology, Christology, emerged, whose epistemology was based on a process of "revelation," requiring no justification for truth outside of the written word.

The Church Fathers were instrumental in formulating Christian doctrines that would have profound implications for the future of psychology and devastating consequences for a scientific approach thereto. A unified soul was institutionally established, endowed with psychological attributes, and connected with the body. In Tertullian's version of *De Anima*, the mind was established as a function of the soul, and the heart as the seat of the soul. The soul, in the hands of Tertullian, also became a free agent, with a directive faculty responsible for man's moral character.

Neoplatonism. Along with the Church Fathers' contributions to the decline of psychology as a natural science was that of pagan mysticism, for instance, the Neoplatonism of Plotinus (204-270). According to Kantor, Neoplatonic philosophy played a double role in the history of Western civilization. First, it laid down basic assumptions and postulates for nonscientific thinking that were imparted to scientific thinking when science re-emerged during the ninth and tenth centuries.

Second, Neoplatonic philosophy maintained the continuity of psychology, although "transmuting" its naturalistic content into mystic transcendentalism.

Plotinus found the model for his system, as did Christian writers of the time, in Platonic doctrine. Plotinus considered himself a follower of Plato who elaborated on Plato's best ideas. What Plotinus did, however, was superimpose a new set of assumptions, incongruent with Greek thinking, on Plato's philosophy. For example, where Plato extolled reasoning over sensing, Plotinus glorified the transcendent soul over the body. Plato's highest Form or Pattern was translated into a mystical unity; that is, Plato's man was translated from a natural being in an environment bounded by time and space to a being as only partially natural in order to connect with a supernatural dimension.

Plotinus' work was published during Constantine's elevation of Christianity as the official religion of the Roman Empire. It mirrored and influenced the concurrent work of the Church Fathers and thus participated in the founding of a spiritual philosophy that influenced later psychology. Plotinus' philosophy aims primarily at proving that the soul has an independent, divine existence. Dealing with a number of psychological actions, including sensing, perceiving, remembering, thinking, imagining, feeling, and reasoning, Plotinus regarded them all as functions of a unified soul or mind. This construction of the soul or mind as engaging in cognitive acts was a new "verbal formulation which is employed even today" (Kantor, 1963, p. 264). Overall, Plotinus formally organized spiritualistic doctrine thereby stabilizing it as a system of thinking that could be established as a durable intellectual institution.

Augustinian age. The lowest point of the Transcendental Era occurred during what Kantor (1963) referred to as the Augustinian Age, which lasted for eight centuries. Until this time, the spiritual world had been conceptualized as the ultimate ideal of life, but still distinct from the real world. During the Augustinian Age, however, this spiritual realm became the essence of everything: Spiritualism was not only above nature, but became nature itself. Building on the work of the Neoplatonists and earlier Church Fathers, St. Augustine (354-430) spoke for the new age where "knowledge of nature as exemplified by the sciences is replaced by the wisdom of intuitive revelation concerning God and spirit" (Kantor, 1963, p. 274). Whereas Plotinus inverted Plato, Augustine inverted Plotinus. Plotinus externalized the spirit, and Augustine internalized the spirit-mind into an inner being that retained knowledge of God and directed man's actions. According to Kantor (1963), this established a postulate of the primacy of the person: Man has some inner power that differentiates him from non-human organisms. This inner power became institutionalized in later psychological institutions as mind and consciousness, which in turn emerged as explanatory principles for acts of knowing, feeling, and willing.

Kantor identified six intellectual traditions institutionalized during the Augustinian Age. They continue to influence psychology strongly: the relation of bodily process and sensation, the doctrine of immediate experience, the absolute uniqueness of the mental, the solipsistic principle, the primacy and uniqueness of knowledge, and the introspective principle. Contemporary constructions of neuronal impulses causing the brain to interpret a sensation evolved from the Augustinian construction of sensation as the result of bodily responses acting on the soul. Immediate experience, or consciousness, evolved from the Augustinian doctrine of the soul as the source of knowledge. The notion of mental uniqueness discounts the uniqueness of all events and establishes the basis for later constructions of the privacy of certain types of knowledge. Related to the doctrine of mental uniqueness are solipsistic arguments: If all knowledge is ultimately derived from the soul, personal mental experience accounts for the whole of the world. The primacy and uniqueness of knowledge reflect a belief in knowing as an act of the soul, different from other actions of the organism. This doctrine anticipated Descartes' contention that clear, distinct ideas reflect the existence of self and God. Once the inner, private domain of consciousness is established, it follows that introspection becomes the method of accessing this knowledge (e.g., knowledge of the soul).

The Second Cycle: Transcendental Era (1200-1900)

Systematization Reemerges

Scientific psychology reemerged gradually from the Dark and Medieval Ages accompanied by numerous social changes. Classical Greek learning had been kept alive, albeit modified, by Arab culture, where the Crusades may have helped disseminate translations of Aristotle. Medieval society was expanded and secularized as various monarchs worked to free themselves from the control of the Popes and the Church. The growth of cities and towns allowed independence from feudal lords and provided a more stable and orderly social organization. Specialization in areas of manufacturing, trade, and crafts developed in these urban areas, which fostered an interest in the concrete problems of living. Other relatively independent social organizations that arose during the Middle Ages were found in the numerous Churches and Cathedrals that sprang up throughout Europe. Universities, originally established as religious organizations, evolved to stimulate secular intellectual activity. Lastly, technological advances, such as the development of lenses, cogwheel gearing, the compass, gunpowder, and the printing press cannot be overemphasized in the development of science. The development of technology both reflects the type of stable social conditions within which science flourishes and facilitates scientific exploration by providing the tools and methods useful in manipulating objects and events under study.

Scientific psychology had earlier lost systematization and then lost naturalism in its decline into the Transcendental Era. Scientific psychology resurfaced during the second cycle in reverse order: First, systematization returned, later naturalism reemerged. By the 13th century, scholarly activity began to move beyond a preoccupation with theology. Nature was once again deemed an acceptable subject matter, even if it continued to be thought of as secondary to theological problems. This beginning of ascent out of the Transcendental Era occurred with the systematization of Medieval theological psychology via the reintroduction of Aristotle's works.

Dualism

St. Thomas (1225-1274) was instrumental in reintroducing Aristotle's *De Anima* to the scholarly community, although from a decidedly different perspective than Aristotle's. According to Kantor (1963), St. Thomas' significance to psychology is his institutionalization of a mentalistic tradition. St. Thomas rewrote Aristotle's *De Anima* from a spiritualistic perspective, essentially attributing all of Aristotle's naturalistic psyche or soul faculties to a spiritual Soul and establishing the Soul as a cognitive power that controlled even the lowest animalistic functions. Aristotelian systematization was reintroduced, despite the fact that Aristotle's naturalistic biopsychology was lost.

Naturalization Reemerges: The Renaissance (1450-1600)

During the Renaissance, as during Medieval times, a number of social changes occurred that contributed to the reemergence of scientific psychology. Secularization of scholarly activity, technological breakthroughs, expanded industry and commerce, and specialization all continued to facilitate and, in turn, be enhanced by science. Interest in natural events continued to gain interest. Most significantly for psychology, however, were advances in biology and medicine. Investigations of human anatomy and physiology by dissection and experimentation contributed to an acceptance of "getting close to the events by suitable manipulation which revealed how they occurred" (Kantor, 1969, p. 34). Studying the human organism as a natural entity became an acceptable practice. Nevertheless, established spiritualistic and dualistic assumptions were, by then, intractable, becoming inherent characteristics of the postulational underpinnings of all sciences.

One event, however, dramatically helped to restrict transcendental assumptions: the Copernican Revolution. Nicolaus Copernicus' (1473-1543) heliocentric model of astronomy fostered the questioning of accepted views. Church Fathers had placed man firmly in the center of the universe, along with the doctrine that planets moved around the earth. Despite being a churchman, Copernicus challenged the assumption that the earth was the center of the universe by placing the sun there instead. As a result, according to Kantor (1969), the unquestioned acceptance of dogma, established by the Church Fathers, was shaken. Additionally, Copernicus' concept of the "machinery of the world," albeit orchestrated by divine control, laid the groundwork for the later mechanization of organisms and anticipated a focus on the material side of dualistic assumptions.

In general, advancement of the sciences during the Renaissance was a result of "triumph of numbers and spatiality" (Kantor, 1969, p. 39). Mathematical determination helped move intellectual activity away from the traditional concerns over intangible, invisible events. Paradoxically, the belief in a nonspatial realm was strengthened during this time. Whereas the other sciences progressed in accord with an increased interest in natural phenomena, psychology leaned toward interest in a type of spiritualistic humanism. Psychological events were treated as processes of cognitive orientation and social adaptation determined by the soul. Although advances in other sciences began to reestablish psychology as a science, spiritualistic assumptions prevented genuine naturalization. Instead, a mutated type of naturalization occurred: Facilities of the soul directing man's moral behavior were naturalized into a "mind."

Psychophysiology

Naturalization of the soul: Hobbes, Descartes, Leibniz, and Locke. Thomas Hobbes (1588-1679) continued to systematize and naturalize psychology. His "materialism," which Kantor (1969) called "metaphysical," held that "all psychological events are concerned with bodies, that is, the human individuals who are the center and source of psychological happenings and who are the objects and materials of the body politic" (p. 45). Accordingly, despite his opposition to scholastic thinkers, Hobbes continued a transcendental institution by contrasting outer and inner reality. Hobbes promoted an "anti-Aristotelian Aristotelianism" by following the Thomistic *De Anima*, yet whereas St. Thomas transformed Aristotle according to Catholic postulates, Hobbes did the same according to Protestant postulates. The "soul" was naturalized as the "mind" by virtue of Hobbes' nominalist logistical method of reifying written verbal products, placing "reasoning upon a linguistic pedestal" (Kantor, 1969, p. 49). Nevertheless, Hobbes further systematized psychology by attempting to deal with psychological events, such as imagination, thinking, speech, volition, and social behavior, following the model of *De Anima*.

According to Kantor, Rene Descartes (1596-1650) did not offer any systematization of psychological phenomena. Instead, Descartes' contribution lies in his emphasis on the natural components of behavior. The construction of organismic action likened to a machine was already introduced by earlier Renaissance physiologists who mechanized the organism on the foundations of Copernicus' construction of a cosmic machine. Descartes' emphasis was on the "double action" of the soul and body, together comprising human action. Because they do not have a soul, nonhuman organisms only behave as nonliving machines. The human soul, in contrast, is responsible for perception, imagination, dreaming, thinking, and feeling on a continuum from independent action of the soul to those passions of the soul arising from the mind-body connection. Kantor observed that Descartes' action-passion analysis became problematic due to his difficulty in explaining how an independent, unified soul is also connected to the body.

Despite Descartes' dualism, his contribution toward the reemergence of a scientific psychology was naturalistic in the sense that he established an institution of "taking into account the actual structure and behavior of organisms" (Kantor, 1969, p. 61). Descartes treated the realms of soul and body as both belonging to the domain of nature, but established the "basic subject matter of psychology [as] the soul or mind, a unified entity, a 'res cogitans' which performs the cognitive processes and determines the movements of the body" (Kantor, 1969, p. 54). Clearly, Descartes prepared psychology for cognitive interpretations of psychological phenomena, and thus his impact on the history of psychology.

The next contributor Kantor identified with naturalization of the soul is Gottfried von Leibniz (1646-1716). Leibniz developed an unsystematic yet highly influential theory of evolving monads, with God as the supreme monad. Leibniz's "spiritualistic atomism" achieved a harmony between diverse naturalistic ideas of the time (e.g., corpuscularity) and transcendental ideas by providing a solution to the mind/body problem that plagued Descartes. The solution was the perspective of psychophysical parallelism. Since matter and spirit were two separate and distinct things, they did not interact; instead, like two perfectly synchronized clocks, once set in motion, they ran in perfect harmony. Leibniz also prominently influenced later psychology, according to Kantor, with the doctrine of apperception or the unified mind. Spiritual monads exhibit different stages of clarity, the highest is complete clarity of cognition or the "mental activity of self-consciousness as well as the consciousness of things" (Kantor, 1969, p. 64). Since spiritual monads are always in relative action to one another, their consciousness may be unperceptual to man, hence the construction of "levels of consciousness," particularly the "unconscious."

Calling John Locke (1632-1704) the "Father of Mentalistic psychology," Kantor (1969, p. 86) stated that one cannot overestimate Locke's place in the history of psychology. Setting the foundation for psychology's later experimental phase, Locke minimized theological implications of the soul (e.g., problems of salvation) by emphasizing problems of human knowledge. Locke transformed soul into psychic particles, which he called "ideas" that, in later times, became mental contents. Thus, while maintaining theological notions of dualism, Locke transformed the naturalized soul into internal mental states and established the subject matter of psychology as the mind. He did this by transforming a theological soul into the mechanism of knowing and then, by concentrating on epistemology, he focused attention on psychological processes, renaming the soul "understanding."

Age of Enlightenment (1700-1800). Kantor (1969) contended that a "great revolution in the spiritistic tradition" (p. 91) took place during the Age of Enlightenment. From an interbehavioral perspective, "revolution" is not a reference to Kuhnian paradigm shifts (see Kuhn, 1962), but rather to "intensified evolution." From Kantor's perspective, there is never a true break in the historic continuum of events. Nevertheless, changes during the 18th century were identified as revolutionary because philosophers of this time departed from a theological epistemology. In doing so, they humanized the soul. Identifying this revolution as the "Berkeley/Hume revolution," Kantor (1969) described four stages: secularization, anthropomorphism, epistemization, and transformation into the mind. Secularization resulted when God became less remote and the soul became more important for worldly knowledge than redemptive action. Anthropomorphism further naturalized the soul by emphasizing the soul's human aspect over its divinity. Epistemization emerged as a psychological institution when doctrines were set forth that established both the process and content of knowledge as mental. Finally, constructions of the soul were transformed into constructions of a mind, for instance, as experience and consciousness. Although the naturalization of the soul brings transcendental doctrine into psychology, it also paradoxically provides for the development of psychology as a positivistic science in that the activities of the soul were then constructed as something observable and, consequently, subject to scientific study. Given that observations result in data that can be organized systematically, the opportunity for system building is established. Nevertheless, as it developed throughout the 18th century, psychology remained a philosophical discipline.

Materialism. Another significant contribution to an evolving naturalistic science of psychology during the 18th century was materialism. According to Kantor (1969), materialism had been misinterpreted by historians as something other than a dualistic philosophy. Instead, Kantor contended that materialists were atheists who accepted mind faculties. The materialist movement resulted in three important consequences for the development of scientific psychology. First, materialism upset transcendental intellectual traditions that discouraged a naturalistic view of psychology. Second, materialism decreased the influence of beliefs in transcendental powers by establishing the power of matter over mental phenomena. Third, by emphasizing the body, materialists could regard observable behavior as an appropriate subject matter for psychology.

As described, the 18th century brought systematization back into psychology, in addition to an early manifestation of naturalization via transformations of soul doctrine. During the 19th century, psychology was further naturalized, primarily through quantization. Interestingly, psychology's acceptance as a quantitative science can be attributed to arguments *denying* the possibility of applying mathematical principles to psychology. The champion of this position was Kant.

Quantization

Immanuel Kant (1742-1804) declared that quantization was vital to science and, because psychology is not subject to quantitative treatment or experimentation, it could not be a science (Kantor, 1969, p. 234). Based on the premises that the foundation of natural science lay in *a priori* laws of mathematics and that the subject matter of psychology was internal psychic states, Kant argued that psychology could never be more than descriptive. According to Kant, natural science must involve more than an empirical component; that is, it must derive from more than experience alone. Science proper is derived from rational, *a priori* laws; however, the continuous flow of psychic states cannot be isolated as objects and, therefore, is immune to *a priori* mathematical laws. Further, as temporally historic events, psychic phenomena can only be constructed along a single dimension of time. Thus, Kant laid the logical foundation for defining what is and what is not science.

Johann Herbart (1776-1841) challenged Kant's view, stating that mental states were composed of atom-like units that reflected dimensions not only of time but also of intensity. Herbart constructed a "mechanics of the mind," where atoms or ideas that reach a strong intensity could overcome counterforces of already existing ideas and move across the threshold from an unconscious domain into the "apperception mass" (e.g., consciousness). According to Kantor, Herbart's contributions toward a re-emerging naturalistic psychology can be found in four areas. First, Herbart's model and his preoccupation with mathematics suggested that psychology's subject matter was not spiritualistic. Second, Herbart argued that psychology should follow strategies of other sciences. Third and fourth, two accepted doctrines were upset by Herbart: that measurement or manipulation must precede quantification and that measurement can only be of "quantity." Herbart argued that sciences such as astronomy were scientifically valid despite the fact that measurement of planetary orbits followed quantification of hypothesized elliptical orbits. He also argued that "quality" was a scientifically valid measure and that it is quantifiable.

Experimentation: The Protobehaviorists

According to Kantor (1969), the importance of experimentation for scientific psychology was methodological. While the psychophysicists engaged in what they thought was a study of mental phenomena, the procedures they developed actually provided the method for studying observable events (e.g., responding). Thus, Kantor called experimental psychologists of this era "protobehaviorists" because, despite holding to mentalistic assumptions, their methods were behavioral. The work of Fechner, Wundt, Brentano, and Helmholtz is included in this category.

Gustav Fechner (1801-1887) was both an extreme mystic and the founder of experimental psychology, thereby exemplifying the paradoxical nature of psychology's evolution. Fechner's primary aim was to establish the relation between the body and the soul. Wilhelm Wundt (1832-1920) and Hermann von Helmholtz (1821-1894) extended Fechner's methods to a more general exploration of how a psychophysiological organism operates. Helmholtz turned to a study of visual and auditory perception and Wundt to perception, attention, and reaction time. In contrast, Franz Brentano (1838-1917) attempted to study psychological events without physiological measurement.

The work of the Protobehaviorists was steeped in mentalistic philosophy, thus their contribution to scientific psychology lay in the development of apparatus and procedures rather than scientific descriptions and laws. According to Kantor, psychophysical measurement confused events (i.e., directly confrontable, naturally occurring phenomena) with constructs (i.e., descriptions and interpretations) and confused manipulation with experimentation. Mentalistic constructions of what events are supposed to involve undermined an objective description of events as observed. Additionally, mentalistic constructions precluded true experimentation in that the hypotheses underlying manipulations were based on nonnatural (i.e., unscientific) assumptions. Nevertheless, because the psychophysicists were actually studying observable responses, their work contributed to an experimental psychology. Kantor (1969) contended, however, that the contributions of 19th century psychophysicists had been overestimated by historians:

> Although to be sure it did establish experimentation as the most potent technique for naturalizing psychology and the soul ever invented, in actuality such an indirect and analogical manipulation of occult processes can only accidentally be brought into context with authentic psychological science. (p. 295)

Evolution

According to Kantor (1969), the theory of evolution had greater impact for scientific psychology than did experimentation by the psychophysicists. An intellectual tradition was founded that resulted in a definite scientific gain for psychology, as well as for the culture overall. The doctrine that humans, by virtue of the soul, are fundamentally superior and different than non-human animals was weakened. Additionally, Aristotelian biopsychology was restored. The “notion of natural selection...made for a much more naturalistic treatment of the human being than had been possible under the domination of notions of special creation” (Kantor, 1969, p. 308). The soul was further naturalized by virtue of evolutionary theory.

Evidence of the overriding influence of the mentalistic tradition, however, could still be found in the application of the theory of evolution to the mind. The mind was viewed as susceptible to the same governing principles of selection that determined physical characteristics. Thus, mentality was then viewed as having inheritable characteristics. In addition, mentality was explained by appeal to biological characteristics and, further, the connection between biology and mentality was distorted by associating mental processes with the nervous system. Consequently, Kantor (1969) concluded that, as with quantification and experimentation, evolutionary doctrine contributed to a scientific psychology only indirectly.

During this period of the late 19th century, psychology underwent a great expansion. Psychologists became involved in the military, industry, education, and medicine. A number of specializations emerged, including child, comparative, physiological, social, clinical, applied, and educational psychology, as well as psychometrics and psycholinguistics. This expansion notwithstanding, Kantor (1969) held that psychology had not achieved scientific rigor or substance. From an interbehavioral perspective, what might be construed as *scientific* psychology was limited: The subject matter must be naturally occurring interactions between organisms with objects and events of the environment (Observer, 1976). Nineteenth-century psychology was imbued with mentalistic assumptions and was therefore unscientific from Kantor’s perspective. Nevertheless, 19th century psychology laid the groundwork for an important change–the behaviorist revolution.

The Second Cycle: Naturalistic Era (1900s)

Conditioning

Stemming from the work of Ivan Pavlov (1849-1936) and Vladimir Bechterev (1857-1927), the conditioning movement brought psychology back to a naturalistic perspective. Developed from the study of reflexive behavior, conditioning–as a psychological phenomena that could be studied scientifically–soon became equated with learning. The conditioning movement's overwhelming importance in the history of psychology resulted from its generalization to learning and then to other psychological phenomena. This generalization is reflected in the number of psychological systems based on physiological conditioning. As a foundation to the behaviorist revolution, conditioning provided an objective model for the explanation of many psychological phenomena without superimposing supernatural or mentalistic constructions.

Behaviorism

The significance of behaviorism in moving psychology into the scientific domain was its "partial freeing of the discipline from the shackles of the spiritistic viewpoint..." (Kantor, 1969, p. 357). Whereas 19th century psychology contributed quantization and experimentation, not until the 20th century behaviorists rejected mental phenomena as the subject matter of psychology did scientific psychology begin to develop.

Behaviorism evolved slowly over the course of a number of decades. Early in its evolution, John Watson (1878-1958) settled on the study of animal behavior where there was less need for postulates about mentality or consciousness. Emerging from Watson's methodological behaviorism was a "retreat from any consideration of mentality" and "the strict denial of the existence of any such psychic factor" (Kantor, 1969, p. 361). Other varieties of behaviorism included molecular behaviorists, such as Pavlov, who focused on neural mechanisms as substitutions for psychic intermediation, and molar behaviorists who focused on the physical action of the whole organism. A version of molar behaviorism, behavioralism, concentrated on procedures of behavior change. Clark Hull's (1884-1952) mathematico-deductive theory of rote learning was an extreme form of behavioralism.

One of the most significant contributions to psychology by the early behaviorists was the recognition that basic assumptions underlying psychological science should be formally examined. Such was the contribution of Albert Weiss (1879-1931), who published his formal system of postulates for behavioristic psychology in 1925. Not only did Weiss provide clarity and order for psychological science, but he demonstrated the importance of articulating protopostulates and metapostulates for building a coherent scientific system.

According to Kantor, the most striking feature of the behaviorist revolution was its attempt to depart from traditional transcendental institutions. Early behaviorism, however, was not a wholly naturalistic enterprise: Identifying behavior as the only appropriate subject matter of psychology did not presuppose that mental phenomena do not exist. Thus, as a naturalistic or scientific perspective, behaviorism did not fully achieve this scientific goal. Instead, Kantor (1969) wrote that behaviorism came "almost full circle back to mentalism" (p. 368). Five points of critical evaluation led Kantor to this conclusion: dualism, specialism, analogism, reductionism, and organocentrism.[5]

According to Kantor, a dualistic tradition was maintained in behaviorism by retaining the "traditional view of body" in mind-body dualism. The body is thus presumed to contain determining properties–such as "genetic factors, organic needs, drives, and structural determiners of action" (Kantor, 1969, p. 366)–heretofore attributed to the mind. Specialism in arbitrarily selected aspects of psychology, such as animal conditioning and learning or perceiving and sensing, produced an oversimplification of general psychology and a neglect of complex types of behavior such as imagining, feeling, and thinking. Analogism, that is, mechanical and electrical models of human behavior, such as artificial intelligence, is reflective of the time when nonhumans were considered as machines. Reductionism, particularly physiological reductionism, simply replaces mental and psychic explanations with physiological explanations. Finally, organocentrism misdirects the behaviorist to exclude the stimulus side of adaptation to the environment. This overselectivity on responding of the organism provided for mentalistic constructions of purposiveness.

Interbehaviorism

Kantor (1969) concluded that for behaviorism to move psychology fully into the scientific domain, the rejection of mentalistic institutions is not enough. Instead, psychological scientists must adopt a field orientation (see Smith, "The Interbehavioral Field," this volume). Kantor (1946) argued that, eventually, all sciences develop a field orientation. For psychological science, only a field orientation allows for a completely naturalistic treatment of complex psychological events. Because equal emphasis is placed on both responding and stimulating, in addition to all relevant factors surrounding responding and stimulating, psychology's subject matter is not restricted and, thus, includes events such as thinking, imagining, feeling, and remembering.[6]

Conclusion

Kantor's (1963, 1969) two volumes of *The Scientific Evolution of Psychology* are rich with historical insights, particularly with regard to the evolution of mentalistic thinking in psychology. Although some events in the history of psychology are treated in detail, many names and movements are mentioned but briefly in the context of the Zeitgeist. Thus, the texts are probably appropriate more for the advanced than the beginning student. Nevertheless, any reader will find many interesting and, at times, provocative historico-critical analyses of psychology's history. For the experienced scholar of history, *The Scientific Evolution of Psychology* is a work of the kind that lends itself to repeated readings. Each revisit can provide new and thought-provoking insights.

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Endnotes

[1]See Kantor (Observer, 1983) for a discussion of how history helps scientists identify their subject matter and how such knowledge is of primary concern; the utility of this knowledge is secondary.

[2]Interestingly, Wertheimer (1980) cites Kantor (1964) as defending the position that there is no value in history. This is a misinterpretation of Kantor's position, however. Kantor objected to only particular types of history, for instance, histories that superimpose later cultural beliefs on interpretations of past events.

[3]In-text references were analyzed for only Volume I because this volume covers a period where most of the available documents are translations or in languages other than English. Given this, Kantor's bibliographic and in-text ratios of primary to secondary sources are extraordinary.

[4]The terms "mankind" and "men" are used instead of less sexist terms because these are the terms used by Kantor. Histories of psychology are predominately histories of men and not women. During much of psychology's history, women were considered biologically and psychologically less capable to men. Although no less than others, Kantor's history does not portray historical events as experienced by women. This does not, however, imply that Kantor's history is without merit.

[5]Kantor (1969) does not delineate between different types of behaviorism in his criticisms of behaviorism. Consequently, from a historiographic perspective, Kantor might be criticized as contributing toward origin myths in that confusions between earlier forms of behaviorism, such as Watson's S-R behaviorism, and later forms, such as Skinner's operant behaviorism, are maintained. In fact, Kantor does not identify operant behaviorism by name or mention Skinner at all in *The Scientific Evolution of Psychology*.

[6]Although Kantor (1969) did not mention operant psychology by name, a number of his criticisms of behaviorism in support of a field orientation appear to target a three-term contingency analysis (Michael, 1985; Skinner, 1953). Examples include: "stimuli do not occur prior to the organism's actions or cause the latter to occur" (p. 379), "behavioristic psychologists have for decades provided examples of a confusion of conditioning and learning with psychological events" (p. 380), "to regard the actions of the organism as dependent variables and the actions of the stimulating objects and events as independent variables is simply to plant oneself in the frame of reference of traditional causal philosophy" (p. 380), and "all behavioral changes, whether gains or losses, are changes in total fields...not just a change in an organism" (p. 382).

Author's and Editors' Note

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Thanks go to Marc Wruble who long ago suggested, unknowingly, the title for this chapter.

Chapter 3

The Nature and Value of Scientific System Building: The Case of Interbehaviorism[1]

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J. R. Kantor's (1888–1984) lifelong mission was to articulate a natural science of psychology. The motivation for this work arose from two sources. First, Kantor regarded psychological events to be an important series of happenings in their own right, about which no satisfactory treatment had been achieved. Second, he felt that a more satisfactory treatment of psychological events would facilitate the work of other scientists in their inevitable encounter with psychological issues (Kantor, 1959, p. ix).

Kantor provided no justification for adopting the perspective of a scientist in contrast to that of some other type of worker. Rather, he took this perspective as a starting point from which he argued that until events were made *available* for scientific study by way of their incorporation into a scientific system, there could be no scientific understanding of them (Kantor, 1959, pp. 53-66). Thus, his mission of forging naturalistic constructs for psychological events could be achieved only through scientific system building, and this was the activity that occupied his entire career. In fact, system construction is a hallmark of interbehavioral psychology.

This paper focuses on system building and its aim is threefold: (a) to clarify the nature and value of scientific system building from Kantor's perspective, (b) to articulate Kantor's system-building procedure, and (c) to outline the system of interbehavioral psychology produced in accordance with that procedure. We begin by examining a small number of presuppositions upon which Kantor's view of science and the aim of his system building efforts were formulated as a means of general orientation to his perspective.

First, as is the case for all scientists (Hayes, 1993, 1997), Kantor assumed the existence of the natural world, in his terms, of a "manifold of events....Each science, including psychology, isolates some phase of this manifold for its special object of study" (Kantor, 1959, p. 72). Generally, he noted that different descriptions and interpretations are possible (e.g., chemical, biological, psychological) of this manifold of events, and argued that scientific activities of these sorts can be distinguished from similar activities characteristic of other domains of knowing (Kantor, 1953, p. 5). Second, he assumed that only the products of scientific description and interpretation can show the properties of validity and reliability, and that only valid products may be characterized as to their adequacy and usefulness (Kantor, 1959, p. 41). Third, he believed that knowledge can show progress over time, but only when it is the product of scientific activity (Kantor, 1953, pp. 6-8; 1959, p. vii). Kantor further noted that scientific constructions can be, and typically are, subject to influence from nonscientific sources. He argued that this influence undermines their validity, and thereby their significance, and is further detrimental to the progressive development of scientific knowledge (1959, p. 39).

With this preliminary orientation to Kantor's views articulated, we now consider them in greater detail. We begin by articulating Kantor's views of science, followed by his views of scientific systemization.

Characteristics of Kantor's System Construction

Kantor's interests and contributions to science, and in particular to psychology, were unique. Much like Einstein, Kantor involved himself not simply in the study of events, but in the formulation of what it means to conduct scientific activity. Recognition and fad were not his motivation; he was a serious scholar, a visionary. In his early years, he searched for a naturalistic comprehensive scientific system that addressed the psychological domain and found none. Subsequently, he devoted his life to articulating such a system to fill this void. His goal was to make a science of psychology possible and available to others who wished to study psychological events in a rigorous, naturalistic manner. His writings are voluminous; his attention to detail, unsurpassed. In the most elegant sense, he was a pioneer, a maverick, and a crusader for improvement of scientific systems in general.

Because Kantor developed the system of interbehavioral psychology from the ground up, his discussions regarding the system and system construction in general were technical. Consequently, Kantor's writings can be difficult due to the careful and lengthy attention given to the development of all constructs, including their conceptual development set within a detailed historico-critical analysis. However, he was never unnecessarily technical; each term or construct had a special place within the overall system, and any description for the reader was therefore a technical encounter. Any difficulties associated with his writings, then, are not necessarily due to an intractability of his writing style or, for that matter, to an intractability of interbehavioral psychology. Instead, these difficulties simply involve a lack of appreciation for Kantor's selective point of view, especially where readers have a difficult time appreciating the need for a radically naturalistic system of psychology. Given that the purpose of this paper is to assist the reader in understanding Kantor's scientific system construction, we devote some time in providing some general information that will help the reader appreciate and understand Kantor's views on system construction.

The Interbehavioral Continuum

A seminal point of Kantor's writings was the fundamental assumption that all events are similar in their most basic character, that is, all events develop (or evolve) in a spatio-temporal framework and nothing fundamentally makes their direct study impossible (Kantor, 1959, p. 42). In this sense, according to Kantor, all events are fundamentally continuous and any class of events, including psychological events, allows for the possibility of direct study. To illustrate this point, Kantor turned to his *schema of evolutionary continuity,* which outlined this complete and exhaustive continuity into four distinct evolutionary intervals: (a) planetary evolution, (b) phylogenetic biological evolution, (c) ontogenetic biological evolution, and (d) psychological interbehavioral history (Kantor, 1959, p. 43). The first interval, planetary evolution, includes the development of all the planets and stars, as well as of chemical elements, compounds, and processes. The second interval, phylogenetic biological evolution, includes the development of all plants and animals (species, genera, phyla), as well as of biological organism-environment adjustments and adaptations. The third interval, ontogenetic biological evolution, includes the embryological development of individual organisms. The fourth interval, psychological interbehavioral history, involves the evolution of acts and traits (behavior) in relation to objects, conditions, and cultural institutions.

These evolutionary intervals represent all possible events that humans might go about explaining in a scientific manner, that is, all scientific disciplines can be defined in relation to one, or more, of these intervals and nothing falls outside of these domains. The fourth interval represents those events most closely defining the subject matter (or events) at the level of analysis we call *psychology*. This continuity is more completely appreciated when one understands (a) that these intervals include all the types of events that are amenable to scientific analyses, (b) that each interval involves only events that are spatio-temporal, (c) that each interval is inextricably related to the others (i.e., they make up the same continuum), (d) that these intervals, although interwoven and related, are never the cause or the source of the other, and (e) that scientific activity cannot transcend them and arrive at Ultimate Truths.

The continuum's significance. The significance of the evolutionary or interbehavioral continuum, especially for those first acquiring knowledge of Kantor's psychological system, is twofold. First, it naturalizes all events (Kantor, 1959). Any event, whether an inorganic process or a highly sophisticated psychological act (e.g., reasoning, remembering), occurs as a concrete spatio-temporal event. Ontological dualism is rejected. Kantor's response was to deny any possibility that other types of events may affect or control events specified within the evolutionary continuum. At no time can scientific description involve the use of terms that refer to events occurring outside spatio-temporal boundaries. Therefore, the idea that a non-spatio-temporal mind, consisting of ideas, beliefs, attitudes, and the like, is necessary to describe psychological acts was completely refuted (Kantor, 1959, p. 42). In fact, by Kantor's standards, any system designed with these qualities would be regarded as proto-scientific, lacking scientific validity due to its reliance on events transcending this continuum. The following helps to clarify Kantor's (1959) position on evolutionary continuity:

> The interbehavioral continuum allows for no break between psychology and other types of scientific enterprise. Every psychological event, like the events handled in any science, consists of the interbehavior of objects, though it must be specified that psychological and biological events involve the interbehavior of an *organism* with stimulus objects. Even the most outstanding differences between psychological and other kinds of events…entail no fundamental variation in character. (p. 42)

A second significant aspect of the evolutionary continuum is directly related to the boundaries that separate each of the four intervals. Due to the continuous nature of the evolutionary continuum, events specified within the continuum play no type of conventional causal role with respect to one another. Therefore, one interval is not responsible (or causal) for any other. The implication is important. In Kantor's system, there was no causal reductionism. For instance, no psychological event can be described in biological terms, nor can a psychological event be said to be caused by a biological event. According to Kantor, psychological events must be described in purely psychological terms. Kantor's system of interbehavioral psychology, including its foundations in system construction, was designed to make the scientific description of psychological events possible in specific psychological terms. The evolutionary continuum is essential for an understanding of Kantor's system construction and his system because it specifically rejects all references to a non-spatio-temporal mind or any attempt to explain psychological events in terms of biology or any other scientific enterprise. With the nature of the evolutionary continuum now described, we continue the discussion of system construction.

Science as a Concrete Activity

Kantor (1959, p. 31) described science as an enterprise for ascertaining the structure, operation, and interrelation of things and events. He emphasized the need to recognize (a) that science is a concrete activity, that is, an activity performed by people, (b) that these activities are subject to cultural influences like any other form of activity, and (c) that these cultural influences can be in direct opposition to the basic tenets of any reasonable scientific enterprise when they are derived historically from non-scientific sources of cultural life (Kantor, 1959, 1962). Therefore, the scientist, as a system builder, has an obligation to discuss events in terms that strictly characterize an authentic science, instead of relying on pre-established cultural biases.

System construction and event availability. By *authentic* science, Kantor was referring to a science that was fully and explicitly postulational and based on the notion of evolutionary continuity (Kantor, 1959). He argued that the underlying assumptions of any authentic scientific system were explicitly stated and organized, and thus were never left to simple happenstance or the result of muddled, disorganized activities. It is precisely Kantor's type of systemization that creates a particular scientific point of view and without these efforts there can be no systematic scientific orientation with respect to events (Kantor, 1959). Among scientists' primary tasks is to avoid contaminating their research with traditional attitudes or with considerations that originate in adjacent areas of cultural life. It is the activities involved in explicit system construction that actually make particular events available for scientific analyses. Prior to any concrete system construction, particular events may be available, but only in terms of a pre-scientific interest in them (e.g., language phenomena) and consequently these events are not, yet, scientifically available. Thus, the need for explicit system construction.

For Kantor (1959), system construction referred to concrete activities of persons in specifying the role of the observer and the fundamental nature of events. Accordingly, all scientific activity must begin and end with reference to concrete events. Only then can the structure, operation, and interrelations of events be articulated in a systematic manner appropriate to their specific description. Kantor (1959) also emphasized that all scientists come into contact with the same general things and events, such that scientific enterprises simply differ with respect to what aspect of these things and events they study. This constitutes a specific subject matter. His main objection to mentalistic and physiological approaches to psychology was due to their lack of concern for events that were explicitly psychological (Kantor, 1959, 1962). That is, mentalistic systems dealt not with concrete events, but rather with supposed psychic events, while physiological systems favored the study of physiological events. This is what set Kantor out to construct a system appropriate for the scientific study of psychological events. In short, as it was derived from system construction, interbehavioral psychology makes psychological events scientifically available.

Types of Scientific Propositions

For Kantor (1959), no system was complete without the specific recognition and articulation of assumptions–termed postulates, when formally stated–that affect the scientist's relationship with events. There are two general types of assumptions. The most general is the analysis referred to as the *logic of science*; the second arises from a set of basic assumptions regarding the interbehavioral field itself (Kantor, 1959, p. 69).

Assumptions pertaining to the logic of science are called *protopropositions* and are comprised of both definitions and postulates, while the assumptions pertaining to the specific formulations of a particular science are called *metapropositions* (Kantor, 1959, p. 69). The *metasystem,* in turn, constitutes the working basis of a science, the distinguishing definitions and assumptions essential to and characteristic of an individual science, which is formally called the *system proper.* Kantor's system proper articulated appropriate definitions, postulates, data, variables, units, investigative operations, and product constructions (laws, theories, etc.) specifically engineered (or constructed) for the interbehavioral system. Because the protopropositions represent the fundamental assumptions of scientific activity, or a logic of science, they are not formally included in Kantor's interbehavioral system, which specifically addresses psychological events. However, these propositions are an essential element of Kantor's overall system construction because they represent the fundamental assumptions concerning the nature of science upon which the interbehavioral system itself rests (Kantor, 1959, p. 69).

Science

Isolation of the Scientific Enterprise

Kantor (1959) isolated the scientific domain by identifying its boundary conditions. In his words:

> Scientists and their operations occupy a middle ground between two enormous bordering areas. On one side is the mighty stream of natural events, on the other, the mass of cultural institutions which influence the worker's hypotheses, procedures, and interpretations. (pp. 37-38)

To understand the work and products of science, we must first take account of these two bordering conditions.

The manifold of events. The "stream of natural events" was understood by Kantor as an evolving field of interactions among the things and events conceptualized collectively as the existent natural world. Although impossible to list or classify because of their vast numbers, these events may be said to vary from directly visible objects to exceedingly subtle aspects and relations among them (Kantor, 1953, pp. 16-17). In taking account of these more subtle aspects of natural events, Kantor addressed what he called spurious problems of reality, namely, the view that the independent existence of the natural world is subject to doubt. In his view, such problems arise from confusing events with scientists' reactions to events, such that scientists are sometimes led to believe that their observations contribute to the existence of the things observed. Kantor argued that the events and our reactions to them can be differentiated and, in so doing, he assumed the independent existence of the natural world (1953, pp. 17-18).

Cultural institutions. The "mass of cultural institutions" referred to the cultural circumstances in which scientific work occurs. As Kantor (1963-1969) related in his two-volume history of psychology, *The Scientific Evolution of Psychology*, "All the sciences in their branches and specializations evolve as a unified constellation. They all arise out of a common matrix of events" (p. 18, Vol. 1); also "the soil or cultural matrix in which each particular institution germinates and grows consists of the specific societal circumstances which provide the conditions of origin and development" (p. 32, Vol. 1). Kantor's point was that scientific activities and products are continuous with the activities and products of other cultural enterprises.

Kantor further argued that cultural circumstances influence the origins of specific enterprises, the problems they address, and the character and use made of their products (1953, p. 45; 1959, p. vii). No matter how highly evolved scientific enterprises become, they carry with them their basic cultural characteristics (Kantor, 1953, p. 46). This notion is fostered by the fact that science has not originated or flourished in every society, but is rather a characteristic of particular cultural arrangements favorable to scientific development. From Kantor's (1959, p. 8) perspective, cultures in which philosophical dualism is adopted as the dominant organizing theme represent the greatest threat to this development. The influence of culture on science is not a one-way process, however. That is, once scientific institutions have arisen in a culture, they may become powerful enough to exert a reciprocal influence on that culture (Kantor, 1953, pp. 48-50).

The Nature and Purpose of Science

Within the two bordering areas of events and culture is the enterprise of science, characterized as the set of unique activities involved in determining (a) the existence of things and events and (b) the characteristics of those things that do exist (Kantor, 1953, p. 4). Among those characteristics are the structure and operations of things and events, as well as their interrelations with other things and events (Kantor, 1959, p. 31). To examine this enterprise, Kantor adopts an observational procedure: Science is an activity of specific workers, operating upon specific materials, with specific instruments, under specific cultural circumstances, producing specific products.

Having articulated Kantor's understanding of the manifold of events and views concerning cultural auspices, we turn now to a selection of the other elements making up Kantor's description of science. For reasons explained below, the discussions of the scientific worker and the work of scientists are collapsed and the tools and instruments with which scientists operate are not specifically addressed.

The work of scientists. As a biological entity, the scientific worker falls outside of the psychological domain as understood by Kantor (Kantor & Smith, 1975, pp. 4-8). In psychological perspective, the scientific worker is the cumulated interactions of the scientific worker with things and events that *constituted* the scientific worker. In other words, the worker is essentially the work. The significant fact to acknowledge about the scientific worker, so understood, is that whenever there is a scientific worker, there is an interbehavioral history with which to contend. This history of psychological *interaction*s was conceptualized by Kantor as an aspect of the stream of natural events. As discussed earlier, the stream of events is described as an interbehavioral continuum in which previous evolutions of inorganic, phylogenetic, and ontogenetic events culminate in the interbehavioral history of an individual organism (Kantor, 1959, p. 43). One significant implication of this understanding is that psychological events, including the activities of scientists, are held to be continuous with, and a culmination of, all other events participating in the complex field of natural occurrences.

While continuous with the activities of all other types of workers, scientific activities can be distinguished on the basis of certain characteristics more common to the scientific enterprise than to others. In this regard, Kantor (1953, pp. 6-7) suggested that scientific work is serious or consequential work, the implication being that it is productive of useful information. Further, scientific work is said to involve *discovery*, the implication being that its products involve a factor of novelty or originality. That is, if the scientific enterprise is successful, something new emerges, something frequently incompatible with previous conditions (Kantor, 1953, p. 7). These characteristics of scientific activities and their outcomes are not possible in the absence of methodological precision and intentionality with regard to goals. Accordingly, scientific work is more definite and deliberate in its organization and operation–that is, confronting concrete events–than are other pursuits (Kantor, 1953, p. 5).

> The basic work of science consists of so interbehaving with things and events as to increase our knowledge of them. Only by examining and manipulating things and events do we obtain knowledge and control....All scientific contacts with things have one primary goal–the ascertainment of their nature: their constitution and organization. The organization of a thing includes its interrelations with other things resulting in various changes and transformations. From such manipulative contacts scientists proceed to describe and explain things. They are then prepared for the further interbehavior of prediction and control. (Kantor, 1953, p. 13-14)[2]

In more specific terms, Kantor (1953, pp. 15-16) outlined four general types of scientific procedures: direct observation, instrumental observation, transforming contacts, and remote observation. Direct observation is distinguished from the other three in that it occurs with a minimum of manipulation of the objects under study. Instrumental observation and transforming contacts involve direct manipulations of objects and events so as to facilitate observations of them and their relation to other objects and events. Remote observation, among which Kantor included generalizing and analogizing activities, is described as inferential in nature. Despite the indirect character of remote observations, Kantor was careful to point out that they are founded, ultimately, on directly encountered events. In his words: "The chain connecting the worker and the thing upon which he operates may consist of many links, but it is characteristic of scientific work that the connection is rigidly maintained" (Kantor, 1953, p. 16).

The products of the work. Given that science is an activity of specific workers, operating on specific materials, with specific instruments, under specific cultural circumstances, no means exist by which the products of scientific work could have universal and absolute characteristics, as is sometimes claimed (Kantor, 1953, pp. 3-4). In other words, the products of scientific work do not consist of *static truths*. On the contrary, "Science is perennially in a formative stage" (Kantor, 1953, p. 25). This admission of tentativeness does not suggest that the outcomes of science are without value. Their value is observed in the extent to which they provide for more effective interactions with nature. A result is not achieved with respect to all things in all circumstances at once, but rather with regard to some things in some circumstances progressively over time. Indeed, from Kantor's perspective, the cumulative character of science not only distinguishes it from other endeavors, but is also the very source of its value.

In this light, Kantor articulated a number of specific products of scientific work. The primary outcome, as previously mentioned, is a new orientation to things and events in the form of ideas and knowledge concerning their structure, operations, and interrelations with other things and events. From these outcomes emerge what Kantor regarded as the most effective and valuable of scientific products, namely, scientific laws (Kantor, 1953, p. 25). In addition to these outcomes, Kantor cited two others. First, societal attitudes toward science might change as a result of scientific activity. Kantor argued that this may be important in itself, as well as constitute a condition in which further scientific activity is influenced (Kantor, 1953, p. 25). Again, the enterprise of science does not operate outside the bounds of culture, but rather is an integral part of it. The second of these outcomes is the production of methods, techniques, and apparatus that can be employed in research beyond that in which they were originally developed (Kantor, 1953, p. 24). This final outcome illustrates the cumulative nature of the scientific enterprise in a particularly concrete way.

Kantor (1981b) argued that scientists always operate against a background of propositions of which they may or may not be aware, but which nonetheless influences their scientific work. Explicit articulation of these propositions thereby serves to clarify the scientific enterprises operating under their influence. Moreover, from Kantor's perspective, until these propositions–explicit postulates and definitions–are identified, and scientific constructions are coordinated with them, there can be no authentic science (Kantor, 1959, pp. 57-58). We turn now to a discussion of the nature and purpose of scientific system building.

The Nature and Purpose of Scientific System Building

A scientific system constitutes a collection of formal definitions and postulates (assumptions) concerning such issues as the kinds of events worthy of study and how knowledge of them might be obtained. The definitions and postulates making up such a system are organized, hierarchically, in accordance with the generality or scope of the issues addressed. This organization results in levels of specification wherein definitions and postulates at the highest level (i.e., those concerning events of least generality) are based on specifications at the next lower level, while these in turn are based on even more general specifications, and so on. Scientific systems are organized into a "Ziggurat of Science" by Kantor (see Figure 1). The issues of broadest scope concern the logic or philosophy of science, above which is the metasystem of individual sciences, and finally scientific systems proper, in which particular models of individual sciences are specified.

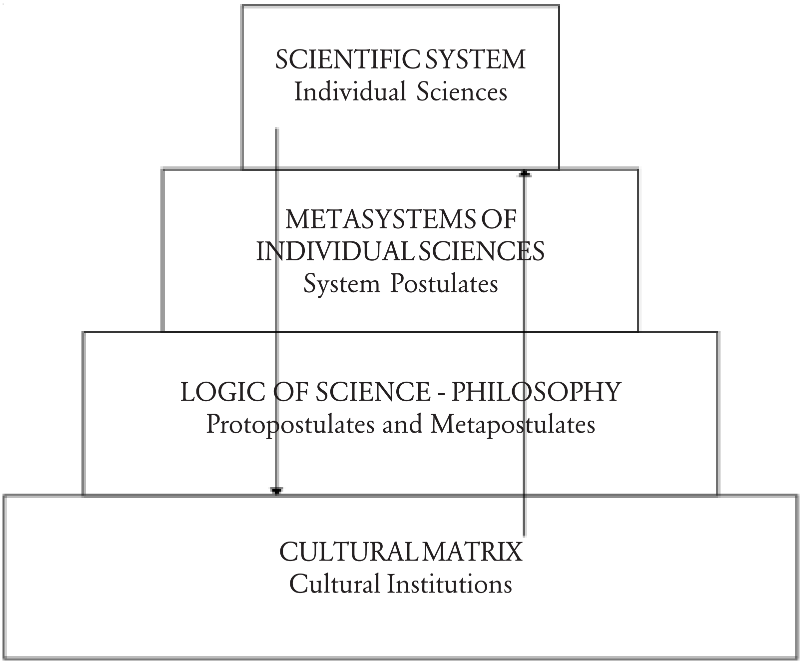

Figure 1. The development of scientific systems through ascending abstractional levels beginning with favorable cultural conditions. Adapted from Kantor (1973, p. 457; 1981a, p. 75) and Kantor and Smith (1975, p. 410).

Postulates are derived from observations of things and events in nature and thereby change as new observations demand. Hence, like all other aspects of scientific work, scientific system building is never complete, but rather is always in a state of progression. However, the products of system building change more slowly than the products of scientific investigation. This is because, in constituting organizations of assumptions concerning multitudes of investigative products, scientific systems are subject to change only as the multitude of investigative products changes. At some point, reformulation becomes necessary, aided by improved criteria for doing so. As a result, the more encompassing the events addressed at a particular level of system construction, the slower will be the pace of change observed at that level. That is to say, the protopostulates of the logic of science may be expected to change more slowly than the metapostulates, followed by the postulates of the system proper. These expectations have been borne out in observations of the products of Kantor's system building over six decades.

Clearly, system specifications regulate all aspects of scientific work, including event selection, investigative practices, and theory construction. Moreover, their explicit articulation allows for periodic evaluations of their scientific serviceability. The task of evaluating the assumptive bases of a particular scientific enterprise has three major components, identified by Kantor (1981a, p. 116) as monitorial, coordinative, and semantic. The first entails a critical examination of the origins and validity of established premises. The second involves coordination of the findings of the various sciences so as to prevent and eliminate contradictions among them, as well as to guard against other problems. The third concerns the way terms are used in the sciences, and serves to prevent semantic confusion and to repair the damage done should it occur.

If the assumptive bases of a scientific enterprise are not explicitly articulated, they cannot be evaluated in this way. Hence, contradictions among findings and interpretations of the various sciences might not be readily detected or, if detected, no guidelines may exist by which they can be eliminated. Likewise, semantic confusion may occur (or even prevail) without notice. Further, because scientists always in some manner operate on a foundation of assumptions, even if not explicitly acknowledged, premises of questionable value might exert a disserviceable influence upon the descriptive, investigative, and explanatory phases of scientific work. The end result is incoherence among the postulates, practices, and products of particular scientific enterprises, as well as ineffective interdisciplinary contacts among them.

As previously discussed, the enterprise of science can be characterized as a serious or consequential endeavor from which emerges new orientations to things and events. This orientation is further said to cumulate and show progression over time. It can have these characteristics, however, only in so far as scientific constructs are valid, and the scientific systems of which they are a part are significant. From Kantor's (1959, p. 3) perspective, validity cannot be achieved unless constructs are developed on the basis of contacts with actual events; and significance cannot be achieved unless influence from non-scientific cultural sources is minimized. Moreover, proper science itself is not feasible in the absence of systemization. We turn now to these provisions for the development of valid constructs and significant scientific systems.

Specifications for Adequate Scientific Systems

Development of scientific constructs. Kantor (1959, p. 40) asserted that "no scientific enterprise will be successful unless the worker derives his constructs from contacts with events. Only then do constructs have any *validity* or *reliability*" (emphasis added). To understand Kantor's position, we must examine, in more precise terms, what he meant by contact with events, as well as what it meant to characterize constructs as valid and reliable.

Event sources. According to Kantor (1959, p. 20), any class of events occurring within the manifold of events is a legitimate area of scientific study. Accordingly, constructs referring to things, events, or processes assumed to exist outside of the manifold of natural events do not constitute scientific constructs. The manifold of natural events is further assumed to show evolution, as represented by the interbehavioral continuum (Kantor, 1959, p. 43). Hence, constructs referring to happenings assumed to fall outside the evolution of natural events are likewise not scientific constructs. Instead, scientific constructs are derived from contact with actual events and refer to a definite series of concrete happenings occurring within the interbehavioral continuum.

Validity of constructs. From Kantor's (1959, p. 79) perspective, levels of events can be differentiated, ranging from crude occurrences, which are quite independent of the scientist's treatment, to verbal descriptions or constructions of those events. Crude occurrences, or crude events, comprise an organism's original adjustments to environmental objects free from formal descriptive constructs (Kantor, 1959, p. 80), while constructs, or refined events, refer to descriptions of those events achieved when the scientist brings an original event into context with scientific interests and activities (Kantor, 1959, p. 80). To put it another way, refined events may be understood as scientific facts.

Valid scientific constructs cannot be developed on the basis of ordinary or superficial contacts with crude events. Rather, the events must be *available* from a scientific perspective. Availability in this context means that the observer must be able to describe them in meaningful terms within a particular scientific system. It is thereby not possible to articulate a valid scientific construct in the absence of a scientific system into which it can be placed.

Coherence of constructs. For a construct to fit within a scientific system, the construct must reflect the definitions and specifications of that system; that is, it must be articulated in such a way that coherence with the system is sustained. A scientific system involves more than the specifications for an individual science. The specifications for an individual science are based on specifications of a broader sort pertaining to scientific enterprises in general. Therefore, a valid scientific construct is not only derived from contacts with actual events within the interbehavioral continuum, but also shows coherence with the metasystem of a particular science, and the logic of science on which that metasystem is based. A construct which fails to meet these criteria is, by definition, not a scientific term, whereupon an evaluation of its scientific validity cannot be made.

Accuracy of constructs. Unlike construct validity, which depends on contact with events and coherence with the system, "accuracy" refers not to the construct itself, but rather, to the behavior of the scientist. In other words, while a construct may be said to be valid, it cannot be said to be accurate. Accuracy refers, rather, to the scientist's activities in making use of a construct, as suggested by Kantor (1959): "Accuracy or serviceability [of constructs] depends entirely upon the scientist's interbehavior with events and his freedom from unrecognized presuppositions" (p. 61). Scientists achieve accuracy with respect to valid constructs only when they use them in relation to proper methods and presuppositions. When a scientist uses constructs in such a way as to violate the specifications of the system, it is the *usage*, not the construct, that is said to be inaccurate.

Development of Scientific Systems

Validity of scientific systems. According to Kantor (1959), "The validity of a system, however, is not affected by the choice of factors to be emphasized but depends primarily upon coherence and congruence" (p. 55). As for coherence of constructs, this is an intra-system issue, referring to the relation of each level of system organization to every other level. As discussed earlier, the validity of constructs, refined events, or scientific facts depends on a number of specifications, among which is their incorporation into a scientific system. In other words, only when constructs are articulated in such a way that they *fit* a system is it possible for them to be incorporated into that system, and hence have the character of validity. Fitness is an issue of coherence: A construct must cohere with the definitions and specifications of the system to fit within it.

Constructs cannot cohere with system specifications unless the latter are themselves coherent because, in the absence of system coherence, there can be no basis on which to judge the adequacy of the fit of the construct. It might, in other words, fit with some system specifications but not with others. The coherence of the system, including the relation of systemic specifications with metasystemic specifications and these, in turn, with specifications of the more general logic of science, is thereby essential to establishing the validity of particular scientific facts.

The coherence of a system cannot be evaluated unless the system is fully formalized. For this reason, Kantor (1959, p. 58) suggested that the goal of system development is full postulation. Moreover, system specifications are subject to influence from non-scientific cultural sources, regardless of scientists' awareness of them, and these influences are given opportunity when postulates are not made explicit. The optimum method of arriving at a secure system, Kantor (1959) suggested, is to assure that systemizing behavior consists exclusively of critically performed operations whereby the constructs of the system remain consistently within the bounds of the interbehavioral continuum (p. 56). In other words, the validity of a scientific system, as with a scientific construct, depends on its having been derived from contacts with actual events.

Significance of scientific systems. Kantor (1959) argued that "a naturalistic logic of science demands that systems be not only valid, but also significant with respect to a particular series of events" (p. ix). From his perspective, the significance of a scientific system can be evaluated only in terms of *other* systems (Kantor, 1959, p. 55). This evaluation is an inter-system issue referring to the serviceability or utility of a system as it pertains to interactions with other systems.

Kantor's logic in this regard bears on his supposition that, although individual sciences are focused on particular sets of events, all such events are isolated from the same manifold; hence, particular sciences constitute points on the same continuum as all other sciences. While all sciences on this continuum are related through a common logic or philosophy of science, a circumstance that permits interactions among them, some are more closely related than others. The closer relation may be owing to any of a number of conditions, among them overlapping subject matters, common methods of operation, and common instruments and apparatus. In such cases, progress in one science might impact progress in another, both favorably and unfavorably. Broadly speaking, progress in science as a whole, as well as in individual sciences, depends on the possibility of interactions among them. Such is possible only when their system specifications show some degree of congruence.

To clarify this issue, Kantor (1959) suggested that "It is possible to construct a perfect 'logical' system by arbitrarily choosing elements and setting up manipulatory rules without regard to anything else than a willfully accepted criterion of consistency" (p. 63). The problem with such a system is that it would be incongruous with other scientific systems and would, as a result, lack serviceability with regard to interactions among them. Such a system would, in his view, be completely lacking in significance.

Kantor's System of Science and Psychology

In this section, we present Kantor's interbehavioral psychology as a scientific system, which includes a logic of science, a metasystem of interbehavioral psychology, and a system proper. Our purpose is to examine its adequacy as indicated by evidence of its validity and significance. We also note modifications of the system as they have appeared in Kantor's articulations of it, from one of his earliest expositions (1918-1919) to among his last (Kantor & Smith, 1975). The system outlined by Kantor and Smith (1975) is identical to that of Kantor (1959), the latter constituting his most formal exposition. For this reason, we take the 1959 exposition of assumptions to constitute the most well-developed of Kantor's system-building products, on which we will evaluate and trace its evolution. We begin at the level of the logic or philosophy of science.

The Logic of Science

The nature and value of protopostulation. When scientists' descriptions of scientific work and their assumptions concerning the nature of science are structured as a set of protopostulates, the latter constitute a logic or philosophy of science (Kantor, 1959, pp. 69-71). Because protopostulates specify both definitions and postulates pertinent to general scientific activity, not to psychological activity in particular, they are not included as a formal aspect of Kantor's system of interbehavioral psychology. The basic assumptions at the logic of science level are nonetheless continuous with the specific propositions of individual sciences, as well as reflective of the cultural circumstances in which they are embedded. Hence, the explicit articulation of protopostulates serves to clarify the scientific systems based on them.

For the most part, protopostulates pertain to the kinds of events subject to scientific investigation, to the investigative activities themselves, and to the products of investigation. In addressing each of these issues, the effects of disserviceable cultural traditions are eliminated accordingly. Moreover, although one of the protopostulates is the claim that scientific systems are corrigible—including the protopostulates themselves—change is slow and it has not been felt in Kantor's philosophy of science: Kantor's protopostulates did not change over repeated presentations. The following protopostulates are taken from Kantor (1959, pp. 70-71).

1. Science is the enterprise of interbehaving with specific things and events which leads to a definite and precise orientation with respect to those things and events (p. 70).
2. Scientific orientation concerns (a) the existence and identity of things and events or their components, and (b) the relationship between either the components of things and events, or between the various things and events themselves (p. 70).
3. No science is concerned with existences or processes which transcend the boundaries of scientific enterprises. No scientific problem is concerned with a "Reality" beyond events and their investigation (p. 70).
4. Scientific orientation requires specialized instruments and methods depending upon (a) the specific characteristics of the events interacted with and (b) the specific problems formulated about them (p. 70).
5. Scientific interactions eventuate in protocols (records), hypotheses, theories, and laws (p. 70).
6. Scientific construction—the formulation of (a) hypotheses and (b) theories and laws—must be derived from interbehavior with events and not imposed upon the events or scientific enterprise from nonscientific cultural sources (pp. 70-71).
7. Culture consists of the events and institutions (religion, art, economics, technology, social organization, and laws) of a specific group of people (p. 71).
8. Scientific enterprises are evolutional; they develop in cultural situations as complex institutions. Scientific domains are cumulative and corrigible. They are completely free from all absolutes, ultimates, or universals (p. 71).
9. Scientific enterprises can be and sometimes are autonomous and fundamental within a cultural complex. Only specific enterprises may cooperate and mutually influence each other with respect to basic investigational and interpretive procedures (p. 71).
10. Applications of (a) scientific findings (records concerning events and their investigation) and (b) investigative results (laws and theories) may be localized within scientific enterprises or in the larger cultural setting of such enterprises. Such applications constitute the authentic basis for scientific prediction and control (p. 71).

The majority of these specifications for science constitute noncontroversial descriptions of scientific events, activities, and products. Exceptions are protopostulates 3 and 8, in which Kantor respectively eliminated certain kinds of events from consideration, and considered certain characterizations of scientific products illegitimate. In essence, these two protopostulates reflect Kantor's biases with respect to the boundary conditions of science. The former reflects views as to the constitution of the event manifold: Events of non-spatio-temporal dimensions are excluded as participants. The latter reflects a concern over what, in Kantor's view, were disserviceable cultural traditions, namely, mind-body dualism in its various forms. The two protopostulates are obviously related.

These assumptions are pre-analytic, and they are not characteristic of the protopropositions of the logic of science articulated by most other philosophers of science. On the contrary, dualism dominates the philosophical views prevalent in Western culture, if not the entire world, and with it comes the view that the manifold of events includes things and events of non-spatio-temporal dimensions.

The Metasystem of Interbehavioral Psychology

The nature and value of metapostulation. Scientific metasystems serve to delineate the foundations and specifications of particular scientific systems. The metapostulates of interbehavioral psychology pertain to such issues as the subject of psychological study and the relation of psychology to other sciences. Beyond these issues, the metapostulates specify certain characteristics of adequate systems from Kantor's perspective, including the comprehensiveness of their event coverage, their avoidance of disserviceable cultural traditions, their evolutionary character, and their compatibility with previously established systemic specifications. Like protopostulates, the metapostulates of Kantor's interbehavioral psychology have also remained relatively stable over repeated iterations. The following list of metapostulates is taken from Kantor (1959, pp. 72-74).

1. Psychology is homogeneous with all other sciences (p. 72). Because all sciences isolate some specific set of events as their special objects of study from the same manifold, "It is assumed here that all sciences are coordinate, none being more basic nor more naturalistic than any other" (Kantor, 1959, p. 72).

2. Psychology is a relatively independent science (p. 72). "All sciences draw upon the same manifold of things and events," and therefore are interrelated. At the same time, they retain relative independence from each other; "psychology has its own subject matter and accumulation of facts and operations and cannot therefore use as its data abstractions borrowed from any other science" (Kantor, 1959, p. 72). On the contrary, "psychological systems require unique construct patterns" (Kantor, 1959, p. 72; emphasis deleted).

3. An interbehavioral system of psychology departs from all traditional epistemological and ontological systems (p. 73). In 1959, the objectionable systems of each type were identified. In addition, confusion of events with their descriptions was cited as an additional problem to be avoided. By 1975, this metapostulate is reduced simply to "psychology must be freed from all traditional philosophies" (Kantor & Smith, 1975, p. 414).

4. A psychological system should achieve a comprehensive coverage of events, operations, and theory constructions (p. 73). This specification, while warranted in its own right, was likely motivated, in part, by the more limited coverage of psychological events characteristic of learning theories of this time, toward which Kantor felt some affiliation. These systems are cited as examples of incomplete coverage (p. 73).

5. System construction requires adequate orientation with respect to systemological problems (p. 73). In 1959, this metapostulate was elaborated to clarify the ancillary role of systems in scientific work. More specifically, a system was not regarded as a thing in itself with its own value, but rather as a tool for improving orientation toward the subject matter of the enterprise, out of which may come explanations and laws concerning it. Moreover, the obligation of the system builder to formulate the system on the basis of previously established specifications was emphasized (Kantor, 1959, p. 74). By 1975, these specifications were reduced merely to "psychological systems must be oriented" (Kantor & Smith, 1975, p. 414).

6. A psychological system is not reducible to any other type (p. 74). All sciences are held to be interrelated on the grounds that the events studied by all sciences are continuous. Nonetheless, Kantor argued, each selects its own data and problems, and the specificity of these events must be respected. In essence, Kantor is rejecting reductionism.

7. Psychological systems are relative and subject to continual corrective reformulation (p. 74). Since all scientific constructions arise from contacts with events, no system can be said to be final or absolute. Further, within the domain of actual prediction and control, systems are subject to verifying tests and are, therefore, tentative and relative to the state of investigation of given data (Kantor, 1959, p. 74).

By 1975, a more detailed explanation for the impossibility of final or absolute systems is presented. It points to changes in the "events under study" as the principle reason for inevitable reformulations of systems. In the words of Kantor and Smith (1975): "Because of perennial *changes of events* and in consequence, greater or lesser modifications in investigative procedures, all scientific systems are subject to changes in circumstances. It must be assumed that *new events* will be met with and therefore new hypotheses will be developed" (p. 415; emphasis added). While changes in the events under study might be a reason for systems change in some sciences, it seems highly likely that this would apply to the science of psychology.

The System of Interbehavioral Psychology

The nature and value of postulation. The definitions and postulates of the interbehavioral system proper outline the distinguishing features of psychological events, along with the implications of those features for their investigation and explanation. Psychological events are distinguished from events of other types on the basis of a number of criteria. First, they are distinguished by the significance of the *interactional history* to the participating objects. In other words, psychological events are relatively less dependent on the structural traits of interacting things than are biological and physical ones (Kantor, 1959, p. 79). Second, psychological events are distinguished by the prominence of *setting factors* in their organization (Kantor, 1959, p. 42). And third, unlike the events of anthropology and sociology, psychological events are constituted of the behavior of *individuals,* not groups (Kantor, 1959, p. 79). The following list of postulates is taken from Kantor (1959, pp. 84-90).

1. Psychological events consist of multifactor fields (p. 84). Psychological events have not always been articulated in this way by Kantor. For example, very early characterizations of psychological events focused on conscious behavior, as seen in the following: "Psychology has as its proper data conscious behavior, and not consciousness or behavior. Conscious behavior is an immediate derivative from exact data, and brings psychology into direct contact with actually existing and transpiring phenomena" (Kantor, 1918-1919, pp. 158-159).

An emphasis on *interactions* among objects, although not a *field of interaction*—which implies an equivalence of factors and an absence of determination of one over another—appears very early, however, as indicated in the following: "One of the interacting objects is a psychophysiological organism to whom the *results* of the present interaction will become significant in *influencing* future contacts of this object (person) with the same or similar object" (Kantor, 1920, p. 192; emphasis added). Similarly, "psychology cannot take as its unit anything less full of content than the actual response of a person to a stimulus object" (Kantor, 1924, p. 2). Then, "Its [psychology's] subject-matter consists of the interbehavior of organisms with objects and events" (Kantor, 1939; reprinted in Kantor, 1971, p. 228).

The field construction proper, prominent in the 1959 treatment, does not appear to emerge fully until later, where it occurs as follows: "A psychological event consists of an interbehavior in which an organism is in contact with stimulus objects. This interbehavior is conditioned by various factors: 1) behavior equipment in the form of responses 2) stimulus functions gradually evolved by objects in such interbehavior, and 3) the settings which condition the interbehavior of organisms and objects" (Kantor, 1943, p. 324). Once articulated in this manner, the postulate showed no further evolution (Kantor, 1959, p. 84; 1973, p. 458; 1977, pp. 630-631; 1980, p. 123; Kantor & Smith, 1975, pp. 415-416).

2. Psychological events are interrelated with social as well as with biological and physical events (p. 84). The relation between psychological events and those of other sciences was not always described as one of interrelation. In earlier iterations of this general point, psychology is described as a branch of biology on one hand, and as a branch of anthropology on the other. For example, Kantor (1924) stated: "Because psychological activity is always the action of an organism or a person this science must have its closely associated sciences which deal with structures....[I]t may be asserted that psychology is a branch of biology" (p. 3). Similarly, the psychological event consists of "not only the acts of biological organisms but also of specific anthropological individuals. The Chinese speaker is entirely different from an English speaker. In this sense, psychology is also a branch of anthropology" (Kantor, 1924, p. 3). Then further refined to "Psychological phenomena are, of course, always at the same time biological phenomena. In other words, physiological activities always participate in psychological happenings" (Kantor, 1933, pp. 7-8).

By 1975, the relation of psychology to other sciences was described as one of *dependence*, as in the following: "How an organism interacts with things depends upon cultural exigencies as well as upon organic and physicochemical conditions and circumstances" (Kantor & Smith, 1975, p. 415).

3. Psychological events are evolved from ecological interbehavior (p. 85). This postulate notwithstanding, Kantor was clear that other factors were also involved in the expression of psychological events, which differentiate them from bioecological patterns of action. In his words, "all psychological interbehavior has bioecological roots, although the accretions of complex cultural factors completely overshadow them" (Kantor, 1959, pp. 85-86). By 1975, the participation of bioecological circumstances came to have a distinctly evolutional character, as seen in the following: "Psychological events are evolved from bioecological interbehaviors. Psychological events of every variety develop from ecological interbehavior in the same sense that organisms of every description have evolved from prior different and simpler organisms" (Kantor & Smith, 1975, p. 415). The 1977 exposition continues this emphasis on evolution but, as in the 1959 treatment, it suggests the participation of factors other than those of the bioecological sort, such that bioecological factors are limited in their expression. In Kantor's (1977) words, "Psychological interbehaviors evolve from biological adaptations but become as different from biological interbehavior as, for example, hominoids differ from organisms in prior stages of evolution. When psychological interbehaviors occur biological components participate in, but do not dominate, the entire field" (p. 631). For Kantor, biological events consist of "adjustments–ecological adaptations, i.e., movements and actions which relate organisms directly and immediately to environmental objects and conditions" (Kantor, 1959, p. 223). Bioecological adjustments are conceptualized as continuous with psychological adjustments, and yet the prior constitute qualitatively simpler acts. These are acts which satisfy basic needs, such as an organismic need for food and shelter. Bioecological adjustments consist of "relatively limited self-maintenance or survival interbehaviors" (p. 223)

The involvement of biological participants in psychological interactions was consistently acknowledged by Kantor. For example, even in one of his earliest treatments, in which psychological events are described as conscious behavior, he wrote, "The specific, behavioristic factors are the three predominately physiological functions, the muscular, the glandular and the organic. Without these there can be no conscious behavior" (Kantor, 1918-1919, p. 161). Stated 50 years later, "Psychological events are at the same time biological events, and psychological behavior of organisms develops in continuity with the embryological maturation of organisms" (Kantor, 1976, p. 126).

4. Psychological events involve the participation of total organisms, not merely special organs or tissues (p. 86).[3] This postulate has changed little, if at all, over the 60-year history cited here. For example, in addressing the issue of the organismic participant in psychological events, Kantor (1924) wrote: "Nor must we assume for our convenience that the part is the whole....The organism is a complex psychological *machine* and not a union of discrete elements or stuffs" (p. 30; emphasis added). The mechanistic flavor of this description no doubt reflects the prevalence of behavioristic views of this period, as it is not carried forward into later treatments.

The exposition by Kantor and Smith (1975) is especially clear on this point: "Psychological interbehavior involves the performance of entire organisms, not special organs or tissues. Psychological events as multiplex fields not only preclude the confinement of action exclusively to the organism alone instead of the total field, but also exclude the notion that some particular biological organ or system is supreme and in control of every other organ or system" (p. 416).

5. Psychological events are ontogenetic (p. 86). The view that psychological events arise and evolve within the lifetimes of individual organisms has always constituted an aspect of Kantor's system, as expressed by way of the construct of the interbehavioral history. The history construct, however, was at one time identified by the term *mind* as a means of showing connection to the terms of other systems. It is this sense in which Kantor (1935) used the term *mind* in the following statement:

> Mind is individual. There is no such thing as mind in general. The psychologist who thinks of mind in any other way is hopelessly lost in the morass of mysticism. Moreover, mind is essentially a phenomenon pertaining to particular organisms or persons. Furthermore, mind is not a substance or quality, but action–the ways in which an individual adapts himself to the things and conditions of his milieu. (pp. 458-459)

Similarly:

> A unique characteristic of specific psychological events is that they originate in the lifetime of particular individuals. This evolution of mentality may be regarded as a third stage following the organism's phylogenetic and ontogenetic biological developments. (Kantor, 1942, pp. 179-180)

The ontogenesis of psychological events is explicit in later expositions, as well. For example, Kantor and Smith (1975) wrote, "Psychological events as the interbehavior of organisms with stimulus objects in definite fields always occur as historical or developmental features of particular organisms, as a third stage following the phylogenetic and ontogenetic stages of organic evolution" (p. 416; see also Kantor, 1980, p. 125).

6. Psychological interbehavior varies in specific details from other types of interbehavior (p. 87). This postulate is reiterated many times, starting in the early part of the 20th century (Kantor, 1918-1919, p. 159; 1924, p. 5), and has not changed significantly over these repetitions (see Kantor, 1942, pp. 178-179; 1973, p. 457).

7. Psychological constructions are continuous with crude-data events (p. 88). This postulate has remained central to Kantor's system and has not changed over repeated presentations of his postulates. In 1929, Kantor noted that "all descriptions and laws must be based upon observations of the organism in contact with other organisms or things" (p. 199). He also wrote: "Description as an actual phenomenon is an action performed by a person with respect to an object or event. Now when we confuse our description with the event, the latter loses its character as a fact in nature and becomes according to tradition, something in the mind of the describer" (1929, p. 209). In 1938: "Our interpretative constructions will be continuous with the manipulation and measurement of such events" (p. 33). In 1942: "All constructions must be made upon the basis of investigative contacts of the scientist with the events which originally stimulate the interest in and work upon the problem" (p. 177). And, in 1969: "The first and foremost characteristic of a scientific psychology is that all its descriptions and interpretations are developed from original interbehaviors with the activities of organisms as they interact with other organisms or other objects" (reprinted in Kantor, 1971, p. 612).

8. Psychological events consist of interrelated factors which do not admit internal or external determiners (p. 89). This postulate has undergone some evolution, not all of which has been explicit. In a very early reference to living beings, Kantor (1924) wrote: "we might say that (a living being) has *forces* working upon it from both inside and outside of the unit thing under observation" (p. 4; emphasis added). At this point in the development of Kantor's system, psychological events were always described as interactions or adaptations, neither of which necessarily implied causality. However, mention of forces suggests that the concept of the interactive field had not yet emerged, as was also suggested in connection with Postulate 1.

Descriptions in terms of forces are explicitly rejected by 1942, however, as indicated in the following passage: "Psychological science consists of the interbehavior of the investigator with the interbehavior of the observed organisms and their stimulational objects. Above all, such a view avoids all sorts of forces and powers assumed to bring about certain conditions" (Kantor, 1942, p. 175). At approximately this time, the integrated field notion was articulated and from that point forward prevails throughout Kantor's systemic discussions. For example, in 1959, Kantor stated: "A psychological event is regarded as a field of factors all of which are equally necessary, or, more properly speaking, equal participants in the event" (1959, pp. 89-90). No change was observed over the next 20 years, as seen in the following:

> Psychological Events Consist of Interrelated Factors Which Do Not Admit Internal or External Determiners. Psychological events like all other types are to be causally interpreted as collocations of factors or variables without the invocation of intervening or extravening influences such as faculties, instincts, native competencies, innate intelligence, drives, and so on. (Kantor, 1973, p. 458; emphasis deleted)

Conclusion

The following is the note found on Kantor's nightstand the morning after his death:

> No spirits, wraiths, hobgoblins, spooks, noumena, superstitions, transcendentals, mystics, invisible hands, supreme creator, angels, demons. (Kantor, 1984)

In the epilogue of *Interbehavioral Psychology*, Kantor (1959, p. 244) wrote that "although the problem of this volume is the simple one of smoothing the path of psychology toward its goal of natural science, the development of that theme has become very complicated." To develop his intervehavioral system, Kantor found that he not only had to specify the events included in a proper psychological analysis, but also had to remove systematically, at every level, the impact of dualistic cultural presuppositions that have hampered the scientific development of psychology all along. According to Kantor (1959, p. 244), it was the removal of these cultural influences that made a relatively simple task a complicated endeavor.

To overcome this challenge, Kantor adopted two key strategies that allowed for the explicit rejection of traditional presuppositions and the development of an authentic natural science. The first involved expanding the breadth of his historical analysis; the second involved the presentation of interbehavioral psychology as a formal logical system. Together, these strategies formed Kantor's approach to scientific system construction.

The breadth of Kantor's analysis included: (a) the specification of the events properly included in the psychological domain, (b) the nature of science itself (or its logic), (c) the relation of psychology to other natural sciences, and (d) the cultural roots of various sciences (Kantor, 1959, p. 244). The purpose of this strategy was to ensure that the interbehavioral system was specifically developed to preclude the influence of presuppositions arising from non-scientific cultural institutions (Kantor, 1959, p. 245). To accomplish this end, Kantor found it necessary to study the historical development of specific presuppositions along with their effects upon science, and in particular, their encroachment on a naturalistic psychology. For Kantor, the emergence of an objective natural science depended on its separation from these non-scientific influences. By articulating a naturalistic logic of science (e.g., the protopostulates), Kantor explicitly rejected traditional influences and was then able to construct a scientific system of metapostulates, postulates, definitions, and constructs entirely based upon the study of concrete events.

Kantor's second strategy, namely, to present interbehavioral psychology as a formal logical system, paved the way for important improvements over less systematized approaches. First, it provided an unambiguous platform from which system propositions were articulated and non-scientific propositions were explicitly rejected. Second, the formal structure facilitated coherence among propositions throughout the entire system of protopostulates, metapostulates, and the postulates of the system proper. Third, the inherent structure of a formal logical system fostered precision and brevity in the articulation of all interbehavioral constructs. Lastly, the formal presentation of the interbehavioral system made possible the complete and critical examination of all system elements. The interbehavioral system was constructed as a fully postulational system making it directly available for scrutiny at every level.

This strategy establishes the basis of the system's validity. In regard to the importance of philosophical work upon scientific system construction, Kantor

(1959) wrote, "Valid constructional work in science can only be based upon the appreciation that the philosophy and logic of science must have reached as high a stage of development as current scientific research" (p. 265). Hence, the proper regulatory role of philosophical behavior for scientific system construction has been well exemplified within the construction of the interbehavioral system.

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Endnotes

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[2]Kantor (1953, p. 14) was cautious about prediction, arguing that such activity is often motivated by aims other than those central to the basic mission of science, namely, orientation to events.

[3]This proposition is articulated as a corollary in Kantor (1959).

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Chapter 4

The Interbehavioral Field

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Kantor (1953, 1959) takes the four stages of the evolution of nature as the common characteristic on which all sciences must build. The first stage of evolution is the inorganic evolution of stars, solar system, and earth. The second is the organic evolution of species. The third consists of the biological ontogenetic evolution of individual organisms from conception to death. The fourth stage, the stage of interest to psychology, consists of the interbehavioral evolution of organisms with their surroundings. Recognizing psychology as the study of one of these stages places it securely within the natural sciences.

The first two stages pave the way and set the occasion for biological and psychological action. In the third stage, the biological structures and functions of an organism are continually changing as a characteristic of its ongoing ontogenetic evolution. These structures and functions, moreover, interact with objects in ways that are also changing and to some extent are reciprocally changed by the interactions. For example, as neuromuscular components of the organism develop, they act upon the surroundings; and their further development is facilitated by that interaction. In the fourth stage, it is behavior that changes, developing in the process a history with its surroundings that affects subsequent behavior. Biology changes with structure and with interactions in which chemistry and physics participate. Behavior changes with history and interactions in which biology and the environment participate.

Although each discipline draws from the same interrelated events that comprise the universe, each also abstracts somewhat different components and organizational characteristics. For example, what astronomers study includes the elements in stars, which are the same elements that comprise our bodies. What biologists study includes the structure and function of organisms, which contain those elements. And what psychologists study consists of the interactions of organisms with their surroundings, both components of the interaction also containing the elements. The remainder of this chapter deals with these interactions in the fourth stage of evolution. The first section describes the components of the interaction that comprise the interbehavioral field, their interdependencies, and their specificities. The second section takes up reaction systems that extend the field construct into a functional description of thinking, choosing, volitional interactions, habitual interactions, and witting and unwitting interactions. The third section considers the scientific nature of the field construct and the form it takes in psychology as opposed to physics. The fourth section treats the advantages of the field construct over organocentrism and psychophysical dualism and its utility in scientific teamwork.

The Interbehavioral Field

The interaction between an organism and its surroundings is an event that is continuous in time. In order to study such an event, one must thus analyze its interdependent components at a moment in time. This results in a unit of analysis that Kantor (1959, p. 15) called the "behavior segment"–one temporal segment of a continuous flow. Kantor represented these analytic components in the following manner as a formula for the psychological event (Kantor, 1959, p. 16):

$$\mathrm{PE} = \mathrm{C}(\mathrm{k}, \mathrm{sf}, \mathrm{rf}, \mathrm{hi}, \mathrm{st}, \mathrm{md})$$

PE is the psychological event, consisting of *C* indicating the interdependence of the factors in the field, *k* the uniqueness and specificity of every behavior segment, *sf* the stimulus function, *rf* the response function, *hi* the history of interactions, *st* the interactional setting, and *md* the medium of contact. (One could add *so* for stimulus object and *r* for response to make the formula more complete.) As the formula suggests, the psychological event *is* the "interbehavioral field."[1] The psychological event is no less than the total interrelation of these component parts and is not reducible to any one of them. The full complement of interdependencies is always the ongoing actuality, and this full complement must be assessed if we are to minimize distortions in our understanding of psychological events, for instance, by placing undue emphasis on any one of the components. Also, contrary to Cartesian assumptions about privacy, every one of these components is observable under one condition or another. In addition to the PE formula, Kantor represented the components of the interbehavioral field diagrammatically (see Figure 1), which suggests a further complexity in and greater sophistication of his analysis (Kantor & Smith, 1975, p. 34). These components are described in what follows.

Structure: Organism and Object

Organism. The organism's biological structure is both an enabling and a limiting condition for interactional potentials but is not a determining condition. To take an obvious example, a bird's forelimbs, which take the form of wings, preclude manual manipulation of objects; but they enable flying; however, they do not cause flying. The inability to metabolize phenylalanine (phenylketonuria or PKU) can result in intellectual retardation, but the ability to metabolize this substance does not cause intellectual development to occur. Similarly, the large brain of humans is an enabling or participating condition in the complex interactions of humans with their surroundings, but does not cause these events any more than electrons and protons cause the biological events of which they are a part.

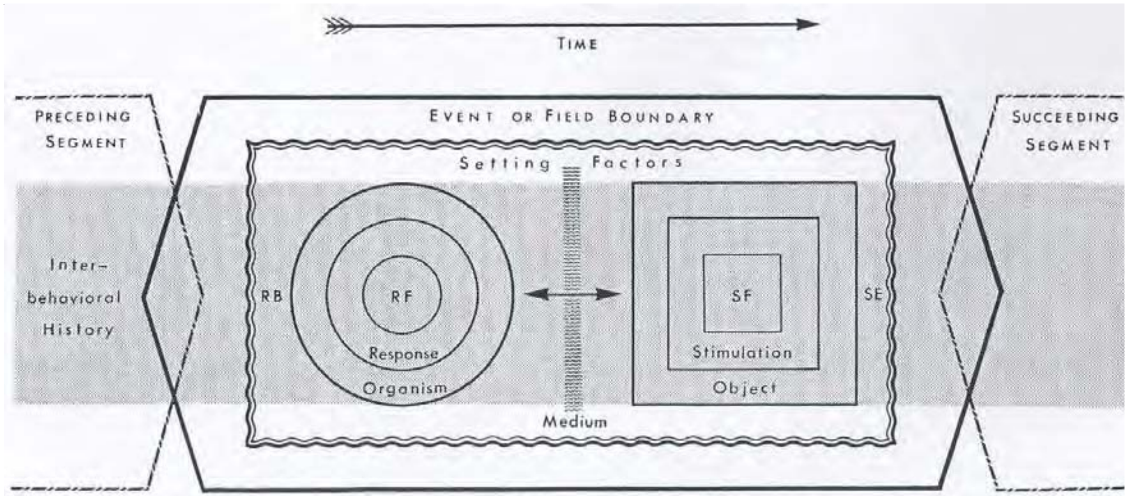

Figure 1. A representation of the interbehavioral field, also called the behavior segment. RB = Reactional Biography, SE = Stimulus Evolution, RF = Response Function, SF = Stimulus Function. Note. From The Science of Psychology: An Interbehavioral Survey *(p. 34), by J. R. Kantor and N. W. Smith, 1975, Chicago: Principia Press. Copyright by The Archives of the History of American Psychology. Reprinted with permission.*

Object. The object can be any thing or event with which the organism interacts. We could describe it by its molecular structure or by its molar characteristics, such as the bark, limbs, and leaves of a tree or the shape, size, and color of a house. Also, the object has an evolutionary history that might be of importance to the biological or physical sciences. Its development of functional characteristics with respect to the organism is of major importance to interbehavioral psychology.

Form: Response and Stimulation

Response. Perhaps the most salient characteristic of psychological events is the organism's response and, secondarily, the object or event to which the response occurs. A response is the biological configuration that an organism takes when interacting with a stimulus object. That is, the structures and functions of the organism are organized in some form or "topography" with respect to the object (Morris, 1982).

Except for simple, unitary responses, such as jerking away from a painful stimulus object, all responses consist of at least two and usually three or more reaction systems. The actualization of one stimulus rather than another is the reaction system of *attending*. *Perceiving* the nature or character of the object actualized is the second reaction system (e.g., the dog is friendly, the chair is sturdy enough to sit on). A *consummatory* or *final* reaction system based on the perceiving is the third (e.g., petting the dog, sitting on the chair). This final reaction system comprises the salient behavior configuration or topography: "the character of a response pattern is determined by its final reaction system" (Kantor & Smith, 1975, p. 213). The reaction systems and the role they play in thinking and other interactions are addressed in more detail later.

Stimulation. A response is not dependent on the object that stimulates it nor does a stimulus stand independently. When we respond, we respond to some thing; when we are stimulated, we are responding. Consequently, stimulus and response are interdependent. This stands in stark contrast to the standard assumption in experimental psychology that a stimulus is independent and that a response is dependent on it. The construct of a linear event involving an antecedent stimulus that evokes or elicits a consequent response is one that gets imposed by those who start with a mechanistic construct. Although a stimulus-response event is central to a psychological event, it is not the entire event but only one of the interdependent components.

Function: Response Function (RF) and Stimulus Function (SF)

A response has a functional character that varies from situation to situation. The response of picking up a book might be to look for something under it, to get it in position for reading, or to move it to another location. And, topographically different responses can have the same function. For example, one could ask a knowledgeable person for medical information or look it up in a book. These two different responses have the same function of seeking information. Similarly, when we respond to a stimulus object, we are stimulated by the object's functional character. Although we could describe a painting in terms of the chemistry of the paint or the configuration of the paint on canvas, we usually respond to it functionally by what it represents or expresses, for example, where we should hang it, what it might sell for, or, more subtly, its quality, aesthetics, school of art, and so on. Also, more than one stimulus object can have the same stimulus function. A pencil might have the stimulus function of something to write with but so also might chalk, a pen, or a computer.[2]

Clearly, a given stimulus object can have any number of stimulus functions and any number of stimulus objects can have the same stimulus function. Likewise, a given response can have any number of response functions and any number of responses can have the same response function. Whether we refer to a stimulus function or a response function depends on which side of the interaction we are emphasizing. For instance, I am stimulated by a table's function as an object on which to place papers, or my response to the table is that of an object on which to place papers. The interdependence of these and other components indicates that an integrated field construct is important if we wish to understand psychological events. The reciprocal action can be symbolized as

$$R_{func} \Leftrightarrow S_{func}$$

where the double-headed arrow indicates mutuality and interdependence. Although for convenience interbehaviorists often refer to the interaction of response and stimulus, it is more accurate to refer to the interaction of the response function and the stimulus function. An important advantage of recognizing the functional nature of the response and stimulus is that this obviates treating the stimulus as physical energy that either (a) directly evokes a response or (b) causes the organism to produce a mental sensation of the object. Neither mechanism nor mentalism finds a place in the interbehavioral system. They are superfluous as well as antithetical.

Medium of Contact

In every case of perceiving, but not in such interactions as imagining or reasoning, a medium provides the contact between the organism and the object. The most conspicuous media are airwaves for objects we hear and light waves for objects we see. Other media are more proximal, such as chemical reactions for taste, fluid motion for balance (labyrinthine sense organs), tissue irritation or laceration for pain, and stretch for kinesthesia. In some instances–noting a sound or a color of light, for example–the medium of contact together with the stimulus object and its function coincide. But Kantor (1924) cautions that "to lose sight of the genuine distinction between media and stimuli spells disaster for the whole psychological system" (p. 55). Here, he is apparently referring to the assumption in psychology that comes down through Galileo, Newton, Locke, Kant, Mueller, and Helmholtz that the medium consists of vibrations or psychic qualities that take their form or even their existence only in a mind or a nervous system. On this assumption, we live in a double world, one inside that we know directly and one outside that we know only indirectly; this "spells disaster" inasmuch as it precludes a naturalistic psychology.

Because the medium is not the stimulus object, the interbehavioral system obviates any hypothetical mechanism for transforming the medium into a *representation* of the object. We see people, buildings, and landscapes, not light waves that must be transformed into an *appearance* of the object. We hear a symphony orchestra, not sound waves. We feel sandpaper, not vibrations. We interact with objects by *means* of media, and perceive them in consonance with the present setting and our interactional history.

Interactional Setting or Setting Factors

If we extend our analysis of the psychological event, we recognize still additional components. Every interaction occurs in some kind of milieu or situation called the *interactional setting*, or, more simply, the *setting*. Individual components of the setting are called *setting factors*. Settings have their effects on any one of three components of a psychological event (Kantor & Smith, 1975, p. 47): (a) those on the reacting individual, which include fatigue, hunger, sleepiness, thirst, and good or ill health, (b) those on the stimulus object, such as the leopard's spots, which render it nearly invisible in the dappled colors of the surroundings, and (c) those on the total interaction, such as a setting of blowing papers in which a book might take on the function of a paper weight. As the last type of setting illustrates, the effect of settings on the total interaction is interdependent with response and stimulus functions.

In fact, distinguishing setting from stimulus can be tenuous: "In many cases the same object might serve as a setting for a stimulus object while also operating as an auxiliary stimulus" (Kantor, 1924, p. 56). When the stimulus and setting coincide, the setting stimulus is auxiliary or subordinate; it merely conditions action to a more central ("adjustmental") stimulus object and has no correlated reaction systems. For example, in selectively listening to and identifying a particular musical instrument (stimulus object) in a symphony orchestra (both setting and stimulus object), the instrument that is part of the symphony orchestra becomes central in the interaction, while the symphony functions subordinately to it. The symphony hall and its audience are a more embracing setting. From this, quite complex interactions involving shifting settings and stimulus objects can occur; for example, the audience or the ceiling of the auditorium could become actualized as a stimulus object, while the music is the interactional setting.

The setting plays an essential role in every behavior segment. For the most part, however, it has been ignored in psychology and its influence attributed to such constructs as drives, motivation, and other hypothetical entities. Careful attention to specific setting factors can obviate such constructs and provide a better understanding of experimental findings (e.g., intra-individual differences) and a better means of control in applied psychology (see Smith, "Interbehavioral Research," this volume, for examples).

Interactional History or Interbehavioral History

The functional character of the response and stimulus depends as much on the setting as on the history of interactions. As the human organism matures biologically, its capabilities of interacting in more complex ways increase. This is the only sense in which psychological events have a biological basis and must be distinguished from the assumption that biology produces or stores such events (Kantor, 1947). Whereas biological equipment matures very slowly, psychological equipment develops quite rapidly. Humans reach their peak of biological capabilities around age twenty, after which T-cell lymphocytes and other biological conditions of well-being or performance begin a slow decline. At the same time, their interbehaviors continue to build on past repertoires of behaviors, and the interbehavioral capabilities (*behavior equipment*) continue to develop. Barring debilitating biological conditions, psychological equipment can continue into old age, while biological capabilities are in decline. The relative independence of the individual's psychological evolution (fourth stage of evolution) from its biological evolution (third stage of evolution) gives the individual great behavioral flexibility and adaptability and is important in making possible art, invention, language, science, and technological and intellectual achievements.

The development of the history of the interaction involving both response function and stimulus function is called the *interactional history* or *interbehavioral history*. On the response function side of the interaction, the history is called the *reactional biography* (RB) and on the stimulus function side, the *stimulus evolution* (SE).[3] Although reactional biography gives rise to the response function and stimulus evolution to the stimulus function, all are part of a unified field event, the *C* in Kantor's formula. Whereas response functions, stimulus functions, media of contact, and setting factors can change discontinuously, interactional history is continuous and accumulative. In some important respects, interbehavioral psychology is a developmental psychology. Perhaps more than any other component, interactional history ties all components together into *C*.

Interdependencies

In addition to its sophistication and complexity, Kantor's diagrammatic representation of the interbehavioral field has other advantages. It indicates the continuity of the interbehavioral history through time (the grey strip in Fig. 1), the behavior segment as a slice of time that is continuous with preceding and succeeding segments, and the interdependencies of all the components with each other.

As an example of these interdependencies, a beverage stimulates me to drink it and I respond to it as something to drink. The beverage has the function for me of drinkability because (a) my past history built up such meanings, (b) I am in a setting such as that of a hot day (environment) and am thirsty (reacting individual) or am with others who are drinking beverages (social environment), and (c) a medium of light is an enabling condition for me to perceive the beverage. The response and its function, the stimulus and its function, the setting, the medium of contact, and the interactional history are specific, observable components that comprise the interbehavioral field as a unit. This is the *C* of Kantor's formula.

Psychological events, however, occur continuously rather than as discrete units, with the entire lifetime being the overarching unit of the interbehavioral field. But, like all sciences, psychology isolates components of the interdependencies into manageable units, while recognizing the need to see the whole as much as possible. Indeed, because of these continuities and interdependencies, the field construct is essential; it attempts to elucidate and represent them.

That we abstract components from the field and that we distinguish one behavior segment from another does not mean that any of the distinctions are arbitrary or that the field construct is a "social construction" (Gergen, 1994). It means that when science goes beyond crude facts and provides some sort of generalization of what has been observed, it reconstructs nature (Kantor, 1919, 1984), for example, chemical equations, laws of physics, geological tectonic plates, and psychological stimulus functions. Yet, it does so strictly in accordance with contacts with ongoing things and events. Consequently, this reconstruction is always subject to modification with further observation and more refined tools of analysis.

Specificity

One final term, *k*, in Kantor's formula remains to be addressed. Although *k* is not one of the components of the field–and thus, not included in the diagram of the interbehavioral field–it is an important characteristic of the field. It stands for specificity: "observers must take into account the unique characteristics of the various components of any system and the interrelationships of the components in their complexity with other factors in specific fields" (Kantor, 1978, p. 118). Even generalizations derive from the observation of specific instances. In psychological events, specificity is especially important because of (a) the participation of biological and physicochemical factors in those events and the complications this brings, (b) misunderstandings such as attributing causality to the biological and physicochemical factors, which are only among the participating conditions, and (c) a long and usually unexamined tradition of interpreting psychological events in terms of cultural constructs and analogies (e.g., mind). To impose constructs that are not a part of observed specific relations–such as putative chemical or biological determiners, or mind–is to distort psychological events. Because of the "intense functionality" (Kantor 1978, p. 123) of psychological events–that is, the functional characteristic of responses and stimuli that develops from previous interactions in specific setting conditions–these particular functional relations must be recognized and treated as essential parts of the event and as criteria that differentiate psychological events from those of biology and physics. Pronko (1988) points out that specificity precludes the adoption of vague constructs, analogies, and abstractions, while directing us to observable, interdependent events. Such constructs as brain processing and mental representations do not meet the criterion of specificity.

The failure both to observe and to analyze specifics leads to various confusions, among them, those between memory and memorization (carrying out an action after a delay vs. repetition until reproduction is achieved), affect and emotion (see below), voluntary behavior and exercise of free will, and voluntary and volitional (see below) interactions (Kantor, 1978). An example from education and another from clinical psychology illustrate the importance of specificity in applied situations. Baxter (1994) shows the necessity of teaching specific skills to children, such as the direction of lines in forming numbers, and taking account of interacting conditions, as opposed to diagnosing deficiencies with "mythological language" that replaces effective teaching. His position finds overwhelming support in a massive study called Project Follow-Through (Adams & Englemann, 1996; Stebbin, St. Pierre, Proper, Anderson, & Cerva, 1977; Watkins, 1988). In the area of clinical psychology, Farrington (1972) and Knapp and Delprato (1980) show that the use of such constructs as "interiorizing" and "willpower," which have no concrete referents, stands in the way of therapeutic efforts.

Specificity and uniqueness–when the particulars of an event are specified in sufficient detail it is uniquely different from all others–are true of all events in nature. The interbehavioral field construct itself is a product of observing the specific events of organism-object relations–the employment of *k* in the formula. The next section describes some more detailed components of the field–the reaction systems–and the ways in which they provide an objective understanding of some important psychological events.

Reaction Systems

Reaction System Components

By identifying the action units that comprise the response, Kantor (1924) extended the interbehavioral analysis to reaction systems: "the lowest analyzable integral action the organism performs" (Kantor & Smith, 1975, p. 35). The term "system" in "reaction systems" suggests that these are complex activities despite their lowest analyzable character.

The simplest response consists of only a single reaction system, as when one jerks away from a pinprick or hot object. In this case, a stimulus object has only a single stimulus function and the response to it is a single reaction system. Most responses, however, consist of a "response pattern" displaying a minimum of three reaction systems. These are *attending*, *perceiving*, and a *final* or *consummatory act* (see Figure 2).

STIMULUS OBJECT ⇔ attending rs → perceiving rs → consummatory rs

RESPONSE

Figure 2. A response pattern and its minimal reaction systems (rs).

In addition to these three, the response pattern might also contain motor and glandular actions, postural adjustment, and any number of other reactions as part of the pattern of reactions to the stimulus object and its function. To illustrate a response pattern, consider an instructor who is explaining a point to a class when a student raises her hand. The instructor discontinues his statements and begins a new behavior segment by attending to the student, perceiving that it is Maria, who often asks insightful questions, takes a few steps toward her, and completes that behavior segment by calling on her by name.

The attending phase of an interaction is the beginning of a behavior segment. With it, the organism and object begin their interaction. The perceptual reaction system, in contrast, provides an orientation toward the object and the setting. Following these two precurrent reaction systems, the individual is still somewhat detached from the stimulus object and thereby has a measure of independence from it. The individual can react now not only to its intrinsic properties–size and color, for instance–but also to what it means: walk around an obstacle, sit carefully on a rickety chair, grasp a kite string more firmly as the wind tugs harder on it, or say "no" to an unacceptable offer. The final consummatory reaction system is often not overt, as in the preceding examples, but might consist of such subtle or covert acts as gazing with pleasure on a newly opened flower blossom, savoring the chords and rhythms in a jazz composition, comprehending a written passage or spoken statement, or appreciating the creative ingenuity in an invention or a scientific theory.

The attending and perceiving are "precurrent" reaction systems; they prepare the organism for the final, consummatory act. If I am looking for a seat and I find a high stool, in attending to it and perceiving its height I adjust my final body position accordingly in order to complete the sitting without mishap. These three reaction systems are central in that they comprise the major part of the adjustment to the stimulus object, the final reaction system displaying what we observe as the response function. Less central acts might go on simultaneously. These *by-play* or collateral reactions could include, for example, affective, verbal, and stressful actions. For instance, while engaging in the central action, the instructor in the earlier example could also engage in by-play actions by feeling appreciative that Maria was introducing discussion or by wondering how to get more students to follow her example.

The precurrent reaction systems of attending and perceiving are handled by the interbehavioral system, like all other analyses of the field, as ongoing events that can be analyzed out of a unitary system. Attending needs no postulation of mysterious filters to sift out one stimulus from another. The actualizing of a new stimulus object can be observed to occur in some cases because of characteristics of the object itself, in some because of the organism's history, and in others because of setting factors and, of course, because of all combinations and interdependencies of these. On the object side, such conditions as relative size, color, loudness, motion, and change bring objects to our attention as stimulus objects. On the organism side, the individual's behavior equipment built up from past interactions, such as knowledge and interest in a particular subject, is important. For example, the extensive knowledge of ornithologists of the characteristics of bird species enables them to notice and identify a small bird in a thicket that most other individuals would pass over. The setting, too, is important. The ornithologist who is conversing with someone might fail to see the bird. The cocktail party phenomenon in which we listen to one conversation while ignoring all the others around us is entirely the same in principle despite efforts to attribute it to a filter.

Personality as Reaction Systems

The enduring characteristics of individuals by which others learn to anticipate certain behavior patterns is personality. These enduring characteristics provide enough consistency for cultures and institutions to develop and continue, and they serve the individuals themselves, as well. Because individuals build up an enormous complex of systems of reaction that equip them for many of the situations they face, Kantor introduced the term "behavior equipment" as an alternative and more descriptive term. Personality or behavior equipment is the universe of response patterns of an individual and consists of knowledge, skills, information, abilities, habits, and other attributes, in short, millions of organized reaction systems. Although language constraints make it difficult to express these attributes as interbehaviors, they are nonetheless exactly that, even though labeled as substantives. Ultimately they refer back to concrete interactions.

Reaction Systems in Complex Interactions

The reaction system construct is a powerful tool for analyzing and describing complex activities. A brief treatment of how it deals with a few of these, namely, thinking, voluntary acts, volitional acts, habits, and witting and unwitting behavior, illustrates its potential (Kantor, 1924, 1926, chap. 14, 15, 21, 25; Kantor & Smith, 1975, chap. 13, 19; Smith & Shaw, 1979).

Thinking interactions. Thinking interactions are either implicit or overt manipulations of an object that facilitate an action that is to follow. Implicit (or covert) interactions are diminished or partial forms of interaction and are equally as concrete as overt interactions. Pondering, planning, evaluating, and choosing are examples of thinking interactions. The diamond cutter overtly turns and examines the characteristics of a rough diamond as a prelude to splitting off parts along cleavage planes. In contrast, an architect might implicitly develop the plan of a building before drawing it on paper or on a computer.[4] Thinking consists of a single behavior segment when it involves a series of reaction systems that anticipate a final action as, for example, in the case of a writer who implicitly forms various parts of a sentence, shifting some parts around or changes words until it is just right and then writes it down as a finalizing action. When the writer writes down one or more sentences, makes changes, re-reads the sentences, and makes more changes, the thinking consists of a series of behavior segments each of which contains a number of reaction systems.

Voluntary (choosing) interactions. When we attend to an object and perceive more than one choice, additional precurrent reactions–such as reasoning, judging, and pondering the consequences–might occur. Or the individual might immediately anticipate the alternative effects of each choice and act accordingly. These are voluntary or choosing interactions; Kantor also calls them "alternative interbehaviors." Language often plays an important role as does an individual's behavior equipment. Settings are also important, for instance, in the choice of a cold drink in hot weather or a hot drink in cold weather. Each event of choosing can be correlated with a specific set of conditions; that set of conditions provides a *functional* description of specific conditions that comprise the choosing event. This functional description stands in contrast to traditional constructs consisting of a *prescriptive cause* such as "will" (a metaphysical construct) or "determinism" (a construct often applied in classical or operant conditioning).

Volitional interactions. Volitional acts, as Kantor uses the term, refer to those that involve some intermediate or auxiliary action before the central act can be completed. These are ubiquitous in everyday life, but have been generally overlooked by other psychologies as behavior qua behavior. One is stimulated by the clock to begin walking to a classroom. In order to get there and complete the interaction, one must not only engage in a long series of walking reaction systems but must also interact with a myriad of objects and obstacles. Each of these objects must be attended to, perceived, and responded to before the final reaction of getting to the classroom can occur and the central act can be completed. Any one of these auxiliary interactions might itself require an auxiliary interaction. Fixing a cup of instant coffee could involve such auxiliary interactions as boiling water, which in turn requires obtaining a pan, which in turn requires opening cupboard doors. One could go on with a large number of auxiliary and sub-auxiliary interactions involving spoon, cup, coffee jar, coffee jar lid, and coffee, each of which must be completed before the central act can be finalized.

Habitual interactions. Through repetitive occurrences, a final act becomes tightly bound to a stimulus object while the attending and perceiving reaction systems become diminished in form and function. These habitual acts are very much a part of our behavior equipment–the totality of reaction systems–and include knowledge, skills, likes, and dislikes. We build up elaborate habit reactions that operate with little inclusion of cognitive reaction systems and consequently they often become unwitting interactions. However, thinking and feeling as well as motor interactions might also become habitual. Whereas habits allow us to engage in such complex behaviors as driving a car while conversing with someone, they interfere when new responses are required and we have to learn a whole new series of reaction systems. For example, those who switch from one word processing system to another struggle with the persevering character of old habit systems, and only gradually make the new ones habitual and efficient. Habitual interactions make up much of mature behavior equipment.

Witting and unwitting interactions. Witting reaction systems (i.e., "awareness") involve reacting to some characteristic of the object or to some phase of it. In putting down an important document, an individual carefully places it on a stack of other important papers and observes that this is a logical place to find it later. I might say to myself, "I must remember that I put it right here on this stack of papers." Speaking, thinking, reasoning, writing, appreciating, judging, and discriminating can all be witting behaviors. Unwitting behavior (i.e., "unawareness") omits the cognitive or language reaction systems, as when we drop the important document in a drawer while thinking little about retrieving it and then do not know where to find it later. Many people who use glasses frequently put them down without the cognitive reaction system and as a consequence are just as frequently searching for them. Without the cognitive or language reaction systems, the person is largely detached from the object.

By describing the actions that occur in witting and unwitting behavior, we need not posit unconscious forces. Similarly, the rather detached behavior that is called "absent mindedness" or the disquieting experience of going around a car on a two-lane highway and being unable to recall doing so, requires no metaphysical or physiological explanation. In the latter case, the act of passing the car was one of thousands of auxiliary interactions in the central act of driving from point A to point B. It could have been a largely habitual interaction in which the precurrent reaction systems were closely bound to the final act and contained no cognitive or language reactions systems. Habitual actions are likely to carry us through an interaction when we are thinking about something else, engaging in conversation, listening to the radio, or performing other witting interactions. When such a pattern of unwitting reactions occurs, we might predict that the driver would not remember the event. Close attention to the specifics of the interaction leaves no room for metaphysical constructs.

Reaction Systems in Combination

Fields of interaction often include various combinations of thinking, choosing, volitional acts, and habits and are either witting or unwitting. All include attending and perceiving as well. As an illustration of some of these, consider the following: An instructor is speaking to a class and finishes a series of statements. What comes next? The stimulus to that topic is listed in her lecture outline, which is on the lectern at the opposite side of the room. A new behavior segment had begun when she attended to a substitute stimulus (completion of the current topic) for the uncertain item in her lecture notes. She engages in a momentary auxiliary interaction of choosing between lecturing on a topic that would be out of sequence in her notes or of looking up the one she expected to cover next. She completes that auxiliary interaction, which is also a voluntary behavior segment, by electing to check the notes. She walks over to the lectern while saying to herself as by-play, "Why can't I think of that topic." She searches through the notes to find the appropriate item (another auxiliary interaction), finds it, and completes the central action, thereby bringing the single behavior segment to a close. This was, of course, a witting behavior segment.

The Scientific Nature of the Field Construct

All sciences deal with fields. "By field is meant a locus of interaction of factors in an event [and this] is an indispensable feature of every scientific description" (Kantor 1936, p. 155) because "things and events are always items in larger field events" (Kantor, 1959, p. 253). Scientists in a variety of disciplines have come increasingly to recognize this as they note that nothing stands in isolation and very little occurs in simple chains of cause and effect. Perhaps one of the most conspicuous failures to move more toward a field orientation has been that of psychology: The brain is still widely regarded as the self-causing producer and container of memories, images, perceptions, and thoughts. Without a field concept to provide an alternative, these self-actional constructs–constructs that have no referent in observation–will most likely continue to hold center stage.

It is not surprising to find resistance in psychology to field constructs. The field theories of Gestalt psychology, for instance, Köhler's (1924, 1947) isomorphic field and Lewin's (1936) vector field, were often blatantly dualistic or mechanistic. Their field constructs were not drawn from observation, but were imposed on observation (Kantor, 1925, 1941). In addition, the "misguided attempts to draw direct analogies between behavioral events and mathematical and physical fields [make it] understandable that mainstream psychologists were not favorably disposed to field theory" (Delprato & Rusiniak, 1991, p. 309). These "misguided attempts" have led some psychologists to question the appropriateness of that construct as applied to psychology. Marr (1993), for instance, writes that "context, by itself, is as empty and meaningless as a frame without a picture" (p. 62); this includes "the vague contextualism of, for example, Kantor and his followers" (p. 64). Apparently, "context" refers to "field." As this account has tried to show, however, the field is not something that exists either "by itself" or something added on, but is comprised of events in interdependent relations.

The scientific enterprise is severely curtailed when we fail to understand the interdependence of field factors. At best, when we isolate a single component or group of single components, this gives us only a limited picture and possibly a distorted one at that. The research on setting factors, for example, shows clearly how the failure to consider settings, as one interdependent part of the field, leads to failed predictions of behavior (see Smith, "Interbehavioral Research," this volume). At worst, such isolation leads to taking recourse in invented constructs–usually physiological or metaphysical–in order to account for the action of the isolated component. Cognitive psychology, for example, demonstrates the worst side of it, where "human behaviors emerge like wraiths out of a mysterious cauldron of processed images, thoughts, strategies, schemas, rules, and representations, all apparently disembodied from history and current contingencies" (Marr, 1993, p. 59).

To understand better the field construct in interbehavioral psychology and how it differs from its well known application in physics, we must note that "field" takes a variety of forms, each of which is specific to a particular science; sometimes more than one form occurs even within a single science. In physics, one form of field construct serves electromagnetism and gravity and another quantum mechanics. In the former, the field is an autonomous entity. Light, electricity, and magnetism are all manifestations of a single electromagnetic force and obey a wave equation as worked out by Maxwell, who showed that the electromagnetic field exists independently as an entity with its own set of laws. Einstein was inspired by Maxwell's success with the field concept and used it for his general theory of relativity. In that theory, a gravitational field consists of space and bodies of mass in which the bodies produce curvature in their mutual space. The gravitational field carried by bodies of mass is analogous to the electromagnetic field carried by bodies with charge.

In the second usage of a field concept in physics, that of quantum mechanics, the field does not specify anything physically real, but instead gives paramount emphasis to a setting or context. The parallel between a field construct in physics and a field construct in psychology is closest with the quantum mechanics field. In quantum mechanics, the wave-particle duality of matter gives rise to the significance of the field as context.

> Quantum mechanics must conform to a reality in which particles may move about under the laws of wave motion yet will often behave as particles in interactions with their surroundings. Here a field concept becomes indispensable, for it is the context in which the particle or wave interacts which determines its specific character. (Smith & Smith, 1996, p. 8)

Despite some important parallels between the interbehavioral field and the field in quantum mechanics, the differences are also important. One is not an analogy for the other. Physics–and biology, as well–must give relatively heavy emphasis to structures and their functions. In a psychological field, the organism's biological structure is only a facilitating or limiting component of the field, while the organism's interbehavioral history is of more direct importance–and is continually accumulating (Kantor, 1947). As these differences suggest, the field of each science is unique and specific to the kinds of events investigated by that science.[5] Although physics has been most conspicuous in its use of field constructs, biology has developed ecology and field relationships, political science has been influenced by Bentley's (1908/1949) emphasis on government consisting of relations among people,[6] and Kantor has given psychology a thoroughgoing field approach.

Although these various fields have parallels in that they all deal with relations of objects and events, they are not analogies to one another. As the history of psychology so well shows, the practice of building on analogies from other sciences is counterproductive. Philosophy that preceded psychology and then psychology itself have employed such analogies as clocks (Leibnitz), optics (Spinoza), blank slates (Locke), vibrations (Hartley), gravity (James Mill), chemistry (John S. Mill, Titchener), chronometers (Donders), evolution (James), biomechanics (Watson), electrical fields (Köhler), and vectors (Lewin). Then came telephone switchboards, computers, and holograms. The result has been a treatment of psychological events for what they are not, while overlooking the field events that they are (Blewitt, 1983).

Kantor (1936) maintains that "psychology…should follow physics in but one thing; namely, in building up a scientific structure from observable phenomena" (p. 154). He notes that "psychologists have done irreparable injury to their science by basing it upon the abstractions of physics (suitable enough for that science) instead of beginning with non-traditional observations of psychological events" (p. 155). His reference to observation comes back to the specificity principle: The scientific psychologist's beginning point is always the observed specifics, the actual events. This, in contrast to invoking traditional constructs, will almost inevitably lead to a field construction. The field construct, in turn, brings advantages of its own.

> It is a basic accomplishment of modern science to discover and employ fields. The essential gain of the field construction is that it strengthens the appreciation of the nature of events. Fields indicate that events consist of systems in which things or processes are in intimate relation with each other so that descriptions and explanations can be made without supernatural or transcendental powers, forces, and causes. (Kantor, 1984, p. 171)

Avoidance of cultural constructs not only contributes to a field construct, but the field construct, in turn, leads to further understandings that do not require those constructs. That is to say, field constructs give us an understanding of psychological events based on concrete events. They also provide a guide for developing methodologies that are in accord with interdependencies and wholistic units (see Smith, "Interbehavioral Research," this volume). And that, in turn, can lead to further descriptive and inferential constructs that more closely represent the actual character of psychological events. The following section examines some additional consequences of the field construct.

Some Implications of the Field Construct

Organocentrism Versus the Interbehavioral Field

The nervous system and all other physiological systems and structures are observed as full participants in the response components of the interaction but receive no pre-eminence over other participants, whose roles are observed to be equally necessary. This precludes turning a necessary condition into a sufficient condition. In a field perspective, the organic participants remain within their organic matrix rather than becoming the locus, producer, or container of psychological events, as happens in an organocentric perspective. The interbehavioral field recognizes both the facilitating and the limiting conditions of biology, and gives them their due place in the field without converting them into determiners of the entire event.

On the facilitating side, for example, our retinal rod cells allow us to see objects in extremely dim light. The special sensitivities of other animals to infrared, ultraviolet, electricity, and vibrations as media of contact are further examples of facilitation, as is a complex nervous system that enables the coordination of complex acts ranging from motor acts such as pole vaulting to cognitive acts such as reasoning. But recognizing these facilitating conditions must be sharply distinguished from assuming that they are the determinants of the behavior. The former is a field construct, the latter a self-actional one.

On the limiting side, a metabolic disorder such as phenylketonuria impairs the developmental history of the individual and can result in intellectual retardation. Some biological limitations, in contrast, are actually desirable, such as our failure to perceive the hole in our visual system where the optic nerve leaves the retina. And, despite our five-per-second saccadic eye movements, we do not have jerky views of the world. The failure to see the empty area in the visual field occurs simply because we do not have the biology that would enable us to perceive it, not because of a putative filling in by the brain (Smith, 1997). Similarly, we do not have the equipment to perceive the individual saccadic segments, not because of a mysterious smoothing action of the brain. In contrast, we have about a 180-degree visual field but do not see all of it, not because of lack of equipment but because seeing is more than the biology of eyes and brains. Seeing also involves what we attend to and perceive, together with other components of the field.

Psychophysical Dualism Versus Naturalism

In contrast to the field construct's beginning point in observation, dualism begins with a tradition that extends back to the Hellenistic period of Western civilization (Kantor, 1963; Lundin, 1991; Smith, 1992; see Fredericks, this volume). That tradition gave the originally naturalistic Greek *psyche* a transnatural meaning, a meaning that was in turn imposed on the originally naturalistic words "soul" and "mind," making them into internal causative agents (Smith, 1989). From about the 1930s to the 1960s, "mind" largely disappeared from the psychological literature but appeared in substitute form as drive, emotion, instinct, purpose, motivation, and brain (e.g., Atkinson, 1964; Birney & Teevan, 1961; Brown, 1961; Cofer & Appley, 1964; Feldman, 1966; Hull, 1943; Kagen & Pribham, 1969; Spence, 1956; Tolman, 1932, 1942; Young, 1961). However, the usages were much the same–that of an unobserved internal causative power. The mind construct began re-emerging in the 1960s, along with similar constructs of cognition, information processing, and internal representations, all orchestrated by the brain. These culturally-derived constructs now dominate psychology (e.g., Johnson-Laird, 1993; Kosslyn & Koenig, 1992; Neisser, 1967; Port & van Gelden, 1995; Simon, 1990). Although the users of the constructs no longer assume a nonphysical mind, they remain dualistic in that they continue to explain observed events in terms of unobserved and unobservable self-actional brain powers. As Kantor (1959) explained:

> Historically the overemphasis upon organisms to the exclusion of other factors was influenced by the need to find a locus for the soul or psychic

> powers. These powers gradually became conceived of as internal forces. With the recession of mentalistic psychology the brain was transformed into the locus of internal powers. (p. 91)

These various forms of psychophysical dualism are construct-based rather than event-based. Investigators who use them develop their constructs–information processing, for example–with only the most tenuous of ties to the actually occurring events (Gibson, 1985). Furthermore, because they are not based on events, these dualistic constructs get converted into analogies from physics and technological instruments such as computers. Research then becomes misguided.

One of the failures of both Watsonian behaviorism and methodological behaviorism was that they gave little attention to such important activities as thinking, imagining, reasoning, perceiving, choosing, knowing, and comprehending. In contrast, interbehavioral psychology (Kantor, 1924, 1926) always included them. It ignores no activity because of its subtlety or difficulty of observation. It holds that all psychological interactions are amenable to scientific study. A widespread appreciation of the interbehavioral system could very well have preempted the advent of cognitivism, which presumes to study the cognitive acts that behaviorism omitted but which actually fails to distinguish between cognitive interactions and traditional constructs (e.g., Andreasen, 1997; Beardsley, 1997; Bechtel, 1990; Campbell, 1989, Fodor, 1981, 1987; Posner & Raichle, 1994; Vera & Simon, 1993; for criticisms of these constructs see Flora & Kestner, 1995; Gergen, 1994; Mixon, 1987; Neisser, 1976, 1985; Simon, 1990; Valsiner, 1991). Cognitive psychology accepts without question Kant's assumption of an inner representation of the outer world and thereby maintains a psychophysical dualism. The dualism is also reflected in its insistence on cognition *and* behavior. Further, in attributing cognitive power and information processing to the brain, cognitive psychology retains the organocentric tradition of the metaphysical mind. And while claiming to have overcome the mechanistic limitations of behaviorism, it adopted methodological behaviorism's methodology, which it used to develop mechanistic analogies with computing machines. As a result, it has squandered enormous human and financial resources on non-events and left our understanding of genuine psychological events all the more confused. Adherence to the interbehavioral investigative principles presented here could have had quite the opposite results for all interbehaviors.

Teamwork with Other Sciences

Because psychology, like other sciences, abstracts out of the event continuum its own domain of events, that domain necessarily contains events that are amenable to study by the specialized techniques of any number of other sciences. In turn, psychology can equally well contribute to other sciences whose domain includes psychological events. Kantor has written extensively on these mutual relationships (e.g., Kantor, 1933, 1953, 1981; Kantor & Smith, 1975). Mutual cooperation can result in findings that enormously enhance our understanding of nature.

Scientific teamwork is especially effective where all parties use an event-based approach. For example, interbehavioral psychology can work with such sciences as physics, chemistry, and biology in better understanding color perception as a naturalistic event. Such event-based collaboration requires discarding the construct-based assumption of physics, which originated with Newton, that the colors of the spectrum have no physical existence but were created in the "sensorium" of the brain.[7] Working with specific chemical events, chemists have shown the concrete chemical conditions of objects that produce colors. Physicists have shown the wave character of color. Biologists have revealed the cones of the retina as cells sensitive to color. Biophysicists have described the role of the lens and its yellowish tinge (and of the macula) in minimizing chromatic aberration. Interbehavioral psychologists, in turn, describe the interaction of organisms with colored objects, the role of light as a medium rather than as a stimulus object, setting factors (e.g., contrast effect), and perhaps some influence of interactional history—all as components in seeing colored objects.

Similarly, behavior-affecting chemicals such as narcotics and psychiatric drugs invite a partnership of psychology and biochemistry. Psychopharmacology has already shown the way and has developed analytic constructs consistent with interbehaviorism. More than twenty-five years ago, for example, McKearney (1977) presented an argument that is still persuasive today. He argued against any biological "basis" of behavior, pointing out that the behavioral effects of any drug depend on a complex of interacting conditions. Further, such labels as aggression, addiction, and learning do not represent single things, but rather, extremely diverse events that can have no single cause in the nervous system or anywhere else. Interbehavioral psychology can contribute to an understanding of these diverse participants, and the biological and medical fields can contribute to an understanding of the biology and operation of these factors as organismic setting factors, for example, the change in affect that anti-depressive medications might contribute or the "highs" facilitated by cocaine. Interbehaviorism can contribute to research in this area and strengthen its entry into behavioral medicine that began with Redd and Rusch's (1985) demonstration of the importance of setting factors in medical treatment in hospitals. Similarly, neuropsychology has enormous potential in teamwork with interbehaviorism, but unfortunately, it has thus far remained bound to the cultural constructs of the brain as a self-acting organ. Like physics' approach to color, neuropsychology has not met the criterion of specificity that is required for interdisciplinary collaboration on actual events.

Conclusion

Interbehavioral psychology stands as a direct challenge to more than a century of psychology that has used analogies, reductionism, mentalism, mechanism, and self-action but that has yet to resolve its conundrums or find any unity in its disparate efforts. Interbehaviorism discards the cultural constructs that produce these conundrums and turns to the best of scientific traditions: It draws from observation, thereby deriving its constructs from the events, rather than imposing cultural constructs on the events. The resulting field construct is in general accord with field constructs in other sciences but has its own unique characteristics specific to the psychological event it represents and its level of evolution. The interbehavioral field deals with all events, including those that have been called mental, conscious, or cognitive, as field relations. Because the field takes in the many components that comprise the psychological event, interbehaviorism has the potential to embrace all of the fields of psychology, as well as to provide a basis of collaboration with other sciences whose events are contained within the field (e.g., body chemistry and biology) or overlap it (e.g., economics and anthropology).

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Endnotes

[1]Kantor (1942) expressed a preference for the term "behavior segment" for specifically psychological events and "interbehavioral field" for indicating the connection with other sciences. However, he increasingly used "field" in later writings. He also spoke of the possibility of referring to "context" or "system" or terms referring to such analytic methods as multidimensional statistical correlations (W. S. Verplanck, April 12, 1998, April 19, 1998, Interbehavioral Network Listserver).

[2]Of the numerous types of stimulus functions, the most common by far is the substitute stimulus. If we set off for a meeting, we are interacting with a watch or calendar or some object or situation other than the meeting itself. All "reminders" are substitutes. Language, too, usually deals with substitute stimulation because the thing the listener hears about and the speaker speaks about are often absent. All literature, art, science, folklore, religion, and metaphors make heavy use of substitute stimulation.

[3]Earlier, before switching the reactional biography to the response side of the interaction, Kantor (1942) used *reactional biography* for interactional history–and that earlier usage obtained some currency.

[4]The creative architect Frank Lloyd Wright was known to do this. Because the contemporaries of Mozart and Shakespeare reported that these artists seldom

made any corrections in their work, this suggests that they also worked out their complex creations, at least in part, implicitly.

[5]Because one cannot measure a psychological field like an electrical field, Marr (1993) is skeptical about its validity. He fails to recognize that a quantum field is not measurable as is an electrical or gravitational field, but that this lack of measurability does not disqualify it as a genuine field. The specificity of different kinds of fields both within and across sciences needs to be recognized.

[6]Bentley (1908/1949) argued that government consists of activities of people, and those activities are relationships: "The raw material we study is never found in one man by himself, it cannot even be stated by adding man to man....It is a 'relation' between men, but not in the sense that the individual men are given to us first, and the relation erected between them. The 'relation,' i.e., the action, is the given phenomenon, the raw material; the action of men with or upon each other. We know men only as participants in such activity. These joint activities are one form, are the cloth, so to speak, out of which men in individual patterns are cut" (p. 176). Bentley also objected to the attribution of causality of human behavior to mentalisms.

[7]This assumption began even earlier in the more general assertions of Galileo that all "secondary" qualities had only mental existence. Before that, it occurred in theological constructs about the wonders contained in the soul (e.g., St. Augustine, *On the Trinity*).

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Chapter 5

Interbehavioral Research

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In a sense, all research is interbehavioral because "all scientific work is projected and performed on an interbehavioral basis" (Kantor, 1969, p. 366). That is, organisms can only interbehave; and investigators can only interbehave with the field of interbehaviors. The presuppositions and interpretations of psychological research, however, are often inconsistent with the interbehaviors that are actually observed. The investigator frequently starts with non-scientific constructs such as mental representations, causality of behavior by the brain, or information processing and interprets the observed events in terms of the initial constructs.

The interbehavioral field on which the research described in this chapter is based is a construct that represents seven interrelated components that can be observed when an organism and its surroundings are interacting. These are (a) the *response* of the organism (i.e., its configuration of participating biological components), (b) the *response function* (e.g., the same biological act of sitting that may either relieve fatigue or conform to social expectations), (c) the *stimulus object* (i.e., the thing the organism is in contact with), (d) the *stimulus function* (e.g., the meaning of a stapler as something to clip together papers or to hold down book pages), (e) the *interactional history* (i.e., performances over time), (f) the *setting factors* (i.e., conditions of the organism or surroundings, such as having a cold or being in good health, being alone or with others), and (g) *media of contact* (e.g., light that enables perceptual interactions to occur). Because these components are interdependent, the psychological event consists of the entire field comprised of these interrelated events. Consequently, all psychological research must deal with these events regardless of whether or not they are identified and regardless of how that research may construe its subject matter. When researchers are claiming to study brain processes or mental functions, they are actually observing the concrete events of the field of interactions but are imposing unobserved constructs on their observations. As Kantor noted:

> No one has ever observed any psychological event that was not structured as a field. Nothing has ever been heard except as the interaction of an individual with a particular sound or noise actual or imagined, nothing has ever been seen or thought of except as the interbehavior of an organism with some object under unique conditions. Nothing has ever been learned

except as a field comprising an individual and some subject matter. (Observer, 1981, p. 103)

This chapter surveys the research that may be termed "interbehavioral" in that it (a) explicitly examines the effect of one or more of the components of the interbehavioral field (Kantor, 1959), (b) explicitly makes use of the interbehavioral system to examine behavioral/psychological activity, or (c) tests or explores an interbehavioral concept or content area. Explicitness refers to citing Kantor or one or more components of the field by name. In addition to requiring one of the three criteria that qualify a study as interbehavioral, the survey is confined to systematic empirical investigations involving original observations, except for briefly noting a few reviews of such research or related research. It does not include citation studies or questionnaires that examine responses to the interbehavioral system itself (Morris, Higgins, & Bickel, 1983; Smith & Ray, 1981).

This review first presents those studies that have examined components of the field, then turns to those that have measured a greater part of the entire field, and finishes with those that have examined some types of interbehavioral fields, specifically, emotional and linguistic. Some areas of study, such as linguistic behavior, have a history spanning more than half a century while others, such as stimulus functions/response functions, have seen no activity beyond the 1950s. Although the lack of continuing research in the latter case is regretful, the findings have not been invalidated or superseded and therefore earn a place in the review.

Throughout this chapter the terms *interbehavior*, *interaction*, and *behavior* are used interchangeably. *Response* is used as the organismic side of the behavioral configuration in conditioning studies and in studies of stimulus and response objects and functions.

Components of the Field

Researchers have given more attention to *stimulus functions* and their interdependent *response functions* and to *setting factors* than to other components of the interbehavioral field. *Interactional history* frequently receives incidental attention, but only a few studies have dealt with it directly or in conjunction with other components of the field. In the case where two or more components receive equal attention in their interdependence, the category in which they are placed in this review is, to a degree, arbitrary. The *medium of contact* has been totally neglected in the literature even though it is involved in every interaction where perceiving is a part of the interaction.

Stimulus Functions/Response Functions

The stimulus has often been treated as physical energy that causes the organism to produce a mental sensation of the object or as a preceding causal event that evokes a response. Kantor departed from both mentalism and mechanistic causality when he observed the following: (a) a stimulating object may harbor more than one stimulating function and (b) a response necessarily correlates with an object, for a response, too, has a functional character that correlates with the function of the stimulus with which it is in interaction. The stimulus, then, does not evoke or elicit a response nor is it a causal antecedent. Nor does one need to posit some unseen force to convert the physical object into mental meanings to the individual. The stimulus function and the correlated response function are part of a constellation of interacting field participants in the total psychological event. Consequently, they are interdependent with setting conditions and interactional history. Often, researchers of stimulus and response functions refer to only stimulus functions, probably for convenience, even though response functions are equally involved.

The following experiments on stimulus and response functions are directed at the stimulus as a function rather than as an object. Beyond that, they are varied. Whereas greater development of each theme would be desirable, this diversity has the advantage of indicating (a) the range of events and experimental approaches to which the constructs of stimulus and response functions apply, (b) the indispensable role these functions play in organism-object interactions, and (c) the interdependence of stimulus and response functions with setting and interactional history, either implicitly or explicitly.

Locus of functions and theoretical comparisons. One of the earliest interbehavioral research projects attempted to investigate psychological stimuli as stimulus functions rather than as stimulus objects. Carter (1937) gave subjects a task of first learning responses to symbols they had not seen before. Subjects learned to press a key for "right" symbols but not for "wrong" symbols. Then, in order to find the locus of change of the stimulus functions (i.e., the point where subjects no longer responded to further variation in the original "right" symbols), the investigator presented graded changes in the "right" figures while instructing subjects to continue responding as before. After "breakdown" was completed, Carter required the subjects to relearn the now inoperative functions of the previous functional points. Overall, he found that as the initial response function began to break down, the locus of the stimulus function shifted as a function of the experimental interactional history of each subject and was restored upon a graded return to the form used in the original learning. He concluded that "a psychological stimulus is not an object that elicits a one to one response. Rather it is a function inhering in an object that under given conditions can be demonstrated to have a locus. Beyond this locus any given stimulus object does not have the functional nature necessary to a given psychological response" (p. 47).

As a follow-up, Carter (1938) conducted a learning experiment to see which of five theoretical approaches could best account for some experimental events. He presented geometric figures and their mirror images to subjects. In the learning situation, they moved a lever to the right or left for figures that appeared. The task was to learn which were right and which left. A buzzer indicated correct or incorrect movements. Trials continued until the subjects had learned the lever movements to criterion. Then he mixed in new figures for the test situation. He asked subjects to respond to the new figures with a key press and old ones with the lever. He found that individual subject's responses in learning and in test situations were unrelated. The subjects responded to new and different stimulus objects in a manner equivalent to stimulus objects to which they had previously learned to respond—as though they were constant figures.

Carter concluded that four of the theoretical approaches could not handle the data, for example, the conditional reflexes of behaviorism and the presumption of the stimulus as an energy releaser of Woodworth's dynamic psychology. A fifth, interbehavioral psychology (then called "organismic psychology"), could do so, he argued: It (a) accounts for the two types of stimulus functions/response functions—use of the lever and use of the key—and the *loci* of these, (b) describes the competitive character of lever versus key that appeared in the reaction times, (c) provides for the historically continuative development of the learning and the test results, and (d) offers a description of behavioral events as exclusively objective events and provides a system that can handle the data without imposing speculative neurology or other hypothetical mediators, as the other four approaches do.

Mutability. In a demonstration of the vicissitudes of stimulus functions, Pronko and Bowles (1948) and Bowles and Pronko (1948) showed that different cola beverages may have the same stimulus function and that the same cola may have different stimulus functions. When restricted to taste alone, subjects identified different colas as the same brand and the same colas as different brands as often as they correctly distinguished them.[1] Using hypnotized subjects, Bowles and Pronko (1949) and Pronko and Hill (1949) measured salivation to demonstrate that lemon juice took on the functional meaning of maple syrup and vice-versa and that water took on either of these.

Problem solving. When a function of an object becomes fixed at one particular usage, and another function of the same object is required for the solution of a problem, the new function may not be readily perceived by the person seeking the solution. This impasse, which Duncker (1945) first identified and called "functional fixedness," translates directly into interbehavioral description: When functional fixedness occurs, the stimulus object has not evolved the requisite new stimulus function. Swartz (1955) utilized this principle in an experiment in which subjects had two separate tasks, one to sort playing cards into four separate piles according to like suits and the other to try to determine the value of a hidden card which depended on the color of the suit of an exposed card. For example, for one subgroup the hidden card for a black suit was always three and for a red suit always six. One group problem-solved and then sorted; the other sorted and then problem-solved. Solving the problem required evolving one stimulus function for a red suit of cards and another for a black suit, the function being different for each. Because there was no significant difference between the groups, Swartz concluded that the stimulus function in sorting did not interfere with the stimulus function required in problem solving; consequently, when subjects must differentiate between stimulus objects that share prominent common characteristics, they tend not to evolve "localized stimulus functions"—a term suggested by Kantor to refer to stimulus functions that are closely linked to specific objects. But the group that problem-solved first did better than the other group in sorting; thus, when subjects' interactions do not result in different stimulus functions of stimulus objects that have in common a distinctive common feature, the resulting functional equivalence is one of a localized stimulus function of that common feature and a fixed stimulus function.

In another study of localized stimulus functions involving problem solving (Herman & Engstrand, 1957), subjects were requested to discover a simple principle on a succession of cards with a letter in each of the four corners and then to solve a problem with the same cards using a different principle. Two solutions involved use of an alphabetical principle (a vowel rather than a consonant or the earliest appearing letter of the alphabet) and two of position (lower left corner or alternating corners). The solution of one problem facilitated the solution of another when stimulus functions were similar–both of alphabet or both of position; however, one solution either failed to help or interfered with the solution of the other when the stimulus functions were dissimilar–one of alphabet and one of position. As Swartz (1955) found, localized stimulus functions can interfere with the solving of a problem; but these data also show that such stimulus functions can provide positive transfer, depending on the interactional history.[2]

Language influence. In a study of stimulus functions and setting factors directed toward the influence of language on visual perception, Herman, Lawless, and Marshall (1957) presented subjects with figures flashed on a screen. Those who were informed that they would draw the figures after seeing all of them made fewer distortions in their drawings than those who were not so informed. A majority of a separate group of subjects who were asked to provide a written label for the figures they saw made distortions similar to those of the non-informed group. The authors inferred that the non-informed group made verbal inferences similar to those of the writing group, and the informed group attended more closely to the details of the figures. They concluded that what the subjects drew or described (the stimulus functions of the ambiguous figures) was influenced both by the language behavior of the experimenter and by the subjects' own language behavior. Stimulus functions occurred in accordance with meanings as they were structured by the experimenter or by the subject.

Social behavior. Cultural or social behavior, the interbehavioral system maintains, involves shared stimulus functions and their interdependent response functions. These sharings make up the greater part of such functions and include those that are political, religious, linguistic, and customary (Kantor, 1929, 1982). When speakers of English say "book," they generally all refer to the same class of objects and thereby have a shared meaning. The reverence for a black rock at Mecca is a stimulus function of that object that is shared by a particular religious community. In order to study how such culturalization of stimulus and response functions occurs, Herman and his colleagues asked subjects to judge the distance that a wooden ball rolled down a trough when they could hear but not see the event (Herman, Bowles, & Hill, 1943, unpublished; described in Herman, 1956). Subjects who judged under group setting conditions showed less difference from one another than those who judged individually, but those who initially judged under individual conditions converged their judgments toward one another under group conditions. The amount of convergence, however, was influenced by setting factors consisting of instructional information, in addition to settings of group or individual. Under four conditions of varying amounts of information, subjects converged less the more factual information they received.

In a second study, by Herman and Staner (1954, unpublished; described in Herman, 1956), the sound of the ball was unrelated to distance and consequently no accurate judgment was possible, although the subjects were not told this. The investigators varied the conditions and confirmed the earlier results as well as finding that when subjects discussed the task, they tended to increase their convergence and that group standards carried over into individual judgments. Under such an equivocal task, the group was able to exert its influence and evolve a belief that was shared by its participants.

Sensory preconditioning. Sensory preconditioning has posed a problem for behavioristic psychology. In stage one (preconditioning), paired stimuli are presented; in stage two, a response becomes conditional to one member of the pair; and in stage three, the non-conditional stimulus is presented. Subjects without stage one perform fewer conditional responses than those whose interactional history includes stage one. Because behavioristic psychology assumed that stimulus and response must be contiguous for conditioning to occur, when it occurs in noncontiguous arrangements explanations include such claims as (a) experience is something different from responding to stimulation and (b) the two stimuli in stage one are "associated" with each other. Brackmann (1956), in contrast, argued that sensory preconditioning (respondent) requires similar stimulus and response functions in all three stages and that these are fostered more by consistent organism-object interactions than by varied interactions. Therefore subjects interacting consistently with the stimulus objects should show a higher frequency of responses in stage three. He hypothesized that preconditioning would depend on similarity of stimulus and response functions. Using rats, he found support for this hypothesis, which was consistent with an interbehavioral analysis, an analysis that has the advantage of drawing "the researcher's attention to . . . the interbehavior of the organism and the preconditioning stimulus object" (p. 26). Further, this approach obviates hypothetical intervening variables while replacing them with observed events and their functional relations.

Graded stimulus functions. One experiment has indicated the importance of individual differences in the interdependence of stimulus function with interactional history. Mountjoy (1957) found that each member of a pair of monozygotic twins developed different responses to the Müller-Lyer illusion despite constant conditions. With the task of setting a comparison arrowhead to equal a standard pair, twin A made an illusion response that was roughly unchanged throughout the two days of the experiment whereas twin B showed a marked decrement in illusion. This demonstrated a differential stimulus function in degree rather than in kind. Because the differences could not be due to heredity, they were probably due to slight differences in interactional history. The results indicate the importance of examining the response record of individuals as well as the danger of amalgamating all data statistically such that important individual differences are lost.

In brief, these diverse studies demonstrate the importance of distinguishing the stimulus function from its object as a means of understanding the experimental outcomes. They also show that stimulus and response functions are interdependent with setting factors and interactional histories.

Setting Factors

Kantor (1924, 1969) recognized that stimulus and response interactions are central to each psychological event but that they do not occur in isolation. These interactions always occur in some kind of setting, and it too is a part of the interaction. In many cases it is difficult to determine whether a given component in the field is setting or stimulus, just as is differentiating a stimulus function from a response function. Precisely because of such interdependence of components the interbehavioral field must be recognized as a unity. Nevertheless, interdependence does not mean identity, Kantor insisted. To analyze out the various components provides a better understanding than an amorphous whole and establishes a basis for conducting research. Setting factors may be those that inhere in the organism, such as sickness, health, depression, hunger, fatigue, etc. Or they may be those of the surroundings of which the possibilities are almost infinite. In fact, both are inevitably present simultaneously: Some biological condition is present in every surrounding condition.

Historically, the various forms of behaviorism have given little attention to the circumstances in which stimulus and response events take place. Some regarded the stimulus as an input and the response as an output and never went beyond the experimental manipulation and measurement of these two variables. When inconsistencies occurred, methodological behaviorists assumed that the differences could be accounted for by hypothetical drives or physiological determinants and Watsonian behaviorists by further exploring classical conditioning arrangements. More recently, behavior analysis has discovered the advantages of taking account of setting factors (see below); but cognitive psychology, the dominant approach today, continues to ignore settings while positing unobserved and unobservable internal causes, often in the form of computer analogies (e.g., Johnson-Laird, 1993; McClelland, Rumelhart, & PDP, 1986). Various forms of contextualism as well as dialectical psychology, phenomenological psychology, and eco-behavioral psychology have recognized the importance of context or setting. Perhaps social constructionism could be said to be obsessed with the setting in that it insists that the social setting is the ultimate determinate—we construct our world from our social relationships (e.g., Gergen, 1994).

Some field components that the investigators called "setting events" (a substitute term used by behavior analysts) were actually interactional histories and have been placed under that heading. Still others are ambiguous in their taxonomy or include interdependent setting and history. The themes or topics of setting factors are as diverse as those of stimulus and response functions. The terms *setting factors*, *setting conditions*, and *settings* are used interchangeably, and in conjunction with behavior analysis, *setting events*.

Educational and care settings. A variety of arrangements and conditions of the classroom, such as physical, social, and programmatic environments, have been used to promote educational experiences and prevent behavior problems. The way in which these conditions interact with one another is important (Nordquist & Twardasz, 1990). Rosenfield, Lambert, and Black (1985) found that even seating arrangements–whether rows, circles, or clusters–for elementary school pupils influence the extent of their on-task behaviors, such as discussion comments, hand raising, and listening as opposed to off-task behaviors such as disruptive behavior and withdrawal. Systematic observation in the classroom disclosed that both molar (such as time in instruction) and a combination of molecular setting factors (such as materials, activities, and behavior of teachers) are influential on classroom performance. An understanding of behavior-setting interactions could direct "the practices and classroom environments needed to influence powerfully the rate of students' academic growth" (Greenwood, Carta, Kamps, & Arreaga-Mayer, 1990, p. 59).

Fox and Conroy (1995) review three methods of assessing the effects of setting factors on children's behavior outside the school as well as in the classroom and conclude that because psychologists and teachers often apply corrective procedures only to the specific behavior that needs correction, these procedures have only limited effectiveness. By making setting factors an integral part of assessment and programming, the effectiveness may be greater and longer lasting (Conroy & Fox, 1994). This systematic approach might contribute to the potential for setting factors suggested by Greenwood et al. (1990).

Effects on social behavior. Two experiments on children's social behavior in conjunction with settings have implications for application. In a study of the effects of social density (crowding) on the social behavior of three- and four-year-old children, Brown, Fox, and Brady (1987) found that a smaller freeplay area as a setting factor led to more socially directed behavior than did a large freeplay area. Freeplay area became a context with size, not just a discrete stimulus at a point in time, and could be used to improve the interactions of children who might be at risk for delayed development. In the other experiment, Chandler, Fowler, and Lubeck (1992) compared the effects of four combinations of settings on children's social behavior and found that excluding the teacher from the activity, limiting the number of materials available, and pairing each child with a partner who has social skills was the most effective combination for increasing social interactions.

Velocity. Setting factors are not static. They change just as do stimuli, responses, and their functions. A series of experiments with rats and humans explored the relation between behavior velocity and setting velocity, that is, the rate of behavior change in conjunction with the rate of setting change. After showing with rats that behavior velocity (specifically, rate of transition from one set of activities to another) slows with a declining environmental pace (setting factors) (Ray & Delprato, 1989; Ray, Upson, & Henderson, 1977), Ray examined this relation further with college students who participated in a succession of three conditions (Upson, Carlson, & Ray, 1981). In Condition 1, the students were instructed to place themselves in settings specified by the experimenter, such as dancing, sitting in chapel, music, or other campus events. This procedure continued for seven days. In Condition 2, students could choose their own setting on the campus. This continued for six days. In Condition 3, the students spent four days on an isolated Bahamian island with no electricity or entertainment but with self-control over settings. In the first condition, they changed settings about 1.7 times per hour; but in the last two conditions–those in which the students controlled their own settings–they selected a lower change velocity, about 1 per hour. They also decreased the variety of their settings. Under self-control, whether on a college campus or on a Bahamian island, the students maintained constant velocities across time, though the Bahamian setting produced a lower absolute level because of fewer options. On the island, the students regularly changed back and forth among the few settings available. Thus, as the environment slowed down, rats also slowed down and humans moved from setting to setting more slowly. Ray (1983) has pursued these temporal factors further by studying various biological rhythms as they interact with setting conditions and the relation of this interaction to health maintenance.

Experimenter as setting. Ray (1977) has also shown that experimenters themselves are setting factors in that they influence the behavior of subjects in subtle and unintended ways. He found the Soviets to be sensitive to this matter and to make adjustments in the "paradigm structure" (p. 304) for the individual differences of the dogs they condition, much as animal trainers do. Only by employing flexibility in such matters as pacing or in avoiding use of a conditional stimulus while a dog was grooming was he able to bring animals to a similar point of behavior when they had started out quite different from each other. Because both behavioral and environmental events are reciprocal, he notes, we need to take account of the behavior of both the dogs and the experimenter. He suggests that while the Soviets may be somewhat too informal in this matter, Westerners are too insensitive. Some of the studies in the next section also found influences of the experimenter as a setting factor.

Extension to behavior analysis: Origins and issues. Although behavior analysts have been studying setting factors for several years, a number of the reports have not specifically referred to setting factors but nonetheless have taken account of them. (For a brief review of these see Wahler & Fox, 1981 and Morris & Midgley, 1990.) Setting factors came into behavior analysis as "setting events" (Bijou, 1976; Bijou

& Baer, 1961). Later, Michael (1982; after Keller & Schoenfeld, 1950) introduced "establishing operations," which Leigland (1984) considers a more precise concept. Mayer (1995), however, points out the extensive overlap of the two terms. Most research on settings, Wahler and Fox (1981) note, considers only presence or absence of conditions. Their review of settings in behavior analysis, however, shows that they are actually quite complex. Setting factors that influence one subject may not influence another or may have a different influence. Yet their role "appears crucial to practical problems of behavior change both in terms of effective, initial behavior change. . .and in terms of generalization. . .and maintenance of behavior change" (p. 331). Wahler and Fox review research showing that positive reinforcement and aversive contingencies influence behavior in periods from minutes to hours later. Where behavior occurs in situations that are outside the reach of contingency interventions, such as those of fighting, stealing, truancy, and vandalism, "it might well be possible to alter the function of these temporally remote stimuli through setting operations" (p. 337). Approaches that have been called "ecobehavioral," which combine ecological psychology (or eco-behavioral science), behavior analysis, applied behavior analysis, and interbehavioral psychology, have been addressing these multiplex variables of human activity (Morris & Midgley, 1990).

Gewirtz (1967) was one of the earliest to take account of setting factors in behavior analysis. He reviewed the operation of "setting conditions" under different names in other behavior analysts' experiments and described two experiments he conducted with children in which social settings influence the effectiveness of reinforcers. He was able to replace his previous assumption of an unobserved drive (though recognized as "gratuitous") as an explanation of his results with observed setting conditions. This is a good illustration of the way in which the interbehavioral system can replace constructs that are not based on observation with constructs that are.

Extension to behavior analysis: Experimenter as setting factor. Influenced by Bijou, Baer, and Gewirtz, Bloom (1974) tested the influence of eye contact as a setting factor on infant learning. She viewed the setting as a "catalyst" for reinforcement and found that "without eye contact the response-reinforcer was inactive; eye contact served as a setting event in catalyzing that relationship" (p. 260). She noted that the role of the experimenter as a setting factor also turned out to be critical in understanding "generalized imitation," which consists of non-reinforced imitation of responses given a history of differential reinforcement for imitating (Peterson, Merwin, & Moyer, 1971; Steinman, 1970; Steinman & Boyce, 1971). Manipulating the experimenter's presence in conjunction with non-reinforcement brought about control of the imitative behavior of a twelve-year-old girl whose behavior was severely retarded (Peterson & Whitehurst, 1971). Similarly, Rosenbaum and Breiling (1976), who worked with a child who behaved autistically, found that the presence of the experimenter, serving as a setting factor, was influential in maintaining non-reinforced imitative behavior. They held that their study, together with those of others, demonstrates the need to go beyond antecedents and consequences to elements in the physical environments that, as setting factors, provide control over behaviors. Because the influence of the experimenter is a matter of visibility, they suggest that studying the effects of visibility on people in offices, factories, and schools will provide a means of gaining greater control. The findings of these studies are reminiscent of Ray's (1977) demonstration that the experimenter subtly affects the conditioning of dogs.

Extension to behavior analysis: Child-parent conflict. A series of applied behavior analysis studies has examined the role of setting factors in child-parent oppositional conflict. By using techniques of "not giving in" together with a point system as reinforcement, Wahler (1980) successfully taught parents to manage their children's oppositional behavior, for instance, non-compliance, hitting, verbal abuse, fighting, stealing, and property destruction. The mothers' aversive behaviors toward their children, such as screaming and complaining, also decreased with training. But after the training program, the mothers did not continue the child management procedures they had learned; and the adversity returned, especially when the mothers had aversive contacts with agency workers or relatives but less so when they had social contacts that were friendly. The unfriendly contacts were setting factors that altered the interactions of mother and child. The author suggested that improving the mother's social contacts might be a necessary part of promoting better mother-child relations. In a related study, mothers who were multistressed and in conflict with their children did not discuss their problems with relatives and friends or seek their advice, as did those who were singularly stressed (Wahler & Hann, 1984). Both the stressful interactions and the social interactions could be considered interactional history rather than settings. Regardless of the taxonomy, it appears that both field factors had a role in oppositional conflict.

Dumas and Wahler (1985) also found that insular mothers engaged in more aversive behavior with their children than did those who had more friends, and that this held whether the children were aggressive and oppositional or not. In the words of the authors' subtitle, the children were "damned if [they] do and damned if [they] don't" (Dumas & Wahler, 1985, p. 1). The mothers' social contacts outside the home would need improvement in order for the training successes to be maintained.

The work of Wahler and others shows that parents who were both economically disadvantaged and in discord with social agencies and other adults tended to fail at programs of contingency management for their oppositional children (Wahler & Graves, 1983). Setting factors also operated to predict depression when conflict occurred between a mother and other adults, and they predicted her aversive behavior when conflict occurred between her and her child. Her aversive behavior and her depression predicted her negative judgments about her children. These behaviors were not tied to present stimulus events but to the previous interactions (Panaccione & Wahler, 1986). Such stressful past interactions seem to interfere with her attending to the relevant present behaviors of her child. These studies and others "suggest a portrait of troubled, multistressed mothers focused on deviant behavior yet inclined to overlook the details of this behavior. Troubled mothers are quick to classify their children's behavior as deviant and equally quick to respond aversively to whatever the children do" (Wahler & Dumas, 1989, p. 123). These studies reveal both (a) interbehavioral history and (b) such aversive setting interactions as stress and depression together with poverty marching in interdependence to affect behavior. Parents are influenced by more than just their children, and these influences consist of a variety of field conditions. Brown, Bryson-Brockmann, and Fox (1986) hold that applied behavior analysts need to deal with these conditions in order to improve the efficacy of their interventions. It might be added that this would hold true for all forms of therapeutic intervention, not just for behavior analysis. Wahler and Dumas (1989) have proposed an interbehavioral model of dysfunctional mother-child interactions and the clinical applications of it that might be generally applicable.

Extensions to behavior analysis: Retardation. Change of setting was used in the case of two individuals, one with severe and one with moderate intellectual handicaps, who engaged in disruptive behavior in the classroom (Kennedy & Itkonen, 1993). In the moderate case, the disruptive behavior was traced to getting out of bed late and, in the other, to the frequent stops of the bus at stop signs. Reinforcement for getting out of bed promptly was used for the one and a change of bus routes for the other. Classroom behavior improved in both cases. The authors note that "preceding setting factors can affect the frequency of problem behavior at other times and in other settings" (p. 327). They refer to "eliminating" settings as the intervention procedure but have actually substituted one for another.

Two other studies of individuals whose behavior was profoundly retarded also made use of settings. Belfiore, Browder, and Mace (1993) were able to obtain more adaptive behavior with such individuals by using a setting of high intensity conditions (more than 15 people present, bright sunshine through the window, and a sound system operating) than with a low intensity setting. Reese and Leder (1990) examined a mixture of interactional history and settings: leisure time, work activities, self-care training, gross motor behavior, open setting or smaller space, and varied treatment by staff members. By enriching the environment during leisure time and providing the presence of a staff member, the authors found that a group that initiated interactions with people and things began to interact more with the leisure material and to engage in less stereotyped action than did a group that did not initiate interactions. Any given combination had different effects with different individuals, suggesting the need to individualize the procedure. Apparently, a careful analysis of the effects of setting factors can provide useful information even where great variability occurs. Such variability and the need to attend to particular events and conditions are consistent with Kantor's (1959, 1978) principle of specificity: Each interactional field is unique with its specific events.

Behavioral medicine. Finally, the recognition of setting factors has also played a role in the advent of an interbehavioral orientation becoming a part of behavioral medicine. This began with Redd and Rusch's (1985) demonstration of the role of enduring setting factors (pain medication, food, nurse call button) and changing setting factors (laboratory procedures, physician visits) in the pain and distress of cancer patients. Another contribution to interbehavioral medicine has been to apply interbehavioral principles to research and relate them to some interbehavioral postulates (McGlynn, Cook, & Greenbaum, 1987). The authors also present findings of mother-child interactions involving anxious mothers and project further research to the interdependence with other field factors. They view interbehavioral principles as able to utilize behavior technologies, organize the field of behavioral medicine, and avoid unidirectional approaches and mind-body dualism.

Interactional History

A history of interactions is a part of every organism-object interaction. Many of the studies directed at other components of the field refer to history's role in the function of these components, but only a few have been directed at the history itself. Of these, some regarded the history as setting factors, and those have been included in this section. A case could be made for including still other studies on history that were described as settings. Some of the confusion may be due to Kantor's statement, noted by Wahler and Fox (1981), that "conditions" that occur in conjunction with behavior such as "the hygiene of the organism, its habituation or past behavioral history, what behavioral circumstances it has recently or just previously passed through" (Kantor, 1970, p. 107) refer to settings. Although interactional history (a) affects what is and is not a setting for a given organism and what influence that setting has in the field of interbehaviors and (b) may not always be clearly separable from settings (e.g., instructions), Kantor would almost certainly insist on making the distinction between them whenever possible. Both distinguishing them and recognizing their relations enhances our ability to understand psychological behavior and to design research that reveals more of its character.

As a controlling procedure. Interbehavioral psychology has received only limited attention as a system for controlling behavior, but Krantz and Risley (1977) demonstrated that potential. They showed that kindergarten children increased their disruptive behavior and gave less attention to the teacher during a story reading period if they had previously participated in boisterous activity for a period of time. By substituting a rest period for the vigorous activity, the researchers were able to control the behavior just as well as they did by use of contingency management.

Influence on Piagetian tasks. Caracciolo, Moderato, and Perini (1988) conducted three series of experiments to examine the effects of some field factors on Piagetian intellectual activities. (a) Children who failed conservation tests received training on numbers and length conservation. They improved on these and also showed generalization to weight, mass, and volume tasks. Improvement was even greater when they received explanation of the rules. (b) Children who failed a class inclusion task improved with verbal explanation in various training materials. Children whose behavior was retarded as well as those whose behavior was normal improved. The investigators concluded that the intellectual level of the children was not as important as such field factors as interactional history and settings: "Even cognitive interaction should be analyzed in terms of organization and arrangement of antecedent and setting factors more than in terms of cognitive level of subjects" (p. 400). (c) The investigators gave 168 children, half underprivileged, tasks of hierarchical classification and categorization involving animal figures. When they gave the criteria for classification after a child made an error, that information facilitated improvement but did not do so when the criteria preceded an error. Their conclusion from this three-part series was that complex cognitive behavior is "a function of" organism-object interaction. It would be more consistent with interbehavioral field psychology, however, to say that such behavior is *comprised of* organism-object interaction.

Ecological setting of ferrets. The functional characteristics of the behavior of young non-human animals must be seen in the "ecological setting" that is relevant to young animals just as the functional characteristics of adults must be viewed in their own ecological setting. And, contrary to common practice, adult standards cannot be applied to the young. With this orientation, Lazar and Beckhorn (1974) began a study of the interactional history of young ferrets in their ecological setting by videotaping the patterns of face-to-face social interactions (i.e., "the nose of one of the kits pointed towards the face of the other"). In analyzing four patterns associated with face-to-face behavior, they found that touching, mouth closed or open, head above or below one another, and moving toward or away from one another changed with age. This "transactional" (a term used by Dewey & Bentley, 1949, and used here in common with Kantor's work) or interactional history was a result of each animal's face-to-face behavior influencing the other's face-to-face behavior and these behaviors in turn influencing subsequent behaviors. Further, the authors argued, to study these behaviors outside the face-to-face context would require restricting the behaviors to biology, and the biology would have to function relatively separately from the social interactions. In Lazar and Beckhorn's words:

> The goal of our analysis of transactions is to achieve a maximum description of their aspects, not to reduce them to their basic elements. The scope of any transaction then will be greater as we successfully identify its aspects and as we combine transactions into new and more inclusive ones. (p. 413)

They hold that this evaluation also applies to other behavior patterns such as sex and aggression.

Classical conditioning. Even classical conditioning with animals, traditionally considered to be rather mechanistic, shows itself to involve interbehaviors in general and interactional history in particular (Henton, 1981a, 1981b; Henton, Ellingson, & Edwards, 1981; Henton & Fishir, 1981; Henton, Fishir, & Spohn, 1981; Henton & Iversen, 1978; Henton & Spohn, 1980). For example, a recording of the location of mice during control and stimulus intervals while undergoing compound conditioning (two or more conditional stimuli) to a light plus a tone showed that the type of food cup responses (approaches, frequencies, duration, and sequential patterns) they made depended on the animals' history of orienting to the light or to the tone (Henton, Fishir, & Spohn, 1981). The authors note that behavioral systems affect conditioning environments and are affected by them, consistent with an interbehavioral analysis advanced by other investigators to account for similar findings. When mice were conditioned to a light paired with sucrose, the location recordings showed varied response sequences such as approach to dipper and orienting to light that indicated a "complex organization of behavior" (Henton & Spohn, 1980).

By treating classical conditioning in a non-mechanistic fashion, Holmes and Delprato (1978) were able to show that such conditioning may be involved in hypnotic arm movements as a part of subjects' interactional histories. This, they hold, supplements a social psychology approach that has largely replaced the mentalistic trance assumption. Here, an interactional approach involving classical conditioning has been useful in furthering the replacement of traditional constructs with specific relations of events.

Multiple Measures of Interdependencies

Most of psychology retains a linear mechanistic view of behavior which invokes chains of cause and effect (Ray & Delprato, 1989; Smith & Smith, 1996). For example, psychology often measures a single response class, which is said to be "dependent" on the stimulus class, whereas the stimulus class is presumed to be "independent" of the response class. When investigators do measure more than one response class, they usually ignore the interdependencies among classes. As Ray and Delprato (1989) note:

> The result is that response organization, when noted, is attributed to organizing factors *external to the responses* (causes, independent variables). These hypothetical organizing factors may be placed in the external environment or inside the organism (e.g., biological states and processes, mental structures). (p. 86)

In a review of a number of animal studies involving shock avoidance and illness aversion, Delprato and Rusiniak (1991) demonstrated that only multiple-response recordings can provide an understanding of the effects of some experimental manipulations on behavior. They also challenged accounts of behavior that have used single variable designs. A review of animal studies and some human experiments shows that a systems or field approach to experimental studies is more fruitful in revealing the nature of the activities of organisms than lineal-mechanistic approaches (Ray & Delprato, 1989). The studies surveyed below turn away from linearity and examine the usually ignored interdependencies.

Systems/Field Approach: Controlled Studies and Naturalistic Observation

A variety of experimental methods and topics have been consistent in showing the importance of taking multiple measures. Ray and Brown (1975) demonstrated that simple motor responses of laboratory rats involve complex *systems* of behaviors. Intervention in a behavior changes the probability of subsequent behaviors and the organization of the whole system as well. Their measurement of entire systems calls into question the traditional meaning of reinforcement: "how is the concept of reinforcement compromised when it is discovered that reinforcers and discriminative stimuli act quite differentially depending on the behavior in progress when the stimulus is presented" (pp. 476-477)? Ray, Upson, and Henderson (1977) studied change in the behavior of rats as a result of imposed environmental settings and measured the biological rhythms of killer whales. These two studies showed that behaviors that occurred in different locations and at different times (e.g., licking/drinking, eating, grooming of the rat and surface or submerged floating and head bob breathing of the whale) showed organized patterns (e.g., behavior flow rates and behavior sequence response patterning) that recurred when multiple measurements such as duration, frequency, and patterns were used. These sequences were influenced by the type and duration of preceding interbehavioral events.

Upson and Ray (1984) conducted a series of human studies that also showed the value of multiple measurements of field relations. (a) By analyzing in a series of sleep studies the spectral-power distributions for each EEG frequency, they discovered patterns that more traditional sleep studies have missed. (b) With nonsleeping subjects, they demonstrated with such EEG records that instructional settings interact with subjects' interactional history. (c) For organismic setting conditions, they chose to study the natural activity of tennis rather than an artificial laboratory arrangement. They identified levels of proficiency as organism settings and found that beginners attended to small details of their own actions, proficient players to procedure and feeling of the game, and professional players to the ball and the other player. (d) Similar results obtained in the investigation of another natural activity, that of golf. As proficiency increases, attending to what one is doing decreases. They also discovered that, in golf, the autonomic activity of heartbeat coordinated with the swing of the highly skilled player but not that of the lower skill levels. Without multiple measures, these findings would not likely have been possible. Also noteworthy is that the findings extended to both controlled and naturalistic research. In other studies, multiple measures in a "behavioral field" approach have been used successfully in animal learning studies (Keehn & Nobrega, 1978; Wong, 1977).

Educational Instruction and Computerizing the Interbehavioral Field

The instructional situation, because of its setting conditions, its designed continuity with interactional history, its presentation of stimulus objects and conditions to which stimulus and response functions are to be learned, and its use of such contact media as light, sound, and touch, is one that can be seen with particular clarity as an interbehavioral field. By employing the field concept for classroom research, the investigator can evaluate settings, people, and responses, and the way in which many classroom events influence many other conditions and events in a multiplex manner (Hawkins, Sharpe, & Ray, 1994, p. 245). This contrasts with the traditional unidirectional approach in which only a few variables and no context receive treatment.

In order to study the multiple variables of the field as they occur over a period of time in movement instruction of physical education, Sharpe and Hawkins (1992a, 1992b) videotaped the instructional lessons of teachers and subjects. Raters of the videotaped behaviors used computerization to record and analyze the complex variables they observed. From this the investigators produced a narrative of the entire event from which responses, stimulus conditions, and environmental and organismic setting factors were identified and combined into categories. The investigators identified the behavioral and stimulus patterns occurring through time (e.g., interdependencies of conflict-specific encouragement preceding positive instructional feedback) rather than as isolated elements at an instance in time. They discovered the importance of particular sequences for successful teaching and, as might be expected, found multiple relations. One such example was that of an expert teacher's simultaneous modeling of a skill, observing a student's performance, and giving verbal feedback. Locke (1992) observes that what the authors term a "field systems analysis" has a "capacity for simultaneous display of temporally ordered details from both teaching behavior and teaching context [that] opens the door to a new dimension, a world containing events of such subtlety that they are invisible to our ordinary perceptions" (p. 86).

The investigators then developed a computerized instrument called the Behavioral Evaluation Strategy and Taxonomy (BEST) and its coordinated Temporal Analysis System (TAS), which they used successfully with public school teachers (Hawkins, Sharpe, & Ray, 1994; Sharpe & Hawkins, 1993; Sharpe, Hawkins, & Ray, 1995). BEST enables the tracking of up to 107 classroom events as well as behavioral and contextual variables. It also offers immediate feedback to teacher trainees after each observational session and an opportunity for rapid modification of their techniques for more effective teaching. TAS provides such information as frequency, duration, rate, percentage of class time for each event, graphics of data including multiple category events, sequential analysis of interactions among events, and analysis within subgroups (e.g., teacher or student behavior). Sequential behaviors in which "one person's behavior is both a response to another's past behavior and a stimulus for yet another's future behavior" and its differential character for novice and expert teachers can also be determined by this technology (Sharpe, 1997, p. 368). In general, "a field systems analysis provides a tool to better understand expert performance as it demonstrates the potential to specify and measure the more complex interactions among teacher and student practices in environmental context" and to show the effectiveness of instruction based on such data in long range teaching practices (Sharpe, 1996, p. 57).

Computer Simulation and Computer Instruction

Computer simulation is now widely used for modeling a wide range of events in the natural world where direct observation is impossible, too difficult, or too costly. Unfortunately, in psychology the computer, aside from its use for conducting sophisticated statistical analyses, has usually been used as an analogy for hypothetical physiological or mental constructs. At the same time, its potential for studying observable events in their complex relations has received little attention. To study these relations, Ray (1992) arranged a computer simulation of the interbehavioral field of a monkey in a cage. To simplify the situation, he allowed for only the behaviors of walk, sit, stand, turn, climb, and eat. He found it necessary to add algorithms for sensitivity to the presence of food, the conditional and unconditional probabilities for each behavior, and similar parameters. Each model algorithm had to account for (a) a behavioral probability based on preceding behaviors, (b) sensitivity to the presentation of food as it changes due to the number of pairings and other behaviors that facilitate or impede it, (c) field conditions of the matrix that enable or disable some behaviors (e.g., sitting disables walking whereas walking enables turning), and (d) reinforcing conditions that change the conditional probabilities. Each behavior has a number of variables whose values were entered into a simulator. The simulated algorithms provide an animated realism to behavior loops that often reveal events which the typical investigator overlooks in the complexity of a field of interactions. As Ray (1992) noted:

> A number of features of this model were not anticipated before I began its construction. Even after 20 years of research on behavioral systems and kinematic analysis, I did not fully anticipate the need for field-specific matrix construction or for reinforcing the field probabilities directly. Nor did I think the implications of stimulus setting factors versus stimulating events would be so different. The persistent presence of food must be handled differently from the momentary presence of sounds accompanying food delivery. (p. 112)

Ray followed this simulation with two additional computer programs called CyberRat (Ray, 2003) and MediaMatrix (Ray, 1995a, 1995b). These complemented his early work (e.g., Ray, 1983; Ray & Brown, 1975; Ray, Upson, & Henderson, 1977; Upson, Carlson, & Ray, 1981), which he had directed toward the structural, functional, and temporal operating characteristics of the interbehavioral field by describing the concurrent and sequential individual-environmental interactions. His efforts to find a better technique for describing these relations led him to develop CyberRat, which provides models or graphical descriptions of fields of events. CyberRat achieves its effects by a complex of descriptive arrangements in the program and the commands to it that allow someone to operantly condition a rat shown in video clips. MediaMatrix allows a programmer to readily develop programmed instructions and adaptive testing. By "learning" what a student learns and his or her rate of learning, the program adjusts contents and testing to the level suited to that student.

Interbehavioral Field Types

Only a few types of interbehavioral fields have received empirical investigation. These consist of interactions that are affective and emotional, linguistic, and social. Of these, social interactions have been investigated by only two studies (Herman, Bowles, & Hill, 1943; Herman & Staner, 1954), both unpublished but described in Herman (1956); they are reported under "Stimulus Functions/Response Functions" rather than in this section. Linguistic and social interbehaviors received the most analytic attention from Kantor, each being the subject of two books and many articles (e.g., Kantor, 1929, 1936, 1977, 1982). The review in this section starts with types of interaction that have received limited treatments, affective and emotional, and then turns to the subject that has received extensive treatment: linguistics.

Affective and Emotional Behaviors

Kantor (1924; Kantor & Smith, 1975) makes a distinction between affect and emotion. Affective interactions, involving considerable intraorganic components, remain coordinated and organized. Emotional responses also include marked visceral activity, but these are not organized in a distinct configuration coordinated with the stimulus event. They are chaotic and result in disruption and disorganization in which it is impossible for the individual to complete the action that was begun to that stimulus event. Brady (1970, 1975) reviews a variety of his own studies and those of others that support the distinction. In his own work with rhesus monkeys, he found that in lever pressing for food the patterns of secretory and visceral changes were stable over long periods involving mood states and affective conditions. But when a clicking noise followed by an electric shock to the foot was introduced, the lever pressing ceased within three to five trials; blood pressure and heart rate went down then abruptly elevated to high levels. The introduction of aversive conditions brought organism-environment interactions to an end, supporting the interbehavioral contention of abrupt and disruptive effects of emotional situations.

Linguistic Interactions

The interbehavioral approach to language is to treat it as bistimulational interaction in which the listener is simultaneously interacting with the speaker and the thing the speaker is referring to (Kantor, 1928, 1977). Living language as opposed to written language is not words or sounds as static structures or brain processing of sounds but complex interactions that include gestures and intonation. What the listeners understand involves the setting, how knowledgeable they are about the subject the speaker is referring to, the characteristics and habits of the speaker, and, of course, how adequately the speaker is able to elucidate.

Early research. Some of the earliest interbehavioral experiments consisted of a series of studies involving the bistimulational interactions of language. Some of these tested the fundamental tenets of interbehavioral psychology about language. For example, as a test of the tenet that language is not words but is speech adjustment, Briones (1937) demonstrated that learning sentences in foreign language is superior in learning time and in retention to learning words. As further support of this tenet, Ratner and Rice (1963) showed that speakers provided more detailed accounts for uninformed than for informed listeners. Language as a referential act also varies in effectiveness with the interactional history, the amount of prior knowledge of the listener. In a series of three experiments to study speech reception, Bucklew (1943) established that fewer errors occur when the thing referred to and the speaking are concurrent rather than successive. This indicates that both stimulating conditions must be present simultaneously to be maximally effective, as the interbehavioral system implicitly suggests. In two of the experiments, he found that speech comprehension is integral with the psychological situation of which it is a part: When distortions occurred in speech, subjects understood it better when they were in the presence of geometric figures or pictures of the objects referred to (concrete groups) than when they were not (remote groups). Speech was more important for the remote than the concrete groups.

In support of another tenet, Pronko (1945) found positive evidence for language as bistimulational adjustment: "being told about something by someone" (p. 433). He found negative evidence for language as symbols that pass from the speaker to the listener and induce ideas or mental images in the listener. Subjects whose task was to learn to relate a nonsense syllable to an object gradually came to do it as rapidly as they already related a well-known word to the object. Initially, the syllable was a symbol that required time for translation, but after about twenty trials of object first then syllable, the syllable came to refer directly to the object. A control group operated in the opposite direction by receiving first the syllable and then the object. Recordings of muscle potential were consistent with measures of reaction time showing opposite trends from beginning to end for the symbol group (syllable first) versus the direct language group (object first). Similarly, Herman (1951a, 1951b) found that subjects given the task of associating nonsense words with objects initially interacted in sequence, first with the speaker and then with the object. With practice, the interactions changed from sequential to direct referential: The interactions with objects and speaker became bistimulational or concurrent. This was consistent with Bucklew's (1943) results.

In order to study the effects of brain impairment on language, Wolf (1958a) examined how persons with aphasia, those with some loss of ability to understand or use language (usually due to stroke), were affected by setting conditions. When confronted with ordinary table items such as spoon, plate, and salt shaker, they could more accurately name them (use of speech) or point to them when someone else named them (understand speech) if the objects were in their normal context as opposed to some irregular arrangement. This established that brain lesions are not the sole determiners of the aphasic deficit and that settings play an important role. In a second study, Wolf (1958b) turned from setting conditions to stimulus objects and showed that the specific interactions (of persons with aphasia) with objects involved the total interbehavioral field of which brain deficit was but one component. He placed table items in an ordinary arrangement on a table or in two rows of six each. The errors patients made were not random but were appropriate to the situation as, for example, when the experimenter pointed to the pepper shaker and the patient responded “salt, no” or to a fork, “knife, no.” Wolf concluded that tissue damage did not fix the patient’s behavior. Accuracy of responses varied from object to object, from time to time, and from situation to situation, an example of the interbehavioral specificity principle.

Another direction of interbehavioral language research is that of concurrent actions consisting of speakers’ interaction with the sound of their own speech at the time they are speaking. The concurrency is a fourth variable that may be added to those of speaker, listener, and referent (Ratner, 1957). By using instrumentation to insert a delay between the act of speaking and the speakers’ hearing their own voices, Ratner, Gawronski, and Rice (1964) were able to study the role of concurrent action in maintaining normal speaking action. Six- to thirteen-year-old children received delayed feedback of their speech. All made errors in articulation and 85% spoke more loudly. Younger children were more affected than the older ones. They spoke more slowly and made more errors. They also got worse with practice whereas the older children improved. The latter’s longer speech history apparently helped them. The interactional history that individuals have with concurrent action apparently is important in the regularity of speech. Disruption results and a period of readjustment is required when the longstanding pattern of concurrency is changed. Interactional history is an evolution over time involving longstanding patterns of interaction that seldom shift abruptly or adapt quickly to new conditions.

Contemporary research. After these pioneering works in interbehavioral linguistics, the topic languished until Bijou and his associates created a manual for identifying and analyzing the component parts of linguistic interactions (Bijou, Chao, & Ghezzi, 1988; Bijou, Umbreit, Ghezzi, & Chao, 1986). Using this program, the investigators developed language training procedures for children whose behavior was mildly retarded (Bijou, 1989; Ghezzi & Bijou, 1994). They videotaped conversations between normally developing children and those whose behavior was mildly retarded and socially withdrawn. Raters analyzed the videotaped speech and gestures of the speaker and listener and the functional relation of the setting and the referent. After the children viewed a videotape of their linguistic actions, they were taught to identify the undesirable language characteristics and to practice improved alternatives. In a second training method, the children engaged in role playing the initiation and continuation of conversation. In a third, a normally developing child assisted each child whose behavior was retarded in improving conversations. As measured by criteria of the manual, all of the procedures were successful in improving the target child’s conversations. The manual that had been developed for an interbehavioral linguistic analysis also provided assessment of training practices.

The Bijou manual also lent itself to studies of the speech of persons with schizophrenia and of college students. Williamson and associates used the manual and raters to study the referential behavior of individuals with schizophrenia (Williamson & Lyons, 1988, May; Williamson, Lyons, Abney, & Gonzales, 1987, May; Williamson, Lyons, Abney, Gonzales, & Galligos, 1986, May). When the listener was normal (non-schizophrenic), both normals and individuals with schizophrenia initiated longer linguistic responses than with a schizophrenic listener, but the individuals with schizophrenia spoke longer and more about themselves regardless of the listener. Normals referred little to themselves, but individuals with schizophrenia did so extensively. Also using the manual and raters, Chiasson and Hayes (1993) studied some features of listeners and speakers among college students. They found that freshmen initiated more interactions with other freshmen and spent more time talking to them than they did to seniors or to graduate students. In an interactional setting with peers, freshmen engaged in more language interactions than in a setting with non-peers.

Conclusion

Upson and Ray (1984) have noted that "it is the missing research methodology [of Kantor] that drives creative and productive people to reject what is possibly one of the truly great contributions to the future of psychology" (p. 497). As this review shows, that shortcoming is now changing. Not only is research occurring, but it is making use of alternative methodologies. These methodologies include computer simulation of an interbehavioral field (Ray, 1992), videotaping and analyzing of multiple variables through computer technology (Sharpe & Hawkins, 1992a, 1992b), observational methods in conjunction with experimentation (Delprato & Rusiniak, 1991; Henton & Iversen, 1978), and the use of systems analysis (Ray & Delprato, 1989; Ray, Upson, & Henderson, 1977). Stephenson's (1993) Q methodology in application to an entire interbehavioral field could serve as another instance (not reviewed here; see Brown, this volume). And because it objectively measures subjectivity, it may have valuable potential for studying implicit or covert interbehaviors (Lichtenstein, 1988; Smith & Smith, 1996). An ongoing partnership with behavior analysis has also been productive. Also noteworthy is Verplanck's (1996) "operational analysis," which addresses the individual "embedded" in his or her surroundings through recording, sorting, arranging, and development of taxonomies and a methodology of investigation and evaluation of data. These newer methodologies together with older ones in conjunction with an interbehavioral framework provide the possibility for a dramatic new direction in psychology. That direction is one of moving beyond cause and effect mechanisms, beyond biology as a producer and container of psychological events, and beyond various imposed mediating powers and hypothetical intervening variables. That direction is one of discovering interdependent relations as they occur in nature and of developing interpretive constructs that adhere to those observed relations.

Although interbehaviorism now has a respectable body of research, it is only a bare beginning. The role the medium plays in the field has not received any systematic empirical treatment; and only a few types of fields, such as affective and emotional interactions and language, have been explored, some of which have not received any recent treatments. Still, interbehavioral research stretching from 1937 to the present has demonstrated the way in which such research can fulfill the potentials that interbehavioral field psychology has to offer. Perhaps others will be inspired to try it and add to the research literature and to a fuller understanding of psychological events.

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Endnotes

[1]The stimulus functions were not mentioned in the original reports but were so described in Pronko and Hill (1949). Perhaps the omission was because of publication in an applied journal, and the characterization had to await the publication in a more general journal the following year.

[2]Some problem solving studies of the same period that are independent of interbehaviorism illustrate its principles extraordinarily well. For example, the work of Scheerer (1963) is exemplary in showing the relations of stimulus and response functions, setting factors, and interactional history even though these terms are not used.

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Chapter 6

Converging Movements in Psychology

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At any particular time, a scientific discipline exhibits not only diversity, but also some fairly widespread agreement on acceptable and unacceptable practices. There is, in brief, the mainstream. Textbooks, undergraduate and graduate curricula, widely promulgated content in particular areas of study, and publications of organizations with the greatest numbers of members all help to specify today's mainstream psychology. In contrast, this chapter is concerned with literatures that lie outside the mainstream in a fundamentally important way: They all converge on a truly *naturalistic* psychology.

The converging movements in psychology (a) represent collections of postulates within and across literatures; (b) set forth progressive views, using modern science as a reference; (c) take positions that are not easily assimilated into mainstream psychology; (d) are found in several different literatures with very little cross citation; and (e) reveal agreement on some of the most long-lasting and central issues of psychology, despite deriving from what are sometimes taken as incompatible and competing systems or perspectives. Although all postulates worthy of consideration have procedural implications (see Smith, "Interbehavioral Research," this volume), this chapter will focus on only the postulational or assumptive components. It is here that we find the basic orienting attitudes for all work (see Clayton, Hayes, & Swain, this volume).

Identification of Converging Movements from Kantor's Macro-Historicocritical Analysis

Claims of convergence found in this chapter may be just that—claims. If several superficially disparate literatures are converging toward agreement on important issues, does this mean anything, and how might one come to identify convergence in the first place? This two-part question takes us to the framework I used to discover and to understand convergence in psychology: Kantor's (1963, 1969) macro-historicocritical and naturalistic analysis of the scientific evolution of psychology (see Fredericks, this volume).

Naturalism Replaced by Supernaturalism

According to Kantor's analysis, the fall of Hellenic civilization was accompanied by a decaying, crumbling society, which set the occasion for the escapistic verbal creation of a world without time and space (Kantor, 1963, 1969). Events that are well documented by historians corroborate this retreat from *rerum natura*. The new nonspatiotemporal world was verbally placed in opposition to the world in which people lived—the natural world. The venerable spiritual-material dualism developed and Aristotelian naturalistic soul was transformed into supernaturalistic soul-spirit. Spiritual-material dualism became institutionalized in the form of the Church, and this sacred view of the world reigned supreme for centuries (e.g., as psychophysical or mind-body dualism).

The earliest form of human escape was to substitute an interest in and concern for things of the world with a preoccupation with the self, which eventuated in a retreat to the inner person. In human verbal adjustments to intolerable living conditions, solace was found by looking inward and rejecting the outer world as of much significance to the individual. A psychological internalism evolved, reaching a high point with Augustine, who placed all existence inside the person.

Secularization of Society and Soul: Naturalism and Science Reappear

When living conditions began changing from those of medieval society, social, economic, and political conditions in Europe started to become similar to those of Hellenic civilization. The Renaissance marks an important point in the return of naturalism. Thinkers rejected medieval culture and sought to return to classical Greek and Roman culture. As part of the change in emphasis from sacred to secular, supernaturalistic soul became less theological and was transformed into mind, consciousness, and experience. Eventually, a point was reached when nonspatiotemporal soul was given to a so-called new science, a science that will be given an impossible task. It was asked to take a radically different—that is, naturalistic—approach to soul and, at the same time, to remain the repository of centuries of cultural tradition in the form of insubstantial, spaceless, timeless, and interiorized soul. Modern science is a manifestation of the secularization or naturalization of society. Science has operated under two major worldviews.

Lineal mechanism of classical science. The mechanical view led thinkers to interpret natural phenomena in terms of attractive and repulsive forces acting between unalterable objects (or particles), dependent on only distance. The period of classical scientific thinking was the era of the world machine, materialism, causal determinism, and reductionism. The fundamental descriptive and explanatory model was cause → effect. The thinking that served science well for such a long time is aptly named *lineal mechanism*.

Field and system constructions of modern science. Physical scientists gradually abandoned mechanism (Frank, 1955), although it is not completely without influence today. The *field* construct has taken physics far away from mechanistic thinking with its bifurcations of nature (e.g., mass and energy, matter and force, gravitational mass and inertial mass) to the inertial-energy concept and the equivalence of mass-energy and gravitational-inertial mass.

Like integrated-field theorists, those advocating a *system* approach maintain that lineal cause → effect mechanisms must be replaced by dynamic systems (or fields) comprised of interdependent components (e.g., Bertalanffy, 1968; Marmor, 1983). The fundamental similarity between field and system outlooks suggests that the most advanced thinking in science is best described as field-system in character (see Delprato, 1989). Most of all, a clearly evident field-system orientation marks literatures in the converging movements as progressive.

The Converging Movements

Seven literatures comprise the converging movements. These are listed in Table 1, along with their main developer(s).

Movement/literature	Developer(s)
Interbehaviorism	J. R. Kantor
Radical phenomenology	M. Merleau-Ponty A. Giorgi
Behavioral cybernetics/ Feedback control systems	K. U. Smith W. T. Powers
Action psychoanalysis	R. Schafer
Behavioral epigenetics	Z. Y. Kuo
Ecological psychology	J. J. Gibson
Dialectical psychology	K. Riegel

Table 1. The Converging Movements and Main Developer(s) of Each

In order for a literature to be included among these movements, I required explicit published statements from an authoritative representative–preferably, a main developer–on at least six out of eight basic orienting attitudes (see below). These statements had to (a) depart markedly from mainstream psychology, (b) be consistent with a progressive approach to psychological science per Kantor's macro-historicocritical analysis, and, thus, (c) agree with others whose statements met conditions a and b. I derived the eight basic assumptive commonalities by inductively combining Kantor's (1959, 1963, 1969) interbehavioral postulates with the literature available to me over a period of years (see Assumptive Commonalities section). The most important aspects of the seven literatures I include in the converging movements revolve around the assumptive commonalities. These are taken up in a later section. First, though, I briefly introduce each literature.

Interbehaviorism

Part I of the present volume is devoted to Kantor's interbehavioral psychology; thus, I do not elaborate on it beyond the following two points. First, Kantor's macrohistoricocritical analysis of psychology found in *The Scientific Evolution of Psychology* (Kantor, 1963, 1969) is important for identifying and situating the converging movements (see Fredericks, this volume). Second, Kantor's creative adoption of a field-system perspective to psychological events is both a natural outcome of his historical work and central for capturing that which distinguishes modern science from its lineal mechanistic formulations.

Radical Phenomenology

Phenomenology has numerous, sometimes conflicting referents, and is the most ingrained in philosophy of the converging movements. Three important contributors to the psychological phenomenology of the converging movements are Brentano, Merleau-Ponty, and Giorgi. Brentano (1874/1973), the eminent student of Aristotle, advocated certain positions counter to the mainstream psychology of the nineteenth century. Brentano's most striking views were that the basic units of psychological events are found in individuals and their behavior, that perception is holistic, and that the essence of psychological events is best described in terms of acts, that is, doings or behavior.

Merleau-Ponty (1942/1963) took great steps toward laying the foundation of a progressive psychology with, among other contributions, his emphasis on the centrality of behavior, but not on a mechanical form of behavior of the sort we have known in mainstream thinking. Indeed, Merleau-Ponty anticipated a convergence between two of our converging movements—radical phenomenology and dialectical psychology—when he noted the dialectical nature of behavior. The present use of the designation "radical phenomenology" follows Kvale and Grenness's (1967) classification and denotes the radical French version of phenomenology (e.g., Merleau-Ponty, 1942/1963), not the idealistic, subjectivistic, and voluntaristic interpretations of the older German phenomenology and existentialism.

Giorgi (1970) contributed greatly to a radical phenomenology that was far removed from mainstream psychology. Giorgi's substitution of psychology as a *human science* for psychology as a natural science is a reflection of movement from lineal mechanism to a field-system outlook. In brief, phenomenologists reject *mainstream* natural science psychology, according to which psychological events are links in atomistic chains of either environmental or mental causes and effects. Intentionality, purpose, and meaning are neither some sort of spooky extranatural powers or substances nor merely concatenations of causally related elements. The former precludes scientific understanding, whereas the latter finds intention, purpose, and meaning subject to analysis via the methods of physical science. Phenomenology as a human science argues that just as physical and biological events have distinguishing characteristics calling for particular knowing methodologies, so do psychological events. Intending and purposeful behavior are distinctive marks of human psychological events, and but incompletely described in the absence of phenomenological methods.

Phenomenological methodologists were in the forefront of a development concerning the objectivity of observers-researchers just now gaining recognition at a wider level when they argued that knowledge independent of a knower is impossible (e.g., Giorgi, 1970). Their point was that human biases (i.e., assumptions) always participate in scientific activity. The solution to ever-present observer presuppositions is to identify and bracket them to increase the degree to which descriptions take them into account (Ashworth, 1996; Kruger, 1979).

Behavioral Cybernetics and Feedback Control Systems

The converging movements in psychology, above all else, are marked by adoption of field-system thinking found in the most advanced sciences, thus by rejection of lineal mechanism. The converging movement that most directly confronts lineal mechanism and points the way to an operative field-system alternative has its foundations in cybernetics. Wiener (1948) inaugurated cybernetics with his suggestion that the operations of living organisms can be described in terms of negative feedback control systems. Although certain applications of cybernetic thinking to psychological events did not fundamentally depart from lineal mechanistic and dualistic postulates, Smith (1972, 1987) and Powers (1973, 1978, 1989) put forth cybernetic views that emphatically left behind the older mechanistic postulates. This was possible because they independently built on the cybernetic principle of closed-loop (negative) feedback control.

The emphasis of Smith and Powers on closed-loop feedback takes their work to a field-system framework in a most elementary way. In contrast to the *open-loops* of lineal mechanism, the constituents of closed-loops are *interdependent*, not standing in relations of independence and dependence (e.g., Kantor's response function and stimulus function). Control in a system so constituted is not, as with lineal mechanism, one-way and imposed. Instead, control is intrasystemic or self-regulatory.

Smith's research strategies were largely directed toward examining experimentally the contribution of negative feedback in the performance of various behavioral topographies, especially in his classic studies demonstrating the devastating effects on performance of temporal delays and spatial perturbations in sensory feedback. His research preparations ranged from simple tracking tasks to human social interactions. Smith argued that feedback principles apply to descriptions of the chemical environment of cells, to human development, to operations of human organizations, and to cultural evolution.

Powers's major efforts have been directed toward developing a quantitative model of living systems based on the principle of negative-feedback control. The heart of Powers's feedback control model is the perceptual control system. To emphasize the point that physical (topographical) behavior is the behaver's way of controlling perceptual input variables, Powers has come to refer to his theory as *perceptual control theory*.

Action Psychoanalysis

The amount of published literature identified with the different converging movements varies widely. One can review the movement referred to as action psychoanalysis in one paper (Schafer, 1975) and two books (Schafer, 1976, 1978). Yet, Schafer takes a strong stand on six of the eight basic assumptive commonalities used to mark convergence.

Schafer, the first Sigmund Freud Memorial Visiting Professor at University College, London (1975-1976), developed action psychoanalysis. Schafer's proposal of a psychoanalysis compatible with the other converging movements is consistent with my thesis that adoption of field-system thinking is the road to progressive out-of-the-mainstream work in psychology. Schafer (1976) finds that a field-theoretical orientation was central in freeing "psychoanalytic theorizing from the binary straightjacket [of dualism]" (p. 61). In order to update Freudian metapsychology, he rejects the mutually compatible assumptions characteristic of mechanistic thinking: cause → effect lineal mechanism, reductionism, and dualism.

Schafer's (1975) field-system orientation leads him to view psychological events as "some kind of activity, henceforth to be called action" (p. 44) to be designated by active verbs and adverbs. Schafer's rejection of lineal mechanism and all it entails yields a psychoanalysis without force, cathexis, motive, unconscious, id, ego, superego, and libidinal energy. The individual does not *have* feelings, impulses, dispositions, symptoms, wishes, or depression–as things. Action psychoanalysis is not part of mainstream psychology, for it takes many of the same remarkable positions as do the other converging movements.

Behavioral Epigenetics

Behavioral epigenetics is the product of Kuo (1967), an early advocate for substituting thoroughgoing developmental interactionist analysis for the dichotomy of innate vs. acquired. He thus became one of the major figures, along with Schneirla (1966) and Lehrman (1970), associated with an approach to behavioral ontogeny that seems to have evolved under the auspices of field-system thinking (see Delprato, 1987). Kuo (1937) declared the behavioristic revolt half-hearted and merely an adjustment to mentalistic psychology. In place of behaviorism and even psychology, Kuo (1937) proposed a new science called "praxiology." In so doing, he anticipated movement away from the mainstream by way of assumptions more in line with those of the advanced sciences of the time.

Kuo (1967) wrote *The Dynamics of Behavior Development: An Epigenetic View* in an attempt to supply behavioral science with a "new orientation" (p. x). Although one does not find "behavioral epigenetics" conspicuously visible in the contemporary literature, Kuo's thinking remains influential in certain interactionist and system approaches to development (see Lickliter, this volume). Perhaps the most prominent display of behavioral epigenetics today is in the work of one of Kuo's few collaborators, Gottlieb (e.g., Gottlieb, 1992).

Ecological Psychology

One of the necessary tasks of those contributing to the evolution of scientific psychology has been to reverse the retreat toward psychological internalism that began after the fall of Hellenic civilization. Ecological thinking has been an important development in keeping the behaver's environment in view. The contemporary literature reveals several versions of ecological psychology (e.g., Barker, 1968; Bronfenbrenner, 1977; Schroeder, 1990). All use the central field-system notion of interdependency in the organism-environment relation; thus, today's ecological psychologies are consistent in one fundamental way, at least, with the other converging movements.

Of the various ecological psychologies, the one developed by J. J. Gibson most contacts the range of concerns found in the other converging movements (see Costall, this volume). Gibson's (1960) departure from the mechanistic mainstream is marked by his use of ecological descriptions. At the same time, Gibson abandoned the mechanistic terms "stimulus" and "stimulation" and substituted expressions intended to implicate more the observer: "information" or "stimulus information" (Mace, 1977). Furthermore, Gibson's major specialty was perception, and his transition from lineal mechanism to field-system thinking is accompanied by a change in a central postulate from "perception is a function of stimulation" to "information pickup" (Mace, 1986, p. 140). The latter construct implies far more of a transaction between behaver and environment than does the former, even though functions do not imply lineally-acting causative relations. Yet another aspect of Gibson's transition from lineal mechanism to field-system thinking is the construct of *perceptual systems*, which replaced the mainstream notion of *channels* for sense impression made up of mutually exclusive bundles of nerve fibers connecting passive receptors with corresponding points in the brain.

E. J. Gibson, Neisser, and others have expanded "Gibsonian" ecological psychology beyond perception to learning, development, memory, and epistemology. One of the many interesting commonalities between the ecological approach and Kantor's interbehavioral psychology is their stress on the importance of research in organisms' natural surroundings, and warnings regarding the limitations of conclusions gleaned from highly artificial preparations.

Dialectical Psychology

Interbehaviorism suggests that psychological events require that we consider all domains of human existence: planetary and phylogenetic evolution, the individual's biological and psychological developmental history, ecological and biological factors, and socio-cultural conditions. The last of the converging movements may be the closest to interbehaviorism in stressing the interdependence of multiple domains. Riegel's (1976a, 1976b, 1978) dialectical psychology has been most associated with the subarea of developmental psychology. The main emphasis of dialectical psychology is on human development as established by patterning of concurrent changes in four major dimensions across time. The inner-biological dimension ranges from momentary organic states to illness, incapacitation, and death. The individual-psychological dimension pertains to interpersonal interactions over the life span. The cultural-sociological dimension contains organizational units with greater expanse than those in the individual-psychological domain (e.g., family, interest groups, religious, political, economic, linguistic, and cohorts or generations). And, the outer-physical dimension consists of events such as earthquakes, climatic changes, droughts, and floods.

Riegel applied the fundamental dialectical principle of contradiction (or conflict) and resolution to human development. Development is considered to result from reductions in asynchrony between any two of the four main dimensions (i.e., the two dimensions become synchronized). Synchronization is not a process that is caused in any lineal way by mental or environmental forces. Rather, synchronization is systemic. It is therefore not surprising that Riegel introduced dialectical psychology with critiques of distinctly non-field-system biases in mainstream psychology. These include stable traits, abilities, and competencies, which he rejected in favor of searching for "concrete events in their temporal order" (Riegel, 1976a, p. 689).

Dialectical psychology places much emphasis on interactional analyses. As Riegel (1976b) noted, "I will emphasize the dynamic interdependence, that is, the mutual interactions between the changes in the individuals and the changes in their social-historical world" (p. 349). Sameroff (1975) recommends the expression *transactional* here, as do Dewey and Bentley (1949) in referring to Kantor's field-system brand of non-mechanical interactionism.

Like phenomenologists (e.g., Fischer, 1970) and interbehaviorists (e.g., Delprato, 1995b), Riegel addressed relations between subject and object, teacher and student, employer and employee, researcher and "subject," tester and testee, and clinician and client in terms of mutuality or interdependence. In comparison with mechanistically-inspired relationships, participatory relationships between members of dyads, such as those mentioned, were found by Riegel (1978) to be less artificial, more ecologically representative, less conducive to conflict, and more likely to yield research findings that are not distorted. Riegel so much emphasized the anti-mainstream character of dialectical psychology that he wrote an unorthodox textbook–in both form and content–to present a contrasting viewpoint to students: *Psychology, Mon Amour*, subtitled *A Countertext* (Riegel, 1978).

Assumptive Commonalities

Having introduced the converging movements, I now turn to the eight orienting attitudes mentioned earlier in order to reveal more specific points of agreement among them. The assumptive commonalities identified here are not independent of one another. Indeed, if the movements are converging toward a thoroughly naturalistic field-system psychological science, postulates *should* be interdependent.

1. Rejection of Cause → Effect Framework (Lineal Causality, Mechanism); Adoption of Circular Causality, Interdependencies, and Participation.

All of the converging movements depart from the one-way mechanistic causality that underlies mainstream psychology. The pervasiveness of lineal mechanism in our discipline today is well illustrated by how instructors present research methods to students. Correlational methods are said to show relations between predictor and criterion variables. Experimental methods, which involve active manipulation of predictor variables and the possibility of controlling extraneous variables, yield *causal* relations. The causal relations of the experimental method are between *independent* and *dependent* variables.

Psychology's classic experimental model is a confusing mixture of procedures and constructs. Confusion is particularly exhibited when criterion variables are taken as dependent on (caused by) independent, predictor variables. To think in terms of lineal, one-way causality, according to which conditions (independent variables) cause that which is measured (dependent variables), is to be predisposed by a lineal mechanistic bias concerning the way events are related. Rejection of this bias on the part of researchers in the converging movements does not mean they reject experimental procedures. Rather, their non-mechanistic orientation leads them to speak more descriptively by referring to manipulated variables as "critical," "crucial," or "predictor" variables instead of as "independent" or "causal" variables.

Lineal mechanism in psychology has contributed to a firm distinction between description and explanation. The reasoning here is that we can derive "true" causal relations and these are required for explanation. Non-causal research findings are said to be merely descriptive. The mechanistic bias finds description necessary but unfulfilling; descriptive research is distinctly less satisfactory. However, once science abandoned lineal causality and took on a field-system character, the most satisfactory explanation became a matter of identifying descriptive mathematical laws between observables (cf. Holton, 1973).

Representatives of certain converging movements have been more outspoken than others in taking a distinctly non-mainstream view of description. None has ruled out procedures associated with careful manipulation of the conditions of observation. But, Kantor (1939), for example, warns of making experimentation a "fetish" such that highly artificial observational conditions substitute for careful and potentially more informative observations under more ecologically representative conditions. And others take "the operative word in phenomenological research [to be] 'describe'" (Kruger, 1979, p. 119), and urge that experimentation be preceded by "[phenomenological] description of individuals in their natural settings" (Graumann, 1970, p. 58).

2. Adoption of Naturalistic Monism; Rejection of Dualism.

Dualism comes in numerous forms. At the level of the cosmos, dualism is actualized by the assumption of two great realms: material and spiritual. The material realm is the lived world; the supernatural or spiritual realm is nonspatiotemporal. In the case of humans, cosmological dualism is translated into body and mind. Body incorporates the spatiotemporal; mind incorporates the nonspatiotemporal. Historically, a supernaturalistic transformation of naturalistic Aristotelian soul antedated mind, consciousness, and experience.

Another important dimension of dualism is the degree to which it serves sacred or secular purposes. Sacred dualism, with the assumption of an unworthy worldly and material realm opposed to a superior spirituality, provides the foundation and justification for many religions; they promise the devout a route to salvation of a reputed soul. The internal workings of the discipline of psychology are not greatly impacted by sacred dualism. Yet, with the secularization of society, a secular version of dualism evolved. As noted, certain thinkers came to transform religious soul into mind, consciousness, and experience (Kantor, 1969). With the secularization of soul, its assumed underlying nonspatiotemporal nature and causal powers were not fundamentally altered (see Fredericks, this volume).

The tenuous worldly and scientific status of nonspatiotemporal events seems to have prompted many contemporary psychologists to disavow dualisms, such as Descartes's, which posit mental life as a ghostly counterpart to body. In this way, Ryle's (1949) argument against "the dogma of the Ghost in the Machine" has been effective. Yet, despite their pronouncements against dualism, mainstream psychologists often take positions that the radical naturalist finds suspect. The problem is not merely one of abstractive constructs or of viewing psychological events as distinctive categories of nature. Mainstream psychologists hint of two worlds: the lived one of space-time and behavior, and another of mental "stuff" or processes that are separate from behavior. For example, Bandura (1977) argues that "cognition has causal influence on behavior" (p. 10), and Mahoney (1977) maintains that "beliefs or expectancies [are] better predictors of human behavior than external variables" (p. 8). Massaro (1986) offers the computer metaphor and physicalism as the route out of dualism, yet claims that "mental processes exist and influence observable behavior" (p. 74). Sperry (1993) insists the "new mentalism" does not uphold "two different, independent realms of existence" (p. 880), hence, is not dualistic in the unscientific sense. To Sperry (1993), however, it is not dualistic to think of behavior as "mentally and subjectively driven" (p. 879) and to think that "mental states, as dynamic emergent properties of brain activity, become inseparably interfused with and tied to the brain activity of which they are an emergent property" (p. 879).

The converging movements are aggressively monistic. The more field- and system-oriented theorists tend to detect dualism in cases where mainstream thinkers may not. For instance, Kantor (1959) does not find the behavioristic shedding of the mental component to be a satisfactory resolution of the problems presented by dualism when brain is merely substituted for mind. Giorgi (1975) sees dualism when we speak of representations of the world in the mind and when we assume an inner part of humans is made up of private conscious states. Is the answer to dualism one of making brain the seat of mind? Gibson (1979) answers in the negative; he also notes the tendency for many to perpetuate the venerable dualistic dogma of separable mental sensations and physical movements. And, Riegel (1976a) holds that the competence-performance distinction in linguistic acts fails to shed dualism. The converging movements so vigorously pursue naturalistic monism that they agree strongly on what might be considered a corollary of their nondualistic bent. This I take up next.

3. The Organism Is in Direct Contact with the World; There Are No Mental Mediators; There Is No Pure Consciousness.

The converging movements' radically naturalistic monism becomes even more evident upon consideration of the behaver-environment relation and what a bit of behavior tells us about its immediate precursors. Since the mid-1960s, psychologists have frequently been told that their discipline has "gone cognitive." Although there is no one version of cognitive psychology, to be cognitive has meant, with few exceptions, to allow a causal role for mentality, consciousness, cognition, or the like. Mainstream cognitive thinking begins with the assumption of Environment → [Cognitive structures and processes] → Motoric output. The bracketed middle term indicates a locus inside the organism, where the structures and processes mediate between the lived world, on the one hand, and knowing and behavior, on the other. Indeed, environment is frequently omitted from the basic "formula." In these cases, analysis begins with "sensory input" perhaps as Sensory input → [Sensory processing → Cognitive processing] → Motor output.

The converging movements' radical departure from mainstream psychology on the cognition issue might be better appreciated by noting the great similarity between the cognitive model and a framework that marked an influential version of what the cognitive movement has been taken to have replaced. In particular, Hullian behaviorism long featured a cognitive variety in the form of mediational theory, which connected experimentally manipulable stimulus (S) and measurable response (R) with hypothetical and internal response (r) and stimulus (s): S → [r → s] → R (e.g., Hull, 1930; Osgood, 1956). The cognitive movement did not depart from mediational behaviorism's lineality, duality, or mediationism. The newer approach *did* place information processing constructs, instead of hypothetical responses and stimuli, inside the organism. But cognitionism did not depart from mediational behaviorism's assumptions of the one-way transmission of causal influence, the duality of inside-outside, and the concept of mediation. As Leahey (1991) put it, "when a new language of power, rigor, and precision came along–the language of computer programming–it proved easy for mediational psychologists to abandon their r-s life raft for the ocean liner of information processing" (p. 291). Indeed, for the mainstream cognitive movement, information processing is the *sine-qua-non* of mentality and cognition (e.g., Sternberg, 1996; Stillings et al., 1995).

Ample justification exists, then, for not being impressed with claims of the "revolutionary" nature of mainstream cognitive psychology and cognitive science. Given the widespread acceptance of the mediational constructs of information-processing and consciousness, I find it noteworthy that representatives of the converging movements, who communicated so little among themselves, have commonly objected to intraorganismic information and conscious processing.

Of all the converging movements, perhaps radical phenomenology has priority on a nonmediational stance. The mainstream view today is derived from the Newton-Locke-Kant model, which became especially formed by the mid-nineteenth century (Kantor, 1969). According to this widely influential lineal, dualistic, and mediational account of knowing, corpuscles strike a receptor and are transmitted to the sensorium or brain where a phantasm, later to be called a sensation, arises. Many central constructs for modern psychology are in this model. All that is needed is their elaboration: encoding, r-s connections, transduction by way of information processing, representations, and inner awareness. The Newton-Locke-Kant model provided a shared assumptive framework for generations of psychologists. However, a largely ignored alternative was available. Phenomenologists, such as Goethe, Purkinje, and Hering, argued that some sort of utter transduction process did not take place (Kantor, 1969); perception of the world was directly given. Eventually, certain French thinkers, such as Merleau-Ponty, came to develop further such atypical ideas.

Despite the early contributions of phenomenologists, in recent years, ecological psychology has received more attention concerning the mediational-nonmediational issue than have other converging movements. A byword in ecological psychology is "direct perception," by which is meant we know the world directly, not via mediating mental processes. There is a special kind of second-hand knowledge called *mediated* or *indirect*, but this occurs when we use images, pictures, and written-on surfaces (Gibson, 1979).

Methodological behaviorism, whether practiced by mediational behaviorists or information-processing cognitivists, has served as the primary strategy for revealing hypothetical mediating processes. According to methodological behaviorism, the researcher infers internal states and processes from the person's observable behavior. In this manner, the behaver communicates about an inner world. Schafer (1976), however, maintains that the essence of such a strategy is not one of telling about something taking place in an inner world but rather, "The inner world of experience is a kind of telling, not a kind of place" (p. 197).

Smith and Smith (1987), Kuo (1937), and Kantor (1959, 1963) supplement the nonmediational alternative to mainstream thinking. The behavioral cyberneticians hold that the only mediation in psychological events is by way of motoric processes that function to exert feedback control of sensory receptors in unified sensori-motor systems. Kuo and Kantor point out that cognitive mediationism is a cultural product that has been handed down over the centuries.

4. Denial of Stimuli and Perception as Causes; Interdependency of Response or Action and Stimulus or Perception.

Lineal mechanism has fostered numerous versions of one-way causality based on the cause → effect model. Mediational behaviorism and information-processing cognitivism are fundamentally identical not only due to their assumption of mediating processes, but also because of their shared adherence to one-way causality. In their joint endorsement of an independent variable → dependent variable framework, mediational behaviorism and cognitivism do not essentially depart from the earlier environment → behavior or stimulus → response model.

Appreciation of interdependency between response and stimulus is found in all the converging movements, making them the legacy of Dewey's (1896) remarkable position on the reflex. Dewey did not account for reflexes in terms of lineal causal chains. He proposed that the nominal stimulus and nominal response were best described as operating continuously or as a single, integrated unit, that is, as a circuit. In this way, Dewey recognized the mutuality (⇔) of putative stimulus and response or of perception and action. All converging movements exhibit Dewey's representation of the environment-action relation in terms of circularity, interdependency, or, indeed, a unitary environment-action unit. Perhaps the most advanced position here is Powers's (1973, 1978) perceptual control system, which might be the best candidate for the fundamental unit of the converging movements.

Powers (1988) correctly points out that the Kantorian double-headed arrow (R⇔S) does not mean the same path of transmission taken first in one direction, then in reverse. Powers builds on the field-system position of *multiple* factors operating concurrently and interdependently and on the actualization of this principle as found in human-constructed devices–control systems–that alter their responses against disturbances. The result is a unit with far more predictive power than the more abstract representations of the mutuality of organism and environment.

In Powers's (1973, 1978) perceptual control system, numerous horizontally and hierarchically organized control systems participate in meaningful bits of behavior. Three essential components of any control system are a sensor, a comparator, and an effector. Each component produces a signal as a function of one or more inputs. The sensor produces a perceptual signal or a controlled quantity. The comparator continuously compares the controlled quantity with a reference level (signal) and produces an error signal that is zero when the controlled quantity equals the reference signal. The effector converts the error signal into an output that affects the organism's effector system.

One of the important contributions of Powers's perceptual control system model is that it takes into consideration and opens up for research a pervasive factor in everyday behavior that psychologists have either ignored, attributed to uncontrolled variability, labeled *extraneous variables*, or, when experimentally manipulated, have called an independent variable or stimulus. In particular, *disturbances* are effects on the controlled perceptual variable other than those produced by the control system itself. Disturbances perturb the control system and contribute to moving the controlled perceptual variable away from the reference level. The perceptual control system unit goes far toward making testable the converging movements' assumption of mutuality of action and perception (see Bourbon, 1989; Marken, 1986).

5. Nonreductionism: The Subject Matter of Psychology Cannot Be Explained in Terms of Biological Principles or Those of Any Other Discipline.

Going hand-in-hand with the outmoded lineal mechanistic, cause → effect, and dualistic world view is materialism (Feigl, 1953b). Mechanism and materialism combine to foster a reductionistic bias, according to which explaining events in terms of materialistic structures and processes is both possible and desirable. An extreme form of reductionism in psychology is to assume that its events and principles can be reduced to physiology, biochemistry, chemistry, physics, and ultimately to particle physics. The most common form of reductionism in mainstream psychology stops at the biological level, although socially objectionable acts frequently are said to be caused by "chemical imbalances in the brain." We hear of how genes, brains, neuronal activity, and hormones cause various actions. Although most reductionistic assumptions may derive from misplaced materialism, the connection to materialism is not always obvious, as in the case of mental reductionism, where explanations are offered in terms of hypothetical causal mental structures and processes.

Of course, the heart of the converging movements' rejection of reductionisms is their adoption of circular (nonlineal) causality, monism, and the field-system perspective. Reductionism takes lineal causality as axiomatic. There is a fixed direction of priority; for example, events are generated from cause in biology to effect in psychological behavior. Clearly, field causality rules out all forms of reductionism. What, then, is the role of the brain, for example, in behavior if not as a causal agent? Kantor has long expressed the answer from a field perspective. The brain, as well as all other parts of the organism, is a *participant* in behavior. Indeed, participation becomes a key construct once one departs from lineal thinking and associated reductionisms. No one field factor, such as the brain, will unilaterally produce behavior. Behavioral events require an entire field or system of participating components. Feigl (1953a) suggested that participation substitutes for unidirectional causality and reductionisms with his description of the contemporary field alternative to *cause* and *effect* as "the entire *set* of conditions" (p. 410). We identify *the* cause of an event when we identify the participating field factors.

Sometimes the field-system principle of participation is reflected in a naturalistic version of holism, especially at the level of the organism's body. Mainstream psychology has placed such great emphasis on one part of the behaver's body causing activity in other parts, as well as causing mental processes, that many representatives of the converging movements have explicitly addressed the matter as found in the next assumptive commonality.

6. The Organism Acts as an Integrated Whole.

Claims suggesting that the organism acts as integrated whole, not in bits and pieces, derive from the same issues as those bearing on anti-reductionism. Circular causality, monism, and field-system units of analysis suggest that the behaver's actions are not independent variables triggered by causal antecedents either outside or inside the body. Instead, participating sensori-motor factors operate in a unified manner.

Kuo (1967) proposed the behavioral gradients construct to emphasize the holistic nature of behavior. According to Kuo, complete descriptions of the organismic component of behavioral events require far more than accounts of overt bodily movements. Structural and chemical changes in the blood stream and in the body tissues, cardiovascular activity, respiratory rates, changes in the digestive tract, biophysical and biochemical changes in the brain, and much more remain to be systematically measured because they all participate in a bit of behavior. Kuo's proposition may appear daunting, but perhaps only because the reference condition for behavioral description is supplied by mainstream psychology.

7. Active Constructs Are Essential for Describing Psychological Events; Action-in-the-World Is Fundamental.

As already discussed, an early case for the centrality of action in psychology is found in Brentano's thinking (1874/1973). Brentano, who contributed especially to radical phenomenology, stressed that static content is not the noteworthy feature of psychology's subject matter. Rather, it is the person's operations on content. This fundamental postulate provided the term by which we have come to know Brentano's approach–*act* psychology.

Ryle's (1949) much-acclaimed critique of dualism offered action as the solution to the problem of not abandoning the distinctive character of mentality (naturalistically construed) while rejecting the antithesis of mental and physical. The expert clown's purposeful tripping, for example, is both mental and bodily, but "it is not two processes, such as one process of purposing to trip and, as an effect, another process of tripping" (Ryle, 1949, p. 33). In brief, the identical topographical trips of the clumsy person and the skilled clown are not the same because the participating field factors are different, not because the unique factor in the clown's performances is other than action-related.

The converging movements' focus on action rules out a mental-behavior dichotomy. If we take mentality as a distinctive mark of psychological events, then we must be referring to ways of behaving or doing. A correlate of this is that psychological behavior is not merely topographical movement. Another correlate that takes into account circular causality and monism finds explanatory references to static constructs such as traits, abilities, and mental representations highly unsatisfactory.

Kantor's identification of his psychology as *inter*behavioral speaks to his view that psychological events involve, at a minimum, two variables, one pertaining to actions of the behaver, the other to actions of at least one set of conditions with which the behaver's actions are coordinated. In Powers's (1973, 1978) feedback control system framework, psychological behavior is inseparable from the control of perceptual variables. This means that psychological behavior includes the perceptual variable that physical behavior controls against disturbances. Psychological behavior requires physical behavior, but the latter is not to be confused with what the behaver is doing psychologically. The action assumption is related to how we view behavior over longer periods of time than what is happening concurrently within an episode. This takes us to the eighth, and final, assumptive commonality of the converging movements.

8. All Psychological Events Evolve: External Forces Do Not Impose Change Onto an Otherwise Inert Organism; Change Is Inherent in Behavior.

An evolutional bias of the converging movements allows us to avoid ahistorical, hereditarian, maturational, synchronic ("timeless"), static, and inert-organism descriptions. Satisfactory understanding cannot be obtained without taking into account the fundamental historicity of the behaver-environment field.

Kantor's (1959) evolutional continuum is a comprehensive framework that views all psychological events as outcomes of a long series of evolutions that began with the first major evolutional period—planetary or inorganic. After phylogenetic and ontogenetic evolution, the fourth evolutional interval—psychological—begins and continues up to the time of death.

Evolutional thinking in the converging movements ranges across the cosmic proportions of Kantor's evolutional continuum to the principle of the active organism and the related one of change as intrinsic to psychological event fields. The active organism (vs. the self-actional organism) and intrinsic change make lineal mechanistically-inspired energizers of behavior and independent external precursors unnecessary for explaining behavioral change, as argued, for example, by action psychoanalysis (Schafer, 1976).

The thoroughgoing developmental character of the converging movements underlies most representatives' departure from mainstream positions on the ontogeny of behavior. Instead of one or another version of heredity × environment interactionism based on lineal mechanism, converging movement theorists, such as Kantor (Observer, 1970), Smith (1987), Kuo (1967), and Riegel (1978), deny the independence of heredity and environment. They do not look for answers to ontogeny in genes, environment, or in the weighted interaction between the two factors. Converging movement psychologists follow Jennings (1930), who long ago examined biological experiments and concluded that characteristics seem to be best described by an integrated heredity (genes)-environment conception because all characteristics he examined depended on the conditions of development irrespective of inherited givens (see Delprato, 1987, 1995a).

Concluding Remarks

This chapter has reviewed seven converging movements toward a naturalistic psychology and eight assumptive commonalities among them. Mainstream psychology, however, may see no convergence at all and dismiss the individual movements. Are the converging movements merely the work of a collection of malcontents? Indeed, is there convergence? Those inculcated with mainstream biases will tend to see little of note in these "so-called" convergences. It takes no effort to write off the radical formulations offered by representatives of the converging movements. With a bit more effort than simple evasion, mainstream theorists no doubt can offer one justification or another as to why they are already adequately addressing matters found wanting in the converging movements. It is likely, however, that years of culturalization, undergraduate and graduate educational experiences, as well as professional systems that reward mainstream behavior patterns and discourage departures therefrom, render the typical member of the psychological community incapable of anything other than perpetuating tradition (Holton, 1968).

This cynical attitude notwithstanding, other signs of progress in contemporary psychology seem also in line with the converging movements. The literature reveals positions that are very much consistent with a field-system instead of a lineal mechanistic beginning for the science of psychology.

1. In the context of the assumption of the holistic, integrated nature of the organismic component of psychological events, Kuo's (1967) proposal that complete descriptions require data on numerous physiological variables in addition to overt bodily movements is rather daunting. But would measuring everything possible in the overt physical behavior and physiological domains be satisfactory? Mainstream psychologists might point to the omission of cognitive or mental areas here and propose some form of inferential analysis. Stephenson (1953) developed a data-collection and interpretative system for studying the phenomenal domain that is not founded on the lineal mechanistic and dualistic postulates that prompt using overt behavior as an indicator of hypothetical mediating structures and processes. As indicated in Brown's chapter (this volume), Stephenson's Q methodology is being vigorously pursued today by researchers in various specialties.

2. Q methodology addresses a complaint occasionally made concerning the absence of significant implications of the field-system perspective for research and data collection. Q methodology unequivocally departs from mainstream methodology, at the level of both assumptions and procedures. Moreover, perusing the methodological landscape of contemporary behavioral science reveals other nonmainstream activity that is compatible with the orientation of the converging movements. Some of the most innovative work involves tracking multiple organismic and environmental events in real time over lengthy time windows. Procedures range from various time series and sequential analytic strategies (Bakeman & Gottman, 1997) to complex real-time multivariate structural, functional, and operational behavioral systems analyses (Ray & Delprato, 1994).

3. Kelly (1955) persistently sought to disaffiliate his views from the major mainstream psychologies–psychodynamic, behavioral, and cognitive–of the 20th century. Not surprisingly, his personal construct psychology was largely ignored for decades. Like Kantor (1959), Kelly took seriously the distinction between events and constructs in describing what scientists and everyone do. There is no one way to construe an event. However, constructions do have varying implications for prediction and control. Kelly's brand of constructivist theory is progressive from the standpoint of the converging movements. It opts for circular causality, psychological events as integrated wholes, evolutional epistemology, mind as always embodied, and a motor theory of mind (e.g., Mancuso, 1996; Rychlak, 1990). Kelly's thinking continues to grow, as indicated by the availability of a dedicated periodical established in 1988 (*International Journal of Personal Construct Psychology*).

4. Cognitive science has been dominated by the lineality and duality of information (symbol) processing and intrapsychic models. Recent years have given rise to a radical departure from mainstream cognitive science in the form of situated cognition. As Kirshner and Whitson (1997) put it, "The central philosophical assumption against which situated cognition theories struggle is ... mind-body dualism" (p. 4). With situated cognition, knowledge is a matter of bodily action (knowing) in the world. An important construct of phenomenological thinking, lived experience, is not devalued in favor of higher, abstracted contemplative processes. Situated cognition finds neither theoretical nor practical advantage to autistic, self-contained, abstract symbol systems. Useful abstractions must have referents in worldly objects and events (Greeno, 1989). The growing literature of situated cognition shows several connections to converging movements, even to the point of occasional citations of Gibson's ecological approach to perception (e.g., Greeno, 1994).

5. Clinical psychology exhibits numerous signs of progress in the direction of the converging movements. At an elementary level, one major contributor to clinical behavior therapy–Franks (1997)–urges more attention to Kantor's interbehavioral psychology as a way out of the linearity of cause-and-effect thinking. In recent years, others have applied interbehavioral psychology (Delprato, 1995b; Wahler & Dumas, 1989), radical phenomenology (Halling & Goldfarb, 1996; Savoie, 1996), dialectical psychology (Linehan & Schmidt, 1995), and feedback control theory (Goldstein, 1990) to various aspects of clinical psychology.

6. One of the greatest advances in management occurred with Taylor's (1911) attempt to base management explicitly on principles of science instead of on what he referred to as "rule of thumb." Not surprisingly, Taylor's "scientific management" followed the lineal mechanism of classic science. The translation of cause → effect was manager → employee. All power and authority were in the cause (employer or manager), and the employee remained passive and subordinate in the effect position of the one-way relation. Management theory and practice have been merging gradually with converging movements thinking over several years. In particular, we

find participative management gradually growing in acceptability and sophistication (Christensen & Westenholz, 1997; Schuster, Morden, & Baker, 1997).

Perhaps conditions are gradually evolving to where more psychologists will find it worthwhile to explore alternatives to the postulates and methods that have dominated their discipline for so many years. Those inclined to do so might give careful consideration to the literatures offered here as converging movements.

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Commentary on Delprato

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Delprato's analysis of converging movements in psychology reveals unsuspected connections among interbehavioral psychology and other systems, and itself exemplifies the strengths of an interbehavioral point of view. Kantor recognized the virtues, as well as the vices, of alternate views and took pains to relate them to his own perspective in a constructive manner. Delprato adopts a similar strategy and embraces ideas that might be unfamiliar to many psychologists, including specialists in the history and systems of psychology. His detailed comparison of systems is a far cry from psychology textbooks organized around a few controversies separating academic psychologists into well-defined categories.

For social reasons unrelated to scientific research, many psychologists are inclined to remain loyal to a single point of view and pay scant attention to others. Lack of communication among people in various fields and trivial differences in terminology obscure similarities. Moreover, theorists often pretend that their own ideas are new and do not cite the sources of their inspiration; multiple formulations of the same or similar theories are not uncommon. Delprato counteracts this isolationism by thoroughly analyzing and establishing important similarities among movements commonly neglected by textbooks. He shows that interbehavioral psychology is akin to action psychoanalysis, behavioral cybernetics and feedback control systems, radical phenomenology, dialectical psychology, behavioral epigenetics, and ecological psychology.

Kantor (1938) emphasized that all sciences study the same domain and noted that "With the scientist's greater emancipation from traditional beliefs and closer approach to the specificities of nature has come a release from scientific hierarchies. Gone are the days when sciences like nations can point to themselves as the chosen ones" (p. 2). Moreover, Kantor believed that science and *authentic philosophy* are closely aligned. His book *Interbehavioral Philosophy* (Kantor, 1981) provided novel insights into the history of philosophy from an interbehavioral perspective and added a new dimension to what philosophers call *naturalism*.

If anything is lacking in Delprato's chapter, it is an expanded discussion of the ways in which cognitive psychology and cognitive science have come to grips with interaction, interdependence, and field-system concepts (see, e.g., Newell, 1990). Although Delprato is skeptical of intrapsychic cognitive theories, innovators in these disciplines rebelled against many of the same views that motivated Kantor to introduce another variety of behaviorism. If history were logically rearranged, early cognitive theorists would have recognized Kantor's contribution and built on it. But history is often disorderly and, as noted, people cherish the seeming originality of their own ideas.

Deciding how far afield to search for convergence is difficult because there is almost no end to movements that share at least some of the central tenets of interbehaviorism. For example, concepts like interdependence, interaction, and transaction are prominent in disciplines outside of psychology, as well as in psychology departments outside of North America. First, dialectical psychology includes not only Riegel's ideas, but also the views of Russian, Chinese, and European psychologists who adopted Marxism and dialectical materialism as a philosophical underpinning. Worldwide, one can add more names to the list of so-called dialectical psychologists, for example, Luria (1976).

Second, the general system theory of Bertalanffy (1968) and others belongs alongside of behavioral cybernetics and feedback control systems. Dispensing with lineal mechanism, it stressed the interdependence of components of systems at all levels in nature, including physical, biological, behavioral, and social. Variants of this approach, including the model of adaptive behavior constructed by Ashby (1960) and the concepts of "autopoiesis" and "structural coupling" introduced by Maturana and Varela (1980), also are suggestive of interbehaviorism.

Third, evolutionary epistemology, originated by Popper (1972), Campbell (1960), and others, is compatible with interbehaviorism, as well as with dialectical psychology and general system theory. Evolutionary epistemology applies principles of variation and natural selection to ideas, knowledge, and creative thinking. Early in the 20th century, Kantor (1924, 1938) also discerned the importance of evolution for psychology. Later, he referred to evolution as "the very essence of psychology" (Kantor, 1969, p. 308), pertinent to the behavior of individual organisms, as well as to the history of science. Of course, the three movements listed above diverge from interbehavioral theory in many ways. In searching for similarities, one should not disregard differences.

Fourth, venturing into speculative philosophy, Whitehead's (1928/1978) philosophy of organism and related types of process philosophy, with their notions of "prehension," "concrescence," and "nexus," are reminiscent of interbehaviorism, and also of dialectical materialism, general system theory, and evolutionary epistemology. Moreover, Whitehead emphasized that abstractions are derived from concrete events and not the reverse. Fifth, Bohm's (1980) conception of "wholeness and the implicate order" extends and transforms the field-system concept beyond its usual domain to nonlocality in quantum theory. There is growing experimental evidence that spatially-separated events in nature reveal correlations that are not classical causal effects bounded by the speed of light. Also, in an appendix to his *The Special Theory of Relativity* (1965), Bohm's analysis of perception has much in common with interbehaviorism.

Another reason for convergence between interbehaviorism and other movements is their rejection of certain views that mainstream psychology regards as fundamental or basic. An example is denial of the empiricist and positivist doctrine that science is grounded in sensory experience. Entertained widely in the previous century, this view holds that all science, indeed all meaningful discourse, is based on acquaintance with atomic bits of sensory data. It assumes that concepts and theories, no matter how abstract, are ultimately reducible to such data. This postulate was put forward by Avenarius and Mach and was eventually adopted by logical positivists and logical empiricists, as well as by many psychologists. Perhaps its most refined statement was Carnap's (1928) *The Logical Construction of the World*.

As psychological theory began to dispel the mystery surrounding perception, attention, memory, and other processes, the limitations of "sensory data" became apparent. Although Mach's arguments and Carnap's logical constructions appealed to empiricists at first, a succession of critics eventually demolished their position. Lenin (1927) criticized it from the standpoint of dialectical materialism in his book *Materialism and Empirio-criticism* and regarded it as a restatement of philosophical idealism (see also Wetter, 1958). Many philosophers, including Feyerabend (1963), Hanson (1967), Hesse (1970), and Quine (1953), rejected it, and Carnap (1956) himself eventually abandoned it. Skinner (1945) considered it to be akin to explanation of behavior by inner agents. Kantor (1924, 1938) was among the earliest critics of this modern version of empiricism. He referred to

> …Mach's paradox–namely, his attempt to separate physics from metaphysics by reducing all physics to Berkeleyan mental states. No one could be more outspoken than Mach in his condemnation of the theological, metaphysical, and anthropomorphic conventions that have dominated physics throughout the ages; still his own attempt to leave this mystic circle places him all the firmer in its center. (Kantor, 1938, p. 46)

In this regard, interbehavioral psychology is close to dialectical psychology and Skinner's (1938, 1953) analysis of behavior, and perhaps not too far from general system theory and evolutionary epistemology. By repudiating sensory phenomena as an empirical foundation, it is also close to cognitive psychology and cognitive science, as well as to modern philosophers who have been influenced by cognitive science. It diverges from several types of phenomenology and from the logical empiricism once advocated by many psychologists.

During the last century, concepts such as interbehavior, interaction, and transaction appealed to researchers and theorists in various disciplines. These concepts hold promise for surmounting earlier mechanistic ideas and at the same time avoiding dualism and retaining scientific objectivity. Nevertheless, future discoveries might, in turn, disclose limitations of these notions. To generalize, (a) as nature evolves, the phenomena that exist and the forms of interaction among phenomena become increasingly complex and specialized, and (b) as science evolves, scientists' understanding of interactions in nature becomes more penetrating. Furthermore, (b) is a special case of (a). Comprehension of nature by human beings is one instance of novel interactions coming into existence. The conceptual framework of interbehavioral psychology encompasses the interbehavior of scientists engaged in the construction of theories. The other converging movements also have their own ways of incorporating the reflexive character of science, but although they illuminate the process, none (including interbehaviorism) provide final answers to all problems.

This commentary has attempted to follow in Delprato's footsteps and identify a few additional converging movements. In the past, many textbook authors have done little more than note similarities among two or three kinds of behaviorism, often passing over interbehaviorism. In contrast, Delprato has examined a broad range of systems and theories outside the conventional psychological curriculum, and has called our attention to currently neglected ideas, facilitating productive research in the future.

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Commentary on Delprato

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Of the various movements in contemporary psychology about which Delprato writes, all except Kuo's position are at least partially dualistic. (It is also possible that Kantor instilled in me a "zero tolerance" for dualism and, hence, rendered me hypersensitive to it.) One theme the movements have in common is the "field theory" concept, which, of course, would have been agreeable to Kantor. To set the stage, Delprato begins with a discussion of the replacement of Greek naturalism by supernaturalism, as elucidated in the first volume of Kantor's (1963) *The Scientific Evolution of Psychology*. Most of the remainder of Delprato's chapter addresses some of the converging movements in today's return to naturalism, each of which I discuss briefly. Considering the extent of the topic and space limitations, Delprato has exceeded expectations in handling a large amount of material.

Radical Phenomenology

Delprato begins this discussion by presenting Brentano's act psychology, which was a reaction to Wundt's (1897) and Titchener's (1896) psychologies, the "in" psychologies of the late 19th and early 20th centuries. Brentano's psychology was in part a field theory; it dealt with acts rather than with structures of the mind. Delprato then proceeds to Merleau-Ponty. From a Kantorian point of view, Merleau-Ponty struggled to avoid dualism and almost succeeded. Kantor would have said that Merleau-Ponty was certainly moving in a commendable direction, but it is a formidable task for phenomenological psychology to be completely naturalistic.

Behavioral Cybernetics

As Delprato suggests, the influence of K. U. Smith and Powers expresses the closed-loop-feedback work in a field theory framework. Kantorians would be sympathetic to this, and Kantor himself would have made the point that if one conducts a properly controlled experiment, then the theory that one is attempting to confirm should not be berated. A good experiment stands on its own merits. Regardless of Kantor's views, the closed-loop-feedback theory seems to have had limited appeal and is not currently popular.

Action Psychoanalysis

It would appear that Delprato has written skillfully here, but being a psychologist of another generation, I have had little exposure to this movement and so will disqualify myself from any comment.

Behavioral Epigenetics

Kuo was one of the earlier behaviorists to have widespread influence. When I was a student under Kantor's tutelage, Kantor expressed to me his admiration of Kuo's psychology, which he thought was an improvement over John B. Watson's. Kantor looked very favorably on the interactional nature of Kuo's psychology.

Ecological Psychology

James Gibson exerted a strong influence on the psychology of perception. His perspective was thought of as a "new look." I had the fortunate opportunity to know Gibson years ago when he was doing important work in visual aesthetics. I thought his work was extremely interesting, although it seemed quite different from Kantor's approach to aesthetics. Ecological psychology may be interpreted in more than one way, and Delprato's interpretation is perhaps the most popular. By way of comparison, Lichtenstein's (1980) more interbehavioral perspective regards behavior as being inseparable from its interpersonal, social, and physical context.

Dialectical Psychology

Riegel recognized Kantor's contributions to psychology. In turn, Delprato has nicely introduced Riegel's developmental approach. If we read the first chapter of Kantor's (1924) *Principles of Psychology*, we recognize the important influence of developmental psychology on Kantor. Kantor placed much emphasis on developmental interactions, for example, the mutual interactions between the individual and the socio-historical world. Here, Delprato writes with discernable interest.

Assumptive Commonalities

1. Rejection of cause → effect framework: Delprato handles the concept of cause-effect and lineal causality well.

2. On dualism: Kantor could discern dualism in virtually any psychological theory except Kuo's. Whether the converging movements have freed themselves completely of dualism is doubtful, although many, such as Gibson's and Merleau-Ponty's, have endeavored to do so. Modern psychology is so replete with dualistic concepts that a naturalistic psychology like Kantor's must compete for the attention of the mentalistic community.
3. Organism and contact with the world: Delprato has demonstrated a good knowledge of this issue, and I think he has handled this section well.
4. Denial of stimuli and perception as causes: Delprato gives this section over to Powers' perceptual control system, which seems to have only a vague relationship to Kantor.
5. Non-reductionism: This seems to be a common characteristic of all the converging movements. Of course, it would have been very congenial to Kantor.
6. Organisms act as integrated wholes: Kantor stressed that Kuo's psychology distinguished itself in this facet of theorizing.
7. Dynamic, active constructs are essential: Delprato begins this section with Brentano's postulating. The rest of this section is devoted to matters relevant to interbehaviorism.
8. All psychological events evolve: Kantor wrote about various types of evolution: inorganic, phylogenetic, ontogenetic, and interbehavioral. As mentioned earlier, Kantor was in many ways a developmental psychologist. The converging movements seem to follow this pattern of thinking.

Conclusion

Many psychologists prefer to follow popular trends and accept conventional wisdom. It is unhappily true that cognitive psychology has brought the "mind" back to psychology with no apologies. To be non-mainstream, however, involves taking risks. We can hope that interbehaviorism will continue to flourish and may yet lead the way out of the mainstream.

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Author's Note

My appreciation goes to Parker E. Lichtenstein, who was immensely helpful in the preparation of this commentary. Without his insight, these remarks might have been of less value.

Chapter 7

Developmental Systems and Psychological Science

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It is high time…that such dichotomies as Nature-Nurture, Heredity-Environment be recognized as the traditional constructions that they are and dismissed from the scientific domain. (Observer, 1973, p. 420)

The behavioral sciences are beginning to appreciate the value of grounding the study of development in a system of multiple influences, rather than continuing to rely on dichotomies such as genes and environment, instinct and learning, and maturation and experience. The view that development is determined by interactions among various components of the organism and its environment, including genes, hormones, diet, sensory experience, social interactions, and numerous other factors has come to be known as a "developmental systems" approach (Ford & Lerner, 1992; Gottlieb, 1991; Oyama, 1985). In recent years, this approach has forged a more coherent and comprehensive view of the process of development by attempting to integrate all these levels of analysis (see Cairns, Costello, & Elder, 1996; Gottlieb, Wahlsten, & Lickliter, 1998; Magnusson, 1996). In general, this approach argues for a shift from simple cause-effect models of development that rely on predeterminism, linearity, and reductionism, to more dynamic, hierarchical, contextual, and multidetermined representations of the developmental process (e.g., Gottlieb, 1996; Thelen & Smith, 1994).

Although difficult to define in a simple, dictionary sense, individual development can be characterized in terms of increased complexity of organization (e.g., Anderson, 1957; von Bertalanffy, 1968). Contemporary developmental systems approaches generally attribute the emergence of increasingly complex and differentiated structural and functional properties of the individual to coactions in the organism-environment system (Germana, 1996; Gottlieb, 1991). This view stresses the fundamental connectedness of the individual organism to its surroundings and thus holds that the most basic unit of developmental analysis must be the developmental system, comprised of both the organism and the set of physical, biological, and social factors with which it interacts over the course of ontogeny.

Although the importance of context so construed has been acknowledged in the behavioral sciences for many years (e.g., Brunswik, 1952; Kuo, 1967; Schneirla, 1960; Werner, 1957), a concerted and explicit effort to include contextual and experiential factors in analytic studies of development is relatively recent (see Michel & Moore, 1995). Today, an appreciation of the constructive role of such factors in the development of phenotypic traits or characters is a core feature of a developmental systems approach (e.g., Gottlieb et al., 1998; Oyama, 1993; Thelen & Smith, 1994), which considers the task of defining the relevant and influential features of an individual's context and the individual's activity within that context as an empirical problem requiring systematic description and analysis (see Johnston, 1985, 1987). In other words, the view that phenotypic development, be it morphological, physiological, or behavioral, necessarily depends on interaction with particular features of the environment makes the organism-environment coaction the explicit object of investigation. This bidirectional emphasis on the organism and its developmental context contrasts with reductionistic approaches that focus almost exclusively on internal factors (e.g., genes; see Buss, 1991; Eibl-Eibesfeldt, 1989; Lorenz, 1965; Mayr, 1974). Approaching behavioral development as a process that is "situated" highlights the need to specify in detail the physical, biological, and social factors that the organism encounters as it develops. This chapter examines some of the conceptual and methodological consequences of this insight in prevailing approaches to the study of behavior and its causes. In addition, the implications of a developmental systems view of behavior to the training of the next generation of developmental psychologists are explored.

A Developmental Systems View of Causality

Over thirty years ago, Kantor (1968) pointed out that the activity of the nervous system can participate in the determination of behavior without being the behavior's "basis." From Kantor's perspective, behavior is always the complex product of many interacting factors; thus, attributing primary causal status to any one factor, neural or otherwise, is erroneous. In the decades since Kantor's admonition, however, many biologists and psychologists continue to assume that behavior is based on or determined by more "fundamental" or "primary" processes occurring at genetic and neurophysiological levels. This linear, unidirectional, bottom-up view of the "biological basis" of behavior and the privileged status it credits to genetic and neurological components of functioning have a long history and continue to be widespread in the behavioral sciences (e.g., Gazzaniga, 1992; Lorenz, 1965; Wilson, 1975).

The bottom-up view of development, however, fails to appreciate the difficulty of predicting or explaining the behavior of an organism by relying on linear causality or unidirectional determinism. At the level of behavior, the organism and its surround constitute an integrated system. Genetic, neural, and physiological factors are always part-and-parcel of the individual organism's entire developmental system, as are contextual features extrinsic to the individual. No single element in the system, be it internal or external to the organism, necessarily has causal primacy or privilege in the emergence of behavior. For example, the movements of an infant (and of an adult) are always the product of the individual's nervous system, the biomechanical properties of the body, the features of available environmental support, and the specific demands of the task in question (Thelen, 1995). The "distributed" relation between these internal and external factors highlights a core feature of a developmental systems approach to behavior, namely, that the functional significance of genes, neural structures, hormonal levels, and any contextual influence on behavior can be understood only in relation to the developmental system of which they are a part. The effect of any level of the developmental system is potentially dependent on the rest of the system, making all factors inherently interdependent and mutually constraining (Gottlieb, 1991; Oyama, 1993). As a case in point, several different lines of research on motor development have provided compelling evidence that the infant's and young child's increasing motor skills not only facilitate the acquisition of subsequent motor abilities, but also contribute to emerging social and cognitive abilities (Bertenthal & Campos, 1990; Lockman & Thelen, 1993; Thelen, 1995).

The important idea that control of any developmental outcome resides in the nature of the relations within and between internal and external variables, rather than in any individual level or factor, is still not widely appreciated in much of psychology, despite the promotion of this insight by several prominent developmental theorists over the last 40 years (i.e., Gottlieb, 1970; Kuo, 1967; Lehrman, 1965; Schneirla, 1957). In fact, the focus on experiential or contextual variables found in this work has been characterized by some as "environmentalistic" and, thus, opposed to a "biological" approach to the study of development (e.g., Lorenz, 1965; Wilson, 1975). The dichotomous framework that this charge assumes–environment versus biology–itself derives from an implicit dualism still common in contemporary psychology, one that attempts to delineate between the relative causal power of internal versus external factors thought to be associated with any given behavioral trait or ability. A developmental systems view argues against this dichotomy and, in its place, characterizes behavior as an emergent property resulting from the integration of nervous system activity, other internal physiological and endocrine variables, and specific features of stimulation present in the organism's immediate physical and social context (Gottlieb, 1991; Michel & Moore, 1995). Sporns (1995), for example, has recently provided a model explicating the connection between specific features of neural structure and visual perception. In particular, he has shown how the perception of visual features, such as continuity, proximity, similarity, and common motion, can be linked to specific neural connection patterns present in the visual cortex (see also Sporns, Tononi, & Edelman, 1991). Importantly, these neural connection patterns are not genetically predetermined, but arise in postnatal development during exposure of the organism to its visual world. Thus, early experience gives rise to particular neural structures, which in turn guide and constrain the subsequent function of the visual system (Lowel & Singer, 1992; Tononi, Sporns, & Edelman, 1992). Simple models of genetic determinism fail to capture this multiply determined, bidirectional nature of the developmental process. What is needed is an approach to development in which factors within and outside the organism are studied in explicitly relational terms.

This insight is certainly not new to psychological science, as evidenced by the following quote from Lehrman (1953) over half a century ago:

> The use of explanatory categories such as "innate" and "genetically fixed" obscures the necessity of investigating developmental processes in order to gain insight into the actual mechanisms of behavior and their interrelations. The problem of development is the problem of new structures and activity patterns from the resolution of the interaction of existing structures and patterns, within the organism and its internal environment, and between the organism and its outer environment. (p. 135)

Interestingly, Kantor (1959) arrived at a similar conclusion regarding an evolutionary perspective on psychological issues. He argued that:

> Evolutionary influences on psychology free it from such constructions as instincts, drives, internal mechanisms, native intelligence, abilities, and capacities, not only because all these generally designate non-existent powers and forces but even more because they turn students away from the observation of detailed and specific happenings... Evolution doctrine has forced the recognition that psychological events are essentially developmental processes, and that psychological constructs should, therefore, demonstrate their derivation from such evolutional situations. (p. 141)

Along with Kuo (1921, 1967) and Lehrman (1953), Kantor (1959) was a pioneer among psychologists in coming to appreciate that positing strictly genetic or "instinctive" causes for behavioral outcomes was taking an essentially non-developmental position to an interesting and significant analytic problem, namely, the identification of the processes whereby behavioral outcomes are actually realized during individual ontogeny. This inquiry is, of course, at the heart of a developmental systems approach.

The implicit dualism underlying the traditional environmental versus biological characterization of developmental causation, still found in much of psychology, is explicitly rejected by a developmental systems view. Hard-line distinctions between genetic and environmental causation, between internal and external sources of control, and between nature and nurture no longer seem tenable in the face of existing data from experimental embryology, developmental biology, and developmental psychology. Nonetheless, many psychologists continue to argue for the value of reducing the study of behavior to strictly genetic or neural levels of analysis. As described earlier, this position on theoretical reductionism is perhaps nowhere more clearly stated or defended than in the growing field of evolutionary psychology, a contemporary exemplar of traditional dualistic (i.e., "innate-acquired") thinking about behavior.

A Non-Developmental Approach to Behavior: Evolutionary Psychology

Evolutionary psychology is a blend of psychology, ethology, sociobiology, and behavioral genetics, and has received increasing attention over the last decade (Buss, 1991; Cosmides, 1989; Crawford, 1989; Tooby & Cosmides, 1990). In general, proponents of this approach argue for the importance of an evolutionary perspective to the study of psychological issues, including such diverse domains as cognition, personality, emotion, psycholinguistics, and social psychology. Inspired by the growing influence of sociobiology on the behavioral sciences over the course of the last two decades (see Wilson, 1975), evolutionary psychologists assert that applying insights from evolutionary theory to explanations of human behavior will stimulate more fruitful research questions and provide a powerful framework for discovering "evolved psychological mechanisms" (i.e., cognitive mechanisms) thought to be forged by natural selection operating over thousands of generations (Buss, 1989; Charlesworth, 1986; Cosmides & Tooby, 1987; Tooby & Cosmides, 1990).

Although ideas gleaned from evolutionary biology have positively influenced theory building in developmental psychology, including such concepts as neoteny, heterochrony, and selectionism (e.g., Cairns, Gariepy, & Hood, 1990; Edelman, 1987, 1989, 1992; Gottlieb, 1987, 1992; Oyama, 1985; Sameroff, 1983), many of the underlying assumptions and conceptual frameworks embraced by current advocates of evolutionary psychology are seriously flawed. In particular, much of the work demonstrates deep confusion about the nature of causality for the origins, diversity, and persistence of human behavior. As an example, Tooby and Cosmides (1990) contend that "present conditions and selection pressures are irrelevant to the present design of organisms" (p. 378). In a similar vein, the neuropsychologist Gazzaniga (1992) argues that "all we do in life is discover what is already built into our brains" (p. 2). These statements are representative of the predeterministic, radically reductionistic thinking advanced by many proponents of evolutionary psychology and highlight the tendency of evolutionary psychologists to ignore developmental processes in their explanations of human behavior.

As illustrated in the above quotes, most applications of evolutionary thinking to psychology assume that historical contingency (so-called "ultimate" mechanisms) overrides the influence of individual ontogeny (so-called "proximate" mechanisms) and, thus, disregard the fundamental role of development in the achievement of any phenotypic trait or character (see Lickliter & Berry, 1990, for a critique of the proximate-ultimate dichotomy). In particular, researchers who appeal to evolutionary explanations typically embrace what can be termed an "instructionist" approach to the study of behavior. The central idea underlying this approach is that of *preformation*, in that instructions for building organisms and their functions are seen to exist prior to individual ontogeny in "programs" found in the genes, which are the vehicles by which such instructions are transmitted from one generation to the next. The instructionist viewpoint is clearly portrayed in the following quote from Tooby and Cosmides (1990):

> The individual organism, fixed at conception with a given genetic endowment regulating its developmental programs, encounters its specific ontogenetic environment, which it processes as a set of inputs to these developmental programs. In other words, the organism blindly executes the programs it inherits, and the ontogenetic conditions it encounters serve as parametric inputs to these programs. (p. 388)

For evolutionary psychology, contextual or experiential influences have no clear place in the determination of behavior. Individual development is characterized as the unfolding of innate programs directed by the genes. Contextual or experiential influences, if considered at all, are simply thought to be triggers that can switch development into one genetically determined pathway or another. This view is remarkably reminiscent of the writings of the classical ethologists, including such well known figures as Lorenz (1965) and Tinbergen (1951), in that it assumes behavior to be genetically determined, part of the innate constitution of the organism, arising relatively independently of the organism's specific interactions with the rest of the developmental system.

The notion of the genetic specification of behavior, common to contemporary evolutionary psychology, represents a disregard of a wealth of empirical findings presently available from embryology, neuroscience, and developmental psychology. Research from these fields has repeatedly demonstrated that phenotypic outcomes (including behavior) are not simply the result of genetic programs triggered by environmental inputs. Genes certainly play a significant role in development, but so do many other non-genetic components in the developmental system and thus there is no basis for granting a unique status to the genes (see Johnston & Gottlieb, 1990; Nijhout, 1990). For example, Atchley and Newman (1989) have articulated several kinds of dynamic factors–genetic, maternal, and environmental–that can affect the stability and variability of developmental phenomena. Their model for integrating genetics with developmental analysis recognizes that multiple factors, including contingencies in mating, which create the individual's genome, and contingencies of the particular maternal (cytoplasmic and uterine) environment in which the individual develops, can mediate variability and stability in developmental outcome. Understanding the developmental pathways of morphological, physiological, and behavioral organization requires knowing the dynamic and contingent processes of interacting internal and external factors operating over the course of individual ontogeny. Such factors and their relations are not included in or specified by predetermined programs or instructions.

Recognition that the developmental system is comprised of genes and all other relevant developmental influences inside and outside the organism, including cells, tissues, neural and endocrine activity, and many aspects of the animate and inanimate environment, clearly poses a challenge to behavioral explanations centered on only one level of analysis (Oyama, 1985). Behavioral development is multidimensional, and no one level, component, or subsystem necessarily has causal priority in determining outcome. Rather, causation in development is coactional, the result of the relation between at least two and often more components of the organism-environment system (Germana, 1996; Gottlieb, 1992). Thus, the attempted resurrection of an "instinct" psychology by evolutionary psychologists, and its strictly genocentric account of the origins and organization of human behavior, cannot be sufficient to the task of contemporary developmental science, namely, the understanding and explaining of individual functioning and its organization, without denying the complexity of the phenomena to be understood. This challenge places the investigation of behavior within the domain of study of complex systems (see Cohen & Stewart, 1994; Thelen & Smith, 1994).

Methodological Aims of a Developmental Systems Approach

Empirical concerns with the complexity of processes, mechanisms, and interactions underlying behavioral development clearly require information and insight obtained from a variety of analytic levels. Such an integrative effort is in keeping with the vision of the pioneering developmentalist Kuo (1967), who argued that the study of behavior must be a synthetic effort. He realized that a comprehensive approach to the study of behavior must address multiple levels of analyses, including comparative anatomy, comparative embryology, comparative physiology, experimental morphology, and the qualitative and quantitative analysis of the dynamic relation between the organism and the external physical and social environment. This interdisciplinary, multi-level conception for the developmental analysis of behavior is gradually being incorporated into psychological science. For example, a shift away from simple cause-effect models of behavioral development is increasingly evident in several sub-areas within developmental psychology, including perceptual (Gottlieb, 1993; Lewkowicz & Lickliter, 1994), motor (Thelen, Kelso, & Fogel, 1987; Thelen & Ulrich, 1991), cognitive (Bjorklund, 1995), language (Dent, 1990; Locke, 1993), personality (Lerner, 1988), and social development (Cairns, Gariepy, & Hood, 1990; Fogel, 1993), to cite but a few examples. Given that the development of any specific behavioral capacity is the product of dynamic, bidirectional interactions among multiple, hierarchically organized levels (see Gottlieb, 1991; Thelen & Smith, 1994), the utilization of interdisciplinary and convergent research strategies seems essential to future attempts at discovering and defining the various conditions, experiences, and events (both internal and external to the organism) necessary and sufficient to understand normal development.

To this end, Gottlieb (1991, 1992, 1996) has distinguished among three functional organismic levels—genetic, neural, and behavioral—and three environmental levels of analysis—physical, social, and cultural—central to a developmental systems approach (see Figure 1).

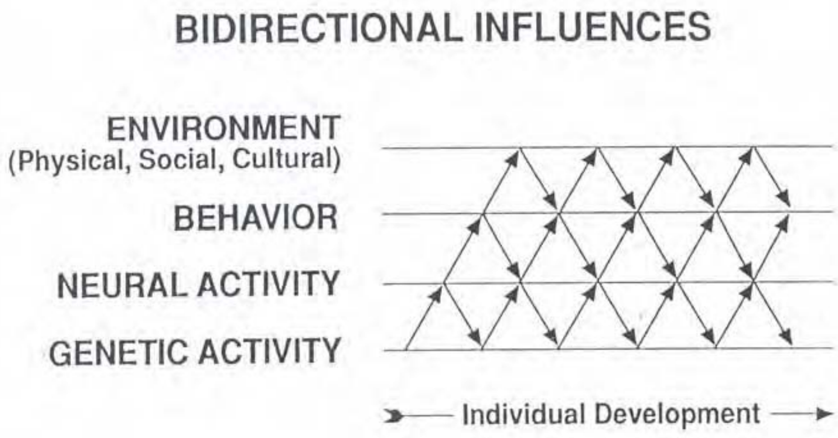

Figure 1. Organismic and environmental components of a systems view of psychobiological development. From Individual Development and Evolution: The Genesis of Novel Behavior *(p. 186), by G. Gottlieb, 1992, New York: Oxford University Press. Copyright by the Oxford University Press. Adapted with permission.*

Gottlieb's scheme of influences is an attempt to represent individual development at a suitable level of complexity and to do justice to the relational complexities of development. From this view, particular developmental outcomes depend on reciprocal influences within and across levels, a concept that is at the heart of a developmental systems approach. Gottlieb's network of interdependent, bidirectional relations among gene action, neuroanatomy and physiology, behavior, and social influences clearly poses a significant challenge for those who still strive to identify linear, unidirectional causes of behavior.

Gottlieb's characterization of the developmental system and its inherent complexity also poses a challenge to researchers committed to unraveling the intricate web of nested influences involved in behavioral development. In particular, the complexity of relational influences requires the discovery and mapping of dynamic, bidirectional relations between levels of organization, rather than simple, antecedent-consequent linkages typically investigated in much of contemporary psychological research. Few, if any, research programs, however, have successfully integrated empirical analyses from genetic, neural, behavioral, and environmental levels of organization, illustrating the scope of the task facing developmental science as it begins the 21st century. That being said, recent work from behavioral embryology (Gottlieb, 1993; Lickliter & Lewkowicz, 1995), developmental biology (Edelman, 1988), neuroscience (Damasio, 1989; Merzenich, Allard, & Jenkins, 1990), and developmental psychology (Smith & Katz, 1996; Thelen & Ulrich, 1991) stresses that the intricacy and complexity of developmental causal networks are not always obvious or straightforward and that this "distributed control" can require repeated probes at more than one level of analysis to be identified.

Efforts Toward Unpacking the Developmental System

As an example of the principle of distributed control, the causal interconnections that underlie the reproductive behavior of the ring dove are summarized in Figure 2.

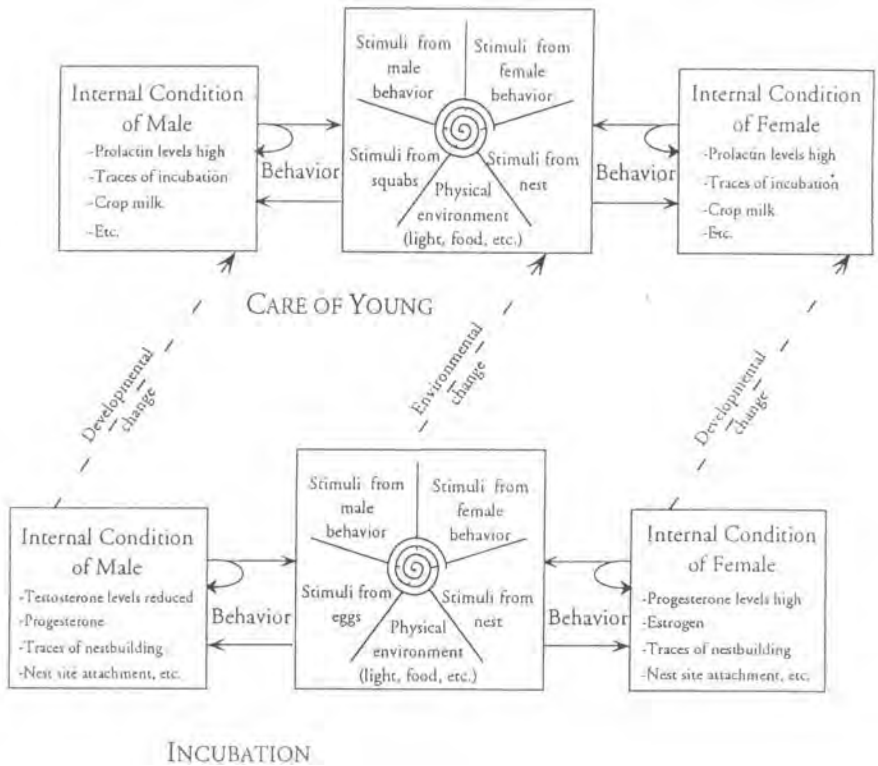

Figure 2. The reproductive cycle of the ring dove, regulated by nested relations among the internal conditions, behavioral patterns, and external environments of both the male and female dove. From Developmental Psychobiology: An Interdisciplinary Science *(p. 58), by G. F. Michel and C. L. Moore, 1995, Cambridge, MA: MIT Press. Copyright by the MIT Press. Reprinted with permission.*

This figure, derived from an elegant series of experiments (see Lehrman, 1965, 1971; Michel, 1986), illustrates the rich network of internal and external features involved in the display of courtship, nest-building, egg-laying, incubation, and parental care.

This network exemplifies the role of diffuse control and reciprocal interrelations in the emergence and maintenance of behavior, themes central to a developmental systems approach. In particular, the ring dove work demonstrates a complex interaction between the effects of hormones (e.g., prolactin, testosterone, progesterone) on the expression of reproductive behavior and the effects of external stimuli (e.g., the behavior of the animal and its mate) on the secretion of the various hormones (Lehrman, 1964).

The ring dove research, for example, highlights the value of an interdisciplinary, multi-leveled approach to behavioral research by demonstrating that: (a) hypothalamic, pituitary, and gonadal functions, essential for the range of reproductive behaviors seen in ring doves, are determined in large part by the social and physical stimuli associated with the reproductive cycle (i.e., the long days of spring, the presence and activities of the mate), (b) changes in levels of circulating hormones affect the dove's relative sensitivity to specific social and physical stimuli (i.e., the presence of a nest, the activities of the newly hatched young), and (c) the dove's prior reproductive experience alters the pattern and regulation of behavior by its influence on the sensitivity of the dove's nervous system to specific hormones and to social and physical stimuli (see Michel & Moore, 1995). Taken together, the coactional traffic between hormones, behavior, and environmental stimuli gives evidence to the difficult but critically important task of filling in the bidirectional details between the specific internal and external factors contributing to behavior. In addition, this body of work provides a strong argument against explanations of behavior cast solely in neurobiochemical terms. An understanding of the ring dove's reproductive behavior was not achieved by examining only the dove's reproductive physiology; it also required detailed information about the organism's physical and social milieu (cf. Stern, 1989, for a mammalian example). In keeping with a basic tenet of the developmental systems approach, the causes of reproductive behavior in the ring dove can be said to occur simultaneously at several levels of organization and to include the coaction of factors internal and external to the organism. In any given process, some factors might be more central and important than others, but the factors always operate in a context in which their effects are dependent upon their relation with other factors.

This coactional theme is also illustrated in recent work on human neonates' arousal and attentional mechanisms. This research demonstrates that the infants' changing sensitivities and responsiveness to postnatal sensory stimulation are the consequence of the interdependence of organismic state and effective stimulus. That is, arousal levels and attention in human newborns appear to work interdependently as a self-organized autoregulatory system that combines the effects of internal and external stimulation to the infant (Gardner & Karmel, 1983; Turkewitz, Lewkowicz, & Gardner, 1983). For example, very young infants will visually orient toward less intense sensory stimuli when more aroused (i.e., hungry) and toward more intense sensory stimuli when less aroused (i.e., recently fed). This arousal-modulated attention effect is seen both (a) when neonates are *endogenously* more aroused (i.e., before feeding) as opposed to less aroused (i.e., after feeding) and (b) when neonates are *exogenously* more aroused due to increased amounts of pre- or concurrent stimulation within or between the sensory modalities (Gardner & Karmel, 1995; Gardner, Lewkowicz, Rose, & Karmel, 1986; Gardner & Turkewitz, 1982; Lewkowicz & Turkewitz, 1981). Thus, an inverse relation apparently exists between level of arousal and visual attention during early development. Distinctions between internal and external sources for changes in stimulus attractiveness appear to be somewhat arbitrary and artificial. The salience of particular patterns of sensory stimulation appears dependent on the total context of presentation, including both internal and external factors, and not simply on the specific physical features or stimulus energy of the stimulus itself. Similar arousal-modulated attention effects have also been recently reported in animal infants (Lickliter & Lewkowicz, 1995; Radell & Gottlieb, 1992; Sleigh & Lickliter, 1995, 1996). In particular, these studies suggest that some optimal, but dynamic, level of overall sensory stimulation is required during early development. A substantial increase or decrease in the amount or type of stimulation normally present in the developmental milieu can result in altered neonatal attention and in subsequent deficits in intra- and intersensory functioning (Banker & Lickliter, 1993; Gottlieb, 1993; Sleigh, Columbus, & Lickliter, 1996, 1997). Thus, stimulus characteristics such as intensity or amount of stimulation interact with organismic characteristics such as the state of arousal of the infant and the larger context of the infant to contribute to the infant's emerging behavioral skills or capacities. These results stress the fundamental connectedness of the organism to its surroundings and emphasize that investigation beyond the boundaries of the organism is essential to understanding its behavior. This dynamic relationship cannot plausibly be reduced to solely genetic or neurophysiological levels of analysis.

By way of summary and synthesis to this point, findings from the comparative and human literature highlight several defining characteristics of the developmental systems perspective. These are interrelated and include the following: (a) development is *multidimensional*, that is, no one level, component, or subsystem necessarily has causal priority in the developmental system; (b) development is *non-linear*, that is, the intricacies of developmental causal networks are not typically unidirectional and are not always obvious; (c) development is *activity-dependent*, that is, abilities emerge from the individual organism's ongoing activities and encounters with its world; and (d) development is *context-sensitive*, that is, emerging capacities are strongly influenced or modified by specific features of the organism's immediate surround.

Strategies of Developmental Analysis

Approaching development as a process that is "situated" and "activity dependent" results in what can be termed an ecological perspective to behavioral development (see Gibson, 1979; Johnston, 1985; Reed, 1996). This ecological perspective highlights the mutuality of the organism-environment system and underscores one of the chief aims of a developmental systems approach: the specification of how external stimulative events coact with organismic factors to exert particular effects on specific traits or characteristics at particular times. The ecological stance recognizes that any organism's functional environment is structured, organized, and specific to the organism. Thus, the task of defining the relevant features of an organism's developmental context is always an *empirical* problem requiring systematic description and analysis. This developmental analysis includes both a descriptive or normative assessment stage and an experimental or manipulation stage to uncover the conditions, experiences, and events necessary and sufficient for normal development.

Assessment and description. As an organism develops, its relation to the external world changes, such that its effective environment, the actual physical, biological, and social factors with which it interacts, also changes (Johnston, 1985). One of the challenges facing a developmental systems approach is to interpret the concept of environment in such a way that it incorporates an appropriately dynamic view of the changing relations between the developing organism and its context. We need to specify in detail the variety of physical, biological, and social factors with which the organism interacts as it develops over time. As Johnston (1982, 1985) has pointed out, the specific and dynamic nature of the organism's developmental context cannot be specified in advance, but rather it must be empirically discovered. This task requires the collection of normative data, founded on naturalistic observation across representative developmental contexts. This often labor-intensive step documents the species-typical experiences and developmental trajectories associated with the organism's normally occurring milieu and illuminates the range of behavioral capacities and developmental outcomes characteristic of the organism-environment system. This critical starting point is then followed by systematic experimental intervention and manipulation designed to uncover the developmental resources necessary and sufficient for normal development.

Experimentation. A developmental systems approach typically results in multiple-study experiments designed to assess the enhancing and limiting conditions contributing to the emergence of specific behaviors. This strategy is in keeping with Klüver's (1931, 1933) method of "equivalent and nonequivalent stimuli," which was originally developed for studies of perception, but which has wide applicability to developmental analysis. In this method, a series of different conditions is presented to subjects to establish the range of stimuli to which they do or do not respond. In particular, the investigator attempts to identify a set of stimuli that evokes the same response from the subject (equivalent set), as well as a set of stimuli that evokes a different response (nonequivalent set). A comparison of the various properties of the two sets of stimuli then enables the investigator to identify the property (or properties) that are present and common to the stimuli in the equivalent set, but that are absent in the nonequivalent set. By testing individuals under a variety of conditions, investigators can establish the range of stimulation under which the subject responds or does not respond, allowing inferences regarding the processes and mechanisms involved in the particular behavior in question.

Klüver's method has been applied with success to the study of human infants' early perceptual development. Bahrick (1983), for example, showed that 4-month-old infants can relate an object and a sound on the basis of temporal synchrony and on the basis of the displayed objects' composition. Infants were shown two side-by-side videos of rattle-like objects. One object was a transparent cylinder containing a single large marble; the other was an identical transparent cylinder containing a number of smaller marbles. Infants were successful at matching the correct videos and soundtracks on the basis of object composition, in that they looked significantly more to the video of the single marble when a single-impact sound was played and to the group of smaller marbles when a compound sound was played, even though the motions of both cylinders were synchronized with each soundtrack. In contrast, infants failed to match correctly when sounds of the wrong substance (single vs. compound) were played in synchrony with the motions of the single or compound objects presented in the video. These studies demonstrate that young infants do not respond equivalently to all conditions of audiovisual synchrony and reveal important boundary conditions or constraints on the types of sounds that young infants will perceive as related to the motion of objects (see Bahrick, 1988; Lewkowicz, 1994, 1996, for related examples).

Comparative Developmental Analysis

The type and duration of experimental manipulations employed in the study of human subjects are necessarily limited in scope, and nonhuman animal research provides an important avenue for developmental analysis. Gottlieb (1977) and Miller (1981) have summarized several specific types of experimental manipulations commonly used in comparative developmental analysis, including: (a) experiential attenuation, in which features of normally occurring stimulation are removed from the developmental context; (b) experiential enhancement, in which additional stimulative features are added to normally available stimulation; (c) experiential substitution, in which normally occurring stimulation is replaced with a different form of stimulation; and (d) experiential displacement, in which the temporal relations between features of normally occurring stimulation are shifted or rearranged. These types of manipulation and the resulting evaluation of consequences are often used in parallel with one another to unpack the complexity and contingency of behavioral development. For example, experiential attenuation (deprivation) methods and experiential enhancement (early exposure) methods employed in studies of animal infants have yielded important information regarding the conditions necessary for normal perceptual development in both altricial and precocial species (Banker & Lickliter, 1993; Gottlieb, Tomlinson, & Radell, 1989; Kenny & Turkewitz, 1986; Knudsen & Knudsen, 1985; Tees & Symons, 1987). As a case in point, Lickliter (1990) found that providing precocial avian embryos with unusually early (prenatal) visual experience altered their subsequent auditory and visual responsiveness following hatching. Specifically, quail chicks receiving early visual stimulation (experiential enhancement) as embryos showed accelerated intersensory responsiveness to maternal auditory and visual cues when compared to control chicks. Also, depriving avian embryos of normal levels of prenatal vestibular and tactile stimulation (experiential attenuation) was found to delay chicks' normal pattern of auditory and visual responsiveness following hatching (Lickliter & Lewkowicz, 1995). These results demonstrate a strong link between the sensory modalities during early development and illustrate the powerful influence of amount and type of prenatal sensory stimulation on normal or species-typical perceptual functioning.

In nearly all cases, sensory deprivation or early exposure techniques cannot be successfully utilized with humans, emphasizing the importance of a comparative approach to contemporary developmental science. In a number of domains, researchers working with humans simply cannot control experience or do the kinds of systematic experiments that are required to investigate the varied features and their interactions thought to be involved in the development of behavior. Animal research has provided and will continue to provide an essential foundation for a developmental systems approach to behavior by affording the means to explore systematically how the emergence of species-typical traits is dependent on species-typical developmental resources. As discussed earlier, these resources occur at various scales or levels and include genes, cytoplasmic mechanisms, cell and tissue interactions, sensory stimulation, and social relations with conspecifics, to name but a few (see Michel & Moore, 1995; Oyama, 1985).

These varied developmental resources and their interactions again highlight the need to study behavior at various scales or perspectives, ranging from genetic to sociocultural, comparative to human. Such investigations are not, however, sufficient in and of themselves. A multileveled approach to the study of behavior also requires integration. As argued throughout this chapter, analyses of behavior restricted to a given level of organization, be it internal or external to the organism, often lead to a simplistic characterization of the processes and mechanisms determining the development of behavior. Careful integration of empirical observations that emerge both within and across diverse levels of analysis is necessary for a thorough scientific account of behavior. As Kantor (1969) acknowledged, a psychological event is at the same time a physiochemical event, a biological event, and a social event. Most traditionally trained psychologists, however, are not prepared to address such a multileveled, integrative framework.

Conclusion: Toward an Ecology of Development

If comprehensive, integrative explanations of the development of behavior are to be achieved, then training the next generation of developmental psychologists is likely to require some modification. In particular, students of development must be educated to overcome the still prevalent tendency to embrace theoretical reductionism or scientific provincialism in which the study of any single level of analysis is thought to be the most appropriate or fundamental approach to an understanding of behavior. In providing alternatives to such provincialism, training programs are needed that equip students with the background and expertise required to deal conceptually and experimentally with the complexities of multiply-determined phenomena. This type of training depends, of course, on wider interdisciplinary cooperation and on the framing and organization of empirical findings within and across domains of study. The promotion of interdisciplinary programs and student exposure to courses beyond a core developmental curriculum, such as history and systems, philosophy of science, evolutionary and developmental theory, embryology, animal behavior, physiological psychology, cognitive neuroscience, and physical and cultural anthropology, are obvious and plausible steps in this direction. Such interdisciplinary coursework would enable students to develop a conceptual understanding (but not necessarily the empirical and methodological details) of related disciplines and allow for linkages with colleagues outside the domain of developmental psychology. Such linkages can facilitate multi-investigator approaches to the study of behavior that will allow the application of diverse expertise and methodologies, and promote the integration of findings across domains and levels of analysis.

Perhaps the most important step to the achievement of a more comprehensive developmental psychology, in which no top-down or bottom-up approach is seen as necessary and sufficient, is the incorporation of an ecological approach to the training of developmentalists. This view explicitly recognizes that a strict emphasis on any single domain or level of analysis, be it genes, physiology, neuroanatomy or neurochemistry, social interactions, or culture, will be too limited to address the development of behavior (see Gibson, 1979; Reed, 1996). Instead, an ecological view stresses that the organism-environment system is the primary unit of development and thus acknowledges that the goal of explaining behavior will depend on our ability to characterize scientifically the coaction of an organism and that organism's specific environment or context (i.e., its "life space," see Thelen & Smith, 1994). In particular, students of development must be prepared to acquire precise and detailed information about the contextual and experiential variables present during the course of the individual organism's development if they are to design experiments to understand that development. Given that behavioral development depends on coactions involving the organism and its context, the task of defining the relevant developmental resources of an organism becomes the foundation of any systematic description and analysis of the development of behavior. As argued throughout this chapter, one value of this approach to development is that it includes an array of non-genetic variables that have often been omitted from explanations of species-typical behavior (see West & King, 1987, 1996, for a further discussion of this insight).

This ecological focus serves to broaden and redefine the traditional scope of psychological inquiry and in so doing directs research attention to the important but often overlooked question of *how* behavioral possibilities and capacities emerge in process. The organism does not come into the world with ready-made response systems; rather, these systems emerge through interaction during development. The developmental scientist's task is to gain deeper and more comprehensive insights into this complex, multidetermined process.

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Author's Note

The writing of this chapter was supported by Grants RO1-MH48949 and KO2-MH01210 from the National Institute of Mental Health. I thank Lorraine Bahrick and Joseph Germana for their constructive comments on the manuscript. Correspondence should be addressed to Robert Lickliter, Department of Psychology, Florida International University, Miami, FL 33199.

Commentary on Lickliter

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Lickliter's chapter on developmental systems and scientific psychology brings to mind my early efforts with Donald M. Baer to present the subject of child development from a natural science point of view. In our first book (Bijou & Baer, 1961), which outlined the principles of child behavior development, we stated at the outset that we were presenting child development from a natural science perspective. And we explained that a natural science studies any natural phenomenon by the methods that characterize scientists and distinguish them from others who seek knowledge of the same phenomenon by different methods. Furthermore, we emphasized the fact that the natural scientist deals with concepts based on observable events.

At the time of publication of that book, we did not think it necessary to discuss whether psychological behavior is caused by heredity or environment, an issue that was given considerable attention in most textbooks on child development. Naively, we believed that as the field of psychology matured, it would gradually embrace the natural science point of view and as a result such a discussion would be only of historical interest. However, in volume two of the series (Bijou & Baer, 1965), which was devoted to applying the principles presented in volume one to the behavior of the neonate and infant, we discussed how behavior was elaborated and in that context we considered the possibility that heredity was the sole cause of psychological development. In the light of data from a variety of studies on twins, we rejected that possibility and concluded that the dramatic changes that one sees in development come about through the continuous flow of interactions between an evolving biological individual and his or her environment.

In the last revision of the book on principles (Bijou, 1993), which appeared some 30 years later, I added a section on the issue of heredity versus environment as the cause of psychological behavior. The concluding sentence of that brief discussion reads: "So it can be said that the genotype has an *indirect* relationship to all psychological traits or characteristics, i.e., it participates in producing the phenotype which in turn participates in producing specific psychological traits" (p. 42). I felt compelled to discuss the heredity versus environment issue because it was still very much alive in the current literature and, what is more, I learned that many students who have studied volume one of the series were unaware of our discussion of the cause of behavior in volume two, which appeared under the heading, "The Elaboration of Behavior."

Considering the slow pace with which psychologists have been embracing the natural science point of view, a full treatment of the cause of behavior, developmental and otherwise, is essential. This task is performed admirably by Lickliter with his conception of developmental systems. For him, "development is determined by interactions among various components of the organism and its environment, including genes, hormones, diet, sensory experience, social interactions, and numerous other factors." He expands on the concept and gives an example of an approach–evolutionary psychology–that sounds as though it should subscribe to a multilevel, multicomponent conception of the cause of behavior, but does not.

Lickliter points out that research from the developmental systems approach consists of two phases: The first is assessment and description; the second is experimentation. In discussing assessment and description, he makes an interesting statement; namely, that descriptive research on the physical, biological, and social conditions of development should all be conducted from the functional point of view. It is unclear how this would be done and the products it would yield.

An outstanding feature of Lickliter's developmental systems approach is that it emphasizes the role of setting factors at each of the levels of investigation. Taking setting factors into account at the level of organism-environment interactions has been a very slow process. Kantor (1926, p. 375) made a plea for it in the 1920s and from time to time others have done the same (e.g., Bijou, 1996; Gewirtz, 1972); recently, Michael (e.g., 1988) has kindled new interest in setting factors in his papers on establishing operations. It turns out, however, that context or surrounding conditions has been used in behavior analysis more than was realized because it appeared in the literature under a variety of names (Nicolson, 1998). There is currently a growing consensus that the term "setting factors" is most appropriate, particularly in analyzing human interactions.

At the end of the chapter, Lickliter recommends that a natural science of development fly under the banner of "an ecology of development," which seems reasonable in the light of everything he discussed in the chapter. However, such a designation could be confused with Bronfenbrenner's ecology of development (1979) and its revision, ecological systems theory (1989). This would be unfortunate, considering that Bronfenbrenner's theoretical orientation contrasts sharply with Lickliter's.

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Commentary on Lickliter[1]

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The interbehaviorist says, “The brain is not a cause of behavior.” The interbehaviorally challenged says, “But how can you ignore the brain? I do not much like this interbehavioral approach.” The interbehaviorist replies, “You overreacted to my claim. We do not deny that the brain is important. According to our position, the brain is a participant in behavior just as many, many other factors are participants. These include all parts of the behaver’s body, various components of what is often called ‘the environment,’ ecological conditions, and cultural factors. Why, one could even include as participatory conditions those commonly referred to as hereditary, vocational, educational, economic, and political.” Reply from interbehaviorally challenged: “Now you are simply going too far. What on earth are the implications of your position for doing science?” What we have here is a clash between older ways of thinking and more recently evolved approaches to the nature of things. From the standpoint of the interbehavioral outlook, behavior events are always systemic, meaning (a) they are made up of many factors and (b) participation is axiomatic. Behavioral science has yet to fully assimilate a field or system view—thus, the clash. My goal here is to highlight the participative principle, an underappreciated alternative to conventional causal logic. I will attempt to clarify the principle of participation by showing how it operates and how it comports with what we know about natural events. Kantor used the principle in various places but did not wave it about. I suggest he should have.

Cause and Factor Participation

One of Kantor's clearest presentations of participation is found in *The Logic of Modern Science* (1953) where he offers factor participation as an alternative to what he calls "traditional causal constructs" and "theories of determining cause." Table 1 summarizes the main characteristics of causality thinking in which the received view is one of determining cause. The table also provides an indication of corresponding alternative characteristics of a newer theory of causality, one of factor participation.

The participative principle is the fundamental way in which contemporary sciences approach the "why" of things and events in that it is inherent in the field-system stage of science. In the prefield or lineal mechanistic stage of thinking, the fundamental descriptive and explanatory model was cause → effect (Kantor, 1969). As Feigl (1953) put it, the field alternative to the terms cause and effect of ordinary language "is the entire set of conditions [event-field]" (p. 410), and this set represents the cause of an event. Feigl's concise statement clearly suggests that factor participation is a key to field-system causality. Things and events in interrelationship replace internal powers and forces. There was no place for participation in the sense of shared governance with the one-way causality of lineal mechanism that required a superior, creative power (cause) and subordinate, created entity (effect). With system causality, the lineality of → is replaced by the double-headed arrow (⇔) and, thus, participation. Factors on both sides are participants. The direction of causality is reciprocal or circular.

One-way causality implies independence and dependence where causal power lies on the independent-variable side. The status of the dependent-variable side of one-way causal influence is determined by the independent variable. Alternatively, with circular causality, we find interdependence in which both factors are participants.

The one-way linearity of most mechanistic views underlies reductionist attempts to understand complex happenings over very brief or extended time periods. Reductionists begin with the assumption that the world is best described in terms of one-way chains of cause → effect. Reductive explanation means placing a to-be-understood thing or event in the effect position of an assumed cause → effect link. This gives reductionists a feeling of understanding because they take cause as a creative agent. The most complete reductive schemes begin with the assumed building blocks of nature, such as atoms or more elementary elements, and proceed to construct the world by way of ever more complex cause → effect acts of creation. One common reductive causal chain is molecules → genes → biological structures and processes → psychological acts. In cases such as this, reductionists aspire to explain events at later points in the chain in terms of earlier links. The alternative to reductionism is factor participation in which complex happenings over time are taken as evolved systems of interdependent factors. Mainstream theorists have long used reductionistic postulates in talking about the relation between biological and psychological events. In his prescient *Problems of Physiological Psychology* (1947),

Scientific stage	
Lineal mechanism	Field-system
Fundamental framework	
Determining cause	Factor participation
Nature and locus of cause	
Internal powers and forces	Systems: things and events in interrelationship
Direction of causality	
One-way (→)	Reciprocal (⇔)
Relationships between variables	
Independence and dependence	Interdependence
The "why" of complex happenings over time	
Reductive chains of cause → effect	Evolving field-systems of interdependent factors

Table 1. Determining-Cause and Participative-Causality Theories

Kantor made the participative principle the key to a nonreductionistic approach to integrating psychology and biology.

The Participative Principle in Biological Science

The Logic of Modern Science appeared in 1953, and Kantor used the relatively current research on plant viruses to illustrate how participation replaces determining cause. He noted that when researchers first isolated the virus of tobacco mosaic in crystalline form, causationists were encouraged because it appeared that the virus could be studied chemically, thus independently of the diseases it caused. Kantor does not mention reductionism in this section, but we recognize a form of reductionism in the causationists' thinking; that is, it first appeared that biological viruses could be reduced to and explained by chemical events.

However, as research proceeded, it became clear that not even viruses in isolation could be adequately understood in chemical terms only because in order to flourish and reproduce, viruses require living tissues. This and other considerations, Kantor notes, "point to no other possible conclusion than that viruses as particulate and independent causes of disease must give way to the view that they are participants in sets of factors constituting fields larger than any single unit or member" (p. 249). And to sum up how scientists must carry forth, he goes on, "This in no way minimizes or reduces the properties of any participant factor: it merely obligates the observer to discover what part each factor plays in the total situation" (p. 249).

Also, in discussing biology in *The Logic of Modern Science*, Kantor notes that the first general way of handling pathology, germ theory, gave way to field constructions. That is, biologists made a great advance when they discovered invading organisms (germs) associated with disease. And, originally, the attacking microorganisms were assumed to be independent determining (or causal) factors. Yet, as research continued, improved observational techniques revealed that the same microorganisms were present when pathological conditions were absent. Clearly, disease was a matter of the presence of invading organisms and other conditions such as those related to the host not being immune or not otherwise able to counteract the effects of the invader. Given this, Kantor concludes that biology "operates on the same basis as any other science–interrelationship of field factors" (p. 248).

Early scientific evidence supporting participation, rather than determining cause, as descriptive of what we actually know about events in the life sciences is found in biology where there is an enormous amount of data. H. S. Jennings's *The Biological Basis of Human Nature* appeared in 1930. Even at this early date, research showed that identical genetic make-up leads to different outcomes depending on the, as Jennings put it time and time again, *surrounding conditions*. But two examples in Jennings include Spemann's work with embryonic differentiation and Emerson's research on the color of maize plants.

It appears that embryonic development is fixed and predetermined in that we can predict with great certainty what a cell becomes: part of brain, spinal cord, eyes, and so on. However, Spemann's transplantation experiments showed that cells develop in accord with the conditions of host sites. For example, if cells from a region that will become the brain are transplanted to a region that will become skin, the transplants may become part of the skin. In other words, genes of transplanted cells are participants, along with those of host cells as well as other chemical and metabolic conditions.

Under ordinary cultivation, which includes usual sunlight conditions, maize plants perpetuate themselves. Red plants produce red offspring and green plants produce green offspring. However, as Jennings (1930) noted, Emerson showed this does not occur if plants are grown in shade. Red plants grown in the shade produce green plants as do green plants still. Genes of maize plants are participants, along with identifiable growing conditions, in the color of offspring.

Rose's *Lifelines* (1998) is a contemporary compendium of biological findings in which the byword is "it depends"; hence, the participative principle reigns. A striking case in Rose's book concerns Zuckerman's baboons. According to Rose, in the 1920s Zuckerman observed strong dominance hierarchies and high levels of aggression among a large baboon colony at the London Zoo. His studies led Zuckerman to develop an influential theory of social behavior, one predicated on violence. He relayed how each baboon appeared to live in constant fear, violence was constantly occurring, quarrelling was frequent, and any significant disturbance of the precarious equilibrium caused the social order to collapse into an anarchic mob, capable of orgies and wholesale carnage. This seems quite disturbing until we consider that Zuckerman's baboons were in the London Zoo in the early part of the 20th century. Zuckerman's conditions of observation were suited to research based on a conventional laboratory model. The zoo animals lived in a highly artificial setting, especially one very confining. It turns out that later researchers who observed baboons in much larger enclosures or in their natural setting did not find anywhere near the amount of fighting as did Zuckerman. Instead, the animals were relatively peaceful and social relations were stable. It appears that baboons' living conditions are participants in, not determining causes of, the animals' social behavior.

Lifelines (Rose, 1998) is a valuable source of evidence countering still widely accepted reductionistic explanation in the life sciences. The author offers considerations that are compatible with many of those in this paper. Perhaps most prominently in this regard is Rose's identification of "seemingly linear chains of cause and effect" with reductionism (p. 77) and his clear distinction between determining-cause and factor-participation causal theory when addressing biologists' contemporary knowledge of genes and gene expression:

> The gene as a unit determinant of a character remains a convenient Mendelian abstraction, suitable for armchair theorists and computer modelers with digital mind-sets. The gene as an *active participant* [italics added] in the cellular orchestra in any individual's lifeline is a very different proposition. (pp. 125-126)

Behavioral endocrinology might offer particularly difficult challenges to participation as a fundamental causal principle. Experimental subtraction (e.g., castration with removal of testosterone) and replacement (e.g., reinstatement of synthetic testosterone levels) conditions are highly associated with reductions and elevations in aggressive responding, respectively (Sapolsky, 1998). These findings seem to indicate that testosterone acts as a determining cause in a lineal way to produce aggression. Yet Sapolsky reviews various research findings best interpreted as showing that testosterone does not cause aggression independently of *other* participating conditions. If present in sufficient amounts, testosterone will contribute to aggressive responding by exaggerating certain neural activity or the response to particular environmental stimuli.

Participation: Old and New Idea

The participative principle is not a new, radical idea. It has been part of scientists' thinking for a long time. Although participation is not usually explicitly recognized in either elementary or sophisticated scientific presentations, this way of approaching causality is a fundamental characteristic of how advanced scientists have treated the "why" of things and events for much of the 20th century. For example, when Staddon (1973) overviewed developments in the notion of cause, he found that thinkers have long recognized that "a cause is reliably followed by its effect only under certain conditions" (p. 26). Staddon here is pointing out that a nominal cause (e.g., activating an automobile's ignition) will only cause the motor to start if certain other conditions are present (e.g., adequate fuel, intact electrical connections). In other words, an automobile does not start because of a single causal agent. Instead, numerous factors participate in the event. Staddon highlighted the role of context or contextual variables in contemporary renditions of cause: "In practice, a cause is reliably followed by its effect only under certain conditions [levels of participating contextual variables]" (p. 26). This generality describes all of the examples of participation in this paper. Context, in one form or another, is prominent in contemporary experimental and applied behavioral science. In addition to historical context and internal states (e.g., Staddon, 1973), behavior theory now recognizes contextuality with constructs such as physical and temporal context (e.g., Bouton, 1994), setting events (e.g., Bijou & Baer, 1961), and establishing operations (e.g., Michael, 1982).

There is no doubting that scientists have long had available an alternative to the determining-cause approach to causality and that the alternative greatly emphasized the participatory role of elements involved in events. For this reason, participation is not a novel suggestion. Yet, the principle has been neglected in many ways. Perhaps the most prominent manifestation of the failure to apply participation in science is when one or another version of reductionism is offered. This point was highlighted in a special section that appeared in *Science* entitled "Beyond Reductionism." Gallagher and Appenzeller's (1999) introduction argues that the predominant answer to the difficult and practical issue of how the different fields of science are related is reductionist: "Questions in physical chemistry can be understood in terms of atomic physics, cell biology in terms of how biomolecules work, and organisms in terms of how their component cell systems interact" (p. 79). Gallagher and Appenzeller proceed to note that inadequacies of reductionism are becoming increasingly apparent and that some scientists are working within the framework of a new approach, one based on the notion of complex systems. Given what is known about the evolution of scientific thinking (Kantor, 1969), it is not a surprise that the scientists whose work is featured take as the essence of complex systems the characteristics described under factor participation in Table 1, as well as the ancillary concept of context. To this group, participation is a novel idea.

Conclusion

The participative principle seems to be applicable over the entire range of the natural world and has much to offer a naturalistic logic of science. Although participation is an inherent characteristic of the contemporary field-system approach to science, the principle is not yet widely promulgated. If the participatory approach to causality were to become more visible, perhaps facile explanation in terms of determining causes and hasty reductionism would be less frequent. One factor contributing to the relative obscurity of participation in the physical sciences and most life sciences is their fundamental inductive nature. Workers proceed by way of observation, experimentation (in the manipulative sciences), measurement, model building, and testing. This means that broader, philosophical concepts are revealed only when enough scientists examine their products (e.g., descriptive models with a satisfactory amount of empirical support) and detect generalities that perhaps were previously unarticulated. The idea of complex systems (Gallagher & Appenzeller, 1999) discussed above seems to have evolved in one scientific subculture via such an inductive route. However, philosophical concepts, be they complex systems or the allied one of participation, do not directly provide grist for the mill of today's scientists who are concerned with adequately describing particular aspects of the world by way of testable models.

In the most formal sense, participation falls within the purview of scientific systematics that examines the logic (philosophy or systematics) of science (Kantor, 1953). Participation arises when scientists or observers of science think in terms of general principles. Although whether or not events under study are best described by participation definitely does bear on models we propose and test (e.g., Gallagher & Appenzeller, 1999; Weiss, 1959), the concept provides more general service as a suitable alternative to reductionist proposals. Participation is a scientifically justified byword that captures how living systems function if they are not the outcome of lineal chains of causes and effects.

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Endnote

[1]This commentary was first published as "The Participative Principle" in the on-line *The Interbehaviorist* (2003, May). As such, it was not written as a commentary on Lickliter's chapter; however, because it addresses several points pertinent to Lickliter's arguments, it is reprinted here, courtesy of *The Interbehaviorist*, with minor editorial changes.

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Chapter 8

Cognitivism and the Schema of "Perception-and-Cognition"

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[If] the activities and methods of behaviorist psychologists grow… the change effected would not be an affair of different ways of dealing with old problems, but of relegation of the problems to the attic in which are kept the relics of former intellectual bad taste.
(Dewey, 1914/1977, p. 442)

Several years ago, Arthur Still and I edited a book setting out criticisms of cognitivism and possible alternatives (Costall & Still, 1987). We used the term "cognitivism" to distinguish between cognitive psychology as a theoretical perspective and as a content area within psychology. The typical response of reviewers to our book was not simply one of rejection but of outrage. One reviewer diagnosed insanity, suggesting that we must have been bitten by rabid cognitivists in our early childhood. Another accused us of simply setting up cognitivist straw men. The most extreme reaction appeared in the *Quarterly Journal of Experimental Psychology*. "Rarely," this review concluded, "has a work of such wooliness of thought, meandering prose, and gross self-congratulation appeared."

Our critics could not believe we were serious. The appeal to "cognitive processes" was, to them, the only possible way for psychologists to engage in proper science. After all, physicists infer the internal structure of materials from their observational data; hence, psychologists should follow their lead and engage in the business of inferring mental or cognitive structures from observed behavior. The computer metaphor—a metaphor taken very literally by most of its proponents—once seemed to provide a most compelling justification for this position. Conventional digital computers "run" by processing stored instructions and data, represented as symbols in the machine; *ergo*, organisms presumably operate by processing stored representations and rules.

Around the time that a substantially revised edition of our book appeared (Still & Costall, 1991), criticism of cognitivism had become more widespread and somewhat more acceptable (e.g., Bickhard & Richie, 1983; Button, Coulter, Lee, & Sharrock, 1995; Coulter, 1983; de Gelder, 1985; Dreyfus, 1971, 1992; Kolers &

Smythe, 1984; Sampson, 1981; Searle, 1989; Shanon, 1993; Weizenbaum, 1984; Winograd & Flores, 1986). To an extent once barely imaginable, developments both within cognitive psychology and beyond have challenged several central tenets of traditional cognitive psychology. What had been widely taken to be an unassailable approach—explanation in terms of cognitive rules and representations—has gradually come to seem much less secure. New approaches within artificial intelligence have called into question the traditional computer metaphor; connectionist modeling has challenged the assumption that "intelligent systems" must be based on symbol-based representations (see Costall, 1991); and the recent intriguing research on "autonomous agents" has perhaps moved beyond a reliance upon representations of any kind (Brooks, 1991).

Within cognitive psychology itself, there has been a reaction to the creation and testing of hypothetical models on the basis of highly contrived experimental situations, and a move toward studying "cognition" in more naturalistic situations (Hutchins, 1995; Neisser, 1997). Some researchers, mainly social psychologists and anthropologists, have gone even further, and question the very idea that "individual memories," for example, can be understood as internal processes with an existence independent of the interpretative and communicative practices of a particular group or society (e.g., Edwards, 1997; Lave, 1988; Middleton & Edwards, 1990). Perhaps the most radical theorists are those who have made "situated action" the focus of their study. The intention of these theorists is not to offer an alternative approach to cognition, but rather to take concrete, contextualized activities as the subject of investigation (Suchman, 1987; see also Costall & Leudar, 1996).

Of course, there has been a long tradition of anti-cognitivist theorizing in psychology, but in the past it had always been marginalized and seldom part of the mainstream. My own work has been strongly influenced by the psychologist James J. Gibson (1904-1979). Gibson is generally regarded as a perceptual researcher, and when the present book was first envisaged, the plan was to include a chapter on perception with reference to Gibson's approach, and a separate chapter on cognition. My initial reaction was to suggest that the division of these topics would not do justice to the scope of Gibson's project. Once I began to get down to work on this chapter, however, I came to realize that the very distinction between perception and cognition has a much wider negative effect. What I shall call "the schema of perception-and-cognition" has been pervasive in Western thought for many centuries and continues to structure and distort psychological theory – perhaps even those theories explicitly claiming to have moved beyond cognitivism. My purpose in this chapter, therefore, is twofold. First, I shall discuss Gibson's sustained critique of traditional psychology and his own alternative theoretical proposals, and then I shall use both the strengths and limitations of Gibson's work to demonstrate the pervasive influence of the schema of perception-and-cognition.

Cognitivism and Perceptual Theory

Gibson's theorizing involved a remarkably productive fusion of American functionalism, Gestaltism, phenomenology, and stubbornness. Gibson studied with

Edwin B. Holt (1873-1946) at Princeton University, and was in close contact with Kurt Koffka (1886-1941) and Fritz Heider (1896-1988) at Smith College, and with Robert MacLeod (1907-1972) at Cornell. His contributions to psychology were both constructive and destructive. On the positive side, he formulated and continually reformulated an alternative account of perception. His destructive efforts might, however, prove of greater enduring importance because he questioned the very foundations of scientific psychology:

> [Psychologists] seem to feel, many of them, that all we need to do is consolidate our scientific gains. Their self-confidence astonishes me. For these gains seem to me puny, and scientific psychology seems to me ill-founded. At any time the whole psychological applecart might be upset. Let them beware! (Gibson, 1967, p. 21)

Gibson realized that the confusions of traditional psychology were especially evident within the field of perception. He was not alone in his criticism of traditional perceptual theory. Kantor (e.g., 1980), of course, was another incisive critic. Gibson, however, unlike most critics, had established for himself a secure reputation within mainstream psychology as an experimentalist. He could not, therefore, be so easily dismissed as a troublesome outsider. He was a troublesome insider, and his criticism was both persistent and searching.

Gibson's criticisms helped to reveal and, in part, to undermine the unexamined assumptions and questionable dualisms that have structured the seeming diversity of perceptual theories. For example, both nativist and empiricist theorists have shared (a) the same commitment to representationalist theory and (b) the same assumption that the information to the perceiver is somehow incomplete and hence needs to be supplemented by cognitive processing or stored representations. Over several centuries, their dispute centered upon the secondary question of whether this supplementary knowledge was individually acquired, evolved, or divinely implanted. Likewise, all theorists, with the possible exception of a few Gestalt psychologists and Gibson, have assumed that meaning is in some way created by the perceiver and projected onto a world that is itself devoid of meaning (Whitehead, 1926). Most generally, all theorists, with perhaps the sole exception of Gibson, have assumed that something is missing from "the stimulus," something that therefore has to be added by the perceiver. Indeed, the fundamental theoretical problem of perception has been taken to concern how the perceiver, through the intervention of mental representations, comes to "enrich" the stimulus.

Gibson refused to take the old problems of perception seriously. He sought to dissolve them by identifying and dismantling the assumptions that had made them seem so inevitable. One of his many important insights was that a theory of perception should also provide an account of the environment. In this, he was clearly drawing on a fundamental tenet of American functionalism: the principle of animal-environment reciprocity or mutuality. Rather than treating organism and environment as somehow existing prior to the adjustment of the one to the other, we should start with "the unity of function and see that the distinction between organism and environment arises because of the adaptation in that process, not vice versa" (Dewey, 1976, p. 275). An organism could not exist outside of *any* relation to an environment, nor an environment be defined independently of *any* relation to an organism. Organisms and environments are mutually dependent and co-evolve.

Gibson's Ground Theory

One of Gibson's first attempts to bring the environment explicitly into perceptual theory was what he termed the *ground theory* (Gibson, 1950). According to Gibson, the so-called problem of space perception, as originally formulated, was not really a problem at all, simply because we do not in fact perceive space; that is, we do not encounter objects floating in an empty void. Environments are not structureless "containers," but constrained in highly specific ways. For example, terrestrial animals inhabit a cluttered environment of objects, surfaces, and the like, and these in turn exist in relation to an extended, textured ground surface. The relations between these textured surfaces in turn structure the light reflected from them in specific and lawful ways. Gibson's more basic point, of which the ground theory is a particular example, is that a proper analysis of the information available to perceivers must take into account the nature of the environment as well as of the organism.

Visual Proprioception

Gibson's (1966, 1979) somewhat neglected concept of *visual proprioception* provides a further alternative to the traditional dualism of perceiver and world. Sensory physiologists continue to claim that our sense of our own bodily posture is based solely on the output of internal receptors in our joints and muscles. Gibson's insight, now well established by subsequent research, was that vision can also provide us with a profound sense of ourselves as beings in the world. We see not simply other objects, but our own bodies, and, most fundamentally, we perceive ourselves-in-relation-to-the world. For example, I do not simply see the computer in front of me as I write this chapter. I see the computer in relation to my own body, my hands typing on the keyboard, and my legs extending under the table. As Gibson noted, this fact about perception is seriously at odds with the traditional dualisms of subject and object, and observer and environment. We experience ourselves *in relation* to our surroundings, as beings *in* the world: "self-perception and environment perception go together" (Gibson, 1979, p. 116).

Affordances

The most discussed of Gibson's mutualist concepts has been that of *affordances*. Gibson's purpose was to counter the entrenched assumption within Western science that meanings and values are not real but purely subjective. According to Gibson, affordances are actual properties of objects, even though they are properties that can be defined only in relation to the organism in question. For example, given its constitution and, indeed, history of coevolution with grazing animals, turf affords food to certain animals, but not to humans. In contrast, bicycles afford locomotion to humans, but to few other animals. By describing the environment in a way that already implicates an organism, the concept of affordance undercuts the traditional dualism of organism and environment. As discussed elsewhere (e.g., Costall, 1995b; Costall & Still, 1989), Gibson unfortunately never completely reconciled the mutualist implications of the concept of affordances with his long-standing commitment to a very traditional form of realism, namely, the idea that only those properties of the world that exist independently of organisms are truly real. He persistently disregarded the logic of his own concept, and claimed that affordances do not, after all, depend on organisms for their existence. Furthermore, by adopting the noun, "affordance," rather than the gerund, "affording," Gibson reified what should be regarded as a process—an emerging functional relation.

One of the several virtues of the concept of affordances has been to offer an alternative view of what perceiving is *about*. Gibson's point was that isolated qualities, such as shape, color, or texture (the favored topics of traditional vision research), do not normally in themselves have any biological significance. What organisms need to detect are the possibilities that objects and events afford for action. As Michaels and Carello (1981) have put it, the theory of affordances was an attempt by Gibson to "write perception into the language of action" (p. 43). To the extent that this was true, I take it to be a positive reflection of Gibson's grounding in American functionalism and indeed in behaviorism.

Effective debate within mainstream psychology about the problems of cognitivism has been stifled for several decades by the accusation that the critics are merely unreconstructed behaviorists. Somehow, Gibson remained largely exempt from this charge, even though he described himself as a philosophical behaviorist (Gibson, 1967, p. 132) and insisted that he shared behaviorism's antagonism to mentalism (Gibson, 1979, p. xiii). There was a single, but important distinction. Even well-informed and sympathetic commentators have mistakenly supposed that he must at least have been a proponent of stimulus-response psychology in that he questioned the need for "a cognitive or psychology level of theory" to intervene between the "stimulus" and "response" (Bruce & Green, 1990, p. 389). They failed to appreciate his more fundamental point, that the apparent need for mediating theories arises from the very schema of "stimulus and response." As I shall shortly explain, Gibson came to replace this schema with a concept of activity very similar to that developed within more sophisticated forms of behaviorism (see Morris, 1991).

Following the lead of his teacher, Holt, Gibson had initially attempted to repair *the stimulus-response formula* by redefining the stimulus in more global, "Gestaltist," terms, as a higher-order spatio-temporal structure. By the late 1950s, however, he became convinced that this entire scheme was doomed to failure, and hence had to be abandoned entirely, rather than patched-up by appeal to processes mediating between the so-called stimulus and response. This was why he was so alert to shameless retention by cognitive psychologists of the stimulus-response or input-output schema, despite their claims to have overthrown mechanistic behaviorism (see Leahey, 1992). Modern psychologists had simply climbed on "the latest bandwagon, the computer bandwagon, without reappraising the traditional assumption that perceiving is the processing of inputs" (Gibson, 1979, p. 251).

According to the traditional approach to perception, perceiving begins with a stimulus or input impinging on the receptive surfaces of the body. In contrast, Gibson argued that the senses should be regarded as perceptual systems that are functionally rather than anatomically defined (Gibson, 1966). The visual system, for example, does not just consist of an "eye and brain," as the title and at least some of the content of Gregory's (1966) well-known textbook seem to suggest. As Gibson (1979) put it, "the eye is part of a dual organ, one of a pair of mobile eyes, and they are set in a head that can turn, attached to a body that can move from place to place" (p. 53). Considered functionally, the visual system includes arms and legs.

The implications of Gibson's alternative approach to the senses are perhaps best illustrated by his research on *active touch* (Gibson, 1962). If an object such as a key is placed upon the palm of our hand, but we are not allowed to investigate the object, we might get a vague sense of something cool and perhaps even metallic touching our skin. But once we actively explore the object by passing it between our fingers, we then get a vivid sense of a coherent, separate object, and might then find it difficult to notice which part of our hand is momentarily touching the object. In the case of active touch, the perceiver initiates the encounter with the object. There is no antecedent stimulus. The so-called stimulus is actually a consequence of the exploratory activity (Dewey, 1896).

Thus, contrary to traditional theory, perceiving is usually active in a very robust, embodied sense. Perceiving is not a question of receiving inputs and then pondering what they might mean. The perceptual systems are, as Gibson put it, *organs of active attention*. Furthermore, contrary to the widespread misunderstanding that Gibson was a nativist, he was well aware that effective perceiving often involves considerable skill, as when a baker handles the dough to test its readiness for baking, or an orthopedic surgeon manipulates a patient's arm in preparation for setting a fracture (Costall, 1995a). Yet perceiving is not always a self-contained exploratory activity, nor even a preliminary to action. When searching for a key in our pocket, we act not out of idle curiosity about the various contents of our pocket. "Perceiving" the key is part of the wider activity of getting hold of it and then manipulating it in order to unlock a door. In such cases, tactile perception does not precede the activity of unlocking the door, nor is it a separate process running in parallel. Similarly, looking where one is going is part and parcel of the activities of walking and driving.

In pursuing a functionalist approach, Gibson came to regard perception as an aspect of activity. Indeed, Gibson's later work could be regarded as not so much a theory of perception as an account of the conditions that make activity in the world possible, that is, the affordances that support activity, and the information that allows the organism to detect those affordances (Costall & Leudar, 1998).

Gibson and Cognitive Theory

In addition to developing a theory of activity, Gibson claimed to be providing an alternative account of "cognition." He regarded perception itself as cognitive in that it provides the organism with knowledge about the world. This may seem an unexceptional claim, but traditional theory had denied that perception could itself be cognitive in this sense because "perceptual inputs" were supposed to require supplementation by cognitive processing in order to provide meaningful information. Gibson did not share the traditional view that perceiving requires such supplementation, and hence regarded perceiving as a way of directly knowing about the world or *direct cognition*.

In addition, Gibson also began to set out an account of *indirect or socially mediated cognition* (see Reed, 1991). I shall not go into this issue in great detail here, since Gibson's discussion of indirect cognition was neither extensive nor systematic and, in any case, his approach is in many ways reminiscent of those developed within Soviet psychology (e.g., Leontiev, 1981; Vygotsky, 1978). Gibson's basic idea was that socially shared systems of representation, such as pictorial representation, number systems, and language, provide a resource that can be "appropriated" by the individual. To take an example from his early writings, Gibson (1950) set the traditional account of visual perception on its head by insisting that perspective forms do not provide the starting point of vision. Rather, he argued, our ability to see the world itself in perspective–for instance, to notice relations of occlusion between objects–had derived from the Western practice of producing pictures in linear perspective. Similarly, to take an example of my own, the fact that I am sometimes struck by "Turneresque" sunsets in the actual sky derives, in part at least, from my familiarity with Turner's paintings, and the remarkable way that nature seems to imitate his art.

As an analytic distinction, Gibson's contrast between direct and indirect cognition seems well motivated. But, in his own writings, this distinction often appears to involve a stark dualism between the social and the asocial, as though direct, asocial modes of psychological functioning coexist along with the indirect, socialized ones. As I have argued elsewhere, when we consider the actual activities of human beings and many other animals, social mediation, in some form or another, seems to be implicated in most, if not all of them (Costall, 1995b). To return to my earlier example, was at least Turner's perception of "his" sunsets *direct*? Possibly in some respects, yet nevertheless he was working within a particular tradition of painting that regarded certain subjects as picturesque and appropriate for depiction. And, social mediation occurs in many ways other than through the appropriation of "representational systems." Other people explicitly instruct us in the ways we should deal with objects and people, or else simply show us by example how things work as they go about their own business. And, objects in themselves have an important, yet often neglected, social dimension. Many of the objects in our surroundings have been constructed and are often maintained by other people, and the activities of individuals are, in turn, constrained and supported by these objects.

My first objection to Gibson's treatment of cognition, therefore, is that his distinction between direct and indirect is overly general and decontextualized (Costall, 1989). But a much more fundamental problem derives from Gibson's very attempt to frame his theory within the traditional terms of perception and cognition. For, as I shall now explain, his theorizing continued to be framed in terms of the pervasive schema of perception-and-cognition, and hence failed to pursue the important promise of his functionalist perspective.

The Schema of Perception-and-Cognition

It is tempting to suppose that psychological theory might take a non-cognitivist stance simply by finding alternative ways to talk about perception and cognition. After all, cannot a distinction be drawn between cognitive psychology as a theoretical doctrine or set of doctrines, on the one hand, and as a content area, on the other? I no longer believe this is a viable option. The problem is this: "Cognition" is itself a highly abstract, theoretically-laden term, as is "perception." These two terms are essentially the creations of theoretical discourse, and they have been linked together for many centuries within Western thought through the schema of perception-and-cognition (see Hatfield & Epstein, 1979). Perception is supposed to be a bodily activity, whereas cognition is a non-bodily intellectual or quasi-intellectual activity.[1] As a physical, bodily process, perception is supposed to be essentially passive, whereas all activity is confined to the mental side of the equation, namely, cognition. Perception is limited to the realm of mechanical causation, whereas cognition is the realm of meaning and the "normative"—we can get things either right or wrong. Knowing cannot be construed as a purely mechanical relation because, like the concept of learning, it involves considerations of aptness and correctness.[2] Any adaptive change in behavior is not *just* change, but change in the "*right*" direction. Indeed, theorists have been struggling for many centuries with the problem of reconciling the causal language of science with the normative status of knowledge (Hatfield, 1990).

The schema of perception-and-cognition is not just a matter of history. *All* modern theorists of perception, with perhaps the exception of Gibson, start with the assumption that perceiving begins with a passively received input, and then embark on an account of how this input is cognitively processed. For example, the debate in recent years over whether or to what extent perception involves "top-down" or "bottom-up" processing is based on the shared assumption of an input needing to be processed. The debate concerns whether central cognitive processes simply wait, as it were, for the input to be processed peripherally before they arrive at the brain, or whether they actively intervene in the peripheral processing. The references to specific neural centers, along with the computer-based language of top- and bottom-down processing, suggest that this debate must be an essentially modern affair. Yet it is not. The astronomer, Kepler, addressed much the same issue four centuries ago—and in more colorful language:

> Whether [the retinal image] is made to appear before the soul or tribunal of the visual faculty by a spirit within the hollows of the brain, or whether the visual faculty, like a magistrate sent by the soul, goes forth from the administrative chamber of the brain into the optic nerve and the retina to meet this image, as though descending to a lower court—this I leave to be disputed by the physicists. (Kepler, cited in Hyman, 1989, p. 71)

To his credit, Gibson was well aware of the schema of perception-and-cognition, with its dualist assumptions and its awkward juxtaposition of the bodily, the passive and the mechanical, on the one side, with the mental, the active, and the normative, on the other. He aptly characterized the tradition of perceptual theory as an attempt to explain how the mind or cognition acts upon the passive deliverances of the senses. And, much of his theorizing was an explicit attempt to undermine this traditional schema. His mistake—and it is mistake I shared until I embarked upon this chapter—was to suppose that the traditional categories of "perception" and "cognition" could be extracted from this schema as if they had a unity and coherence outside of that very schema.

Let us first consider "perception." As Coulter and Parsons (1990) have pointed out, this theoretical term covers a disparate variety of activities and ways of relating to one's surroundings: observation, inspection, taking notice of something, looking at what you are doing or where you are going, or simply enjoying the view. Furthermore, even when trying to discuss the role of "perception" in relation to an ongoing activity such as driving, the term itself, with its legacy, persistently leads us to suppose there are two things going on at the same time, perception (or exploratory activity) versus performatory activity.

Now let us turn to "cognition." Being also a creature of a highly abstracted discourse, this term has no real coherence once detached from the traditional schema of perception-and-cognition. Although, within that schema, perception and cognition were apparently opposed, cognition was construed specifically in terms of a perceptual metaphor, described by Dewey (1930) as a spectator theory of knowledge. The problem of cognition, within this schema, arises because the knower is external to what is known, and hence knowing could involve nothing but a relation of correspondence as re-presentation:

> ... the correspondence consists in the fact that the terms in one order are related to one another as the terms or members of the other order are connected within themselves. The correspondence is like that of various phonographic records to one another; but the genuine correspondence of life and mind with nature is like the correspondence of two persons who "correspond" in order to learn each one of the acts, ideas and intents of the

> other one, in such ways as to modify one's own intents, ideas and acts, and to substitute partaking in a common and inclusive situation for separate and independent performances. If the organism merely repeats in the series of its own self-enclosed acts the order already given without, death speedily closes its career. ... Yet all schemes of psycho-physical parallelism, traditional theories of truth as correspondence, etc., ... first make a division where none exists, and then resort to an artifice to restore the connection which has been willfully destroyed. (Dewey, 1958 p. 282)

The organism exists only by virtue of its existence in, and relation to, an environment. It is not–*and could never have been*– "a mere looker-on" (James, 1920, p. 67). And this is why we should no longer be bothered by the problem of cognition. As Dewey (1917) put it, this apparently general problem only arises "because it is assumed there is a knower in general, who is outside of the world to be known, and who is defined in terms antithetical to the traits of the world" (pp. 33-34). The implication of Dewey's insight, however, is precisely that we should *not* try to find an alternative, non-cognitivist, metaphor or general model of cognition, not even one based, say, on a monolithic notion of "action." Rather, psychologists and indeed philosophers need to address the manifest diversity of activities and modes of relations that exist between organisms and their environments. After all, life really *is* complicated, and psychology might begin to become a more sensible science once we take note of that fact.

Conclusion

Gibson was a long-standing and radical critic of the pretensions of "scientific psychology." He challenged its commitment to representationalism and questioned its largely implicit retention of mechanistic behaviorism. But Gibson was also an active contributor to scientific psychology both as a theorist and a researcher. In this chapter, I have considered Gibson's work as a reaction to the ancient schema of perception and cognition. According to that schema, perception is supposed to be bodily, mechanical, and meaningless, whereas cognition is non-bodily, active, and the source of meaning. Gibson regarded his own work as a contribution to the theory of "cognition." He claimed that perception should be regarded as a mode of "direct cognition," providing meaningful knowledge about the world. In addition, he began to develop a theory of "indirect cognition," that is, socially mediated modes of knowing based on shared representational practices. Yet, by framing his own work in the traditional terminology of perception and cognition, Gibson not only failed to distance himself from a very ancient schema, but thereby underplayed the importance of activity in his later theorizing.

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Endnotes

[1]Surprisingly, Descartes, despite his general commitment to mind-body dualism, was an exception in this regard, and treated perception as having a hybrid status bridging the mind-body divide.

[2]Perception, within this schema, is not itself a form of knowing, and hence can be regarded as a purely mechanical process.

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Commentary on Costall

Vicki L. Lee

This commentary elaborates two assertions implied by Costall's arguments: First, the traditionally-accepted foundations of psychology are mistaken. Second, "a more sensible science" of psychology should explicitly concern organism-environment relations.

Conceptual Foundations

What are the traditionally-accepted foundations of psychology? They are expressed by words borrowed from English and presumed to identify the subject matter of psychology. Psychology is about the entities that seem to be designated by *perception*, *cognition*, *consciousness*, and other such words, and about the processes apparently designated by *learning*, *remembering*, *thinking*, and other such words. These words give psychology its research agenda, for example: What is consciousness? What causes people to forget? How many types of intelligence are there?

These conceptual foundations depend on a mistaken understanding of the borrowed words. The mistake is discussed by many writers (e.g., Coulter, 1979, 1982; Deitz, 1986; Deitz & Arrington, 1984; Harzem, 1986; Kagan, 1992, pp. 18-23; Lee, 1986; Malcolm, 1970, 1971, 1978; Ryle, 1949/1963; Skinner, 1989). It is to treat these words as designating a "middle-ground" between brain and conduct (Coulter, 1982, p. 3). This conceptual nervous system is presumed to consist of attention, cognition, memory, personality, and other such psychological entities.

Acceptance of the conceptual nervous system implies acceptance of the assumption that psychological nouns, such as *intelligence*, *emotion*, and *cognition*, name things, just as *dog*, *cat*, and *door* name things. We can define *book*, *cup*, and other such nouns ostensively, by uttering them while pointing to the named objects. However, we can point to no single thing when we attempt to define, for example, *mind*. *Mind*, *cognition*, *intelligence*, and other such words must therefore name something inside the body that we cannot see, and, thus, psychology has its (apparent) subject matter.

Let us return to ordinary usages of *mind*. We find diverse expressions, such as *Mind the step*, *Mind your manners*, and *What's on your mind*? When used in conversational contexts, such expressions are readily paraphrased. For example, *the man has lost his mind* might become *the man is acting unwisely*. These paraphrases suggest that ordinary usage of such words concerns what people do. *Do* means to complete something, to have some effect, or to bring about a result.

If the psychological nouns do not designate psychological entities distinct from the things people do, then perhaps other words do. Let us replace *memory* with *remembering*, *thought* with *thinking*, and so on. However, these words also present difficulties when presumed to be easily definable. Ostensive definitions are given by uttering a term while pointing to its referent, and nominal definitions are given by providing equivalent words. If I say Geoff is thinking of buying a car, what am I saying? Am I saying Geoff is likely to buy a car, or spending time visiting car yards, or listing the costs and benefits of buying a car instead of a boat, or something else? In conversational English, *thinking* is usually combined with other words, and the resulting expressions have multiple interpretations, as in the above example. When we talk with these expressions, we talk about the things people do, but our utterances do not specify which events we are talking about. Instead, what we say covers loosely-defined sets of the things that people do, such that what we say does not have a one-to-one correspondence to events to which we can point unambiguously.

There are other words to consider. We can transform the psychological nouns into adjectives and the adjectives into adverbs. Schafer (1976) recommended these transformations as a way to overcome the puzzles created by the psychological nouns (see Lee, 1988, for a review; see Delprato, "Converging Movements in Psychology," this volume). For example, *consciousness* becomes *a conscious person*, which becomes *acting consciously*, and *mind* becomes *a mindful person*, which becomes *acting mindfully*. Adverbial forms make explicit the judgments otherwise less readily noticed. For example, *acting intelligently* (and, hence, *intelligent person*, and *intelligence*) suggests approval; *acting stupidly* (and, hence, *stupid person* and *stupidity*) suggests disapproval; and so forth. Compared to the nouns and adjectives, adverbial forms (e.g., *acting intelligently*) are obviously about what people do, including the relations among the things people do (*pay a debt by posting a check*, *cool the room by opening a window*, etc.). The adverbial forms return us to the action vocabulary of English, but that vocabulary still does not identify unambiguously-available units.

Consider the action of making a computer screen flash by pressing a button. Imagine we want to collect the data required to create a visual reconstruction of what an observer sees when observing this action. It turns out we need data that represent (a) movements of body parts in relation to each other and in relation to the button *and* (b) the results effected by the individual at the button and at the screen. Without both types of data, we cannot visually reconstruct what an observer sees. Actions extend across these two nested domains of discrete and recurring particulars, as now explained.

Movements of body parts in relation to each other (e.g., flexion around the elbow joint) and in relation to external objects comprise one domain. Continuing with the example of button pressing, many different motions of various body parts could depress a button, such that the full range of possibilities probably cannot be specified. Any one specific type of motion, such as flexion around the elbow joint, is a discrete and recurring particular that might or might not occur when a button is depressed. The actual motions of the body that occur before, during, and after each button depression are built from such particulars. These motions are observed by observing the body segments and how they change in relation to each other. The observed events can be represented by using movement notation (e.g., Jacobs et al., 1988; Pellis, 1981; Whishaw, Pellis, & Gorny, 1992).

The results, effects, or changes that individuals bring about to various objects comprise the core of the other domain. The present examples are depressions of the button and flashes of the screen. These events are seen by observing the button or the screen and watching for particular changes in a particular object that depend on a particular individual. The resulting data represent the points in time at which each such change occurs.

Instead of leading to detailed investigation of movements and the effects of movements, in psychology, questions about actions more commonly prompt research that leads to conclusions about the conceptual nervous system. This arises because any action (e.g., posting a letter) can be discussed using every one of the psychological nouns, verbs, and adjectives. For example, how does *cognition* bear on this action of posting a letter? How is the location of the post box *remembered*? Why is the person *motivated* to post the letter? These questions have more appeal than questions about movements and effects. They yield psychologies of cognition, motivation, learning, and so on. Each such psychology is pursued relatively independently of the others. Then it is realized that cognition omits learning, perception omits social factors, and so on. The resulting proliferation of psychologies is endless. In these psychologies, the consensible particulars available for observation and conceptualization (i.e., movements and results) are obscured by action categories (e.g., lever pressing), which are interpreted as evidence of a conceptual nervous system.

Costall alludes to reasons why psychology does not have a theory of the consensible particulars from which reliable data can be collected, as opposed to a theory of the conceptual nervous system. Psychologists typically collect small sets of data from the actions of many individuals, average these data across individuals, and use the averages to test hypotheses about the conceptual nervous system. A psychology grounded in reified words, for instance, *memory*, *attention*, and *cognition*, requires only this data-sparse approach. The details of movements and of the relations among the effects of movements seem of little interest in this context. McDowell (1990) muses at this self-declared science of nonmaterial processes.

Organism-Environment Relations

Costall speaks of a psychology of organism-environment relations. Psychology's subject matter does emerge when humans (or animals) relate to objects and media outside their own bodies, which they inevitably do. But that does not mean psychology's subject matter is well-described as human-environment relations. Walker (1942) said psychology needs "concepts which will picture the organism and the environment united in a single event" (p. 584). Talking of organism-environment relations only restates this problem. Walker (1942) also said this: "[B]odily movements have always been the concern of the physiologist; the effects of bodily movements have been the concern of the psychologist" (p. 575). Examining this distinction assists in clarifying the problem of relating organism to environment.

Consider flexion of the elbow. This is a motion of body parts in relation to each other, describable with the language of functional anatomy. However, the changed position of the lower arm relative to the upper arm is also a result of effort, of interest to psychology. If this result is specified, for example, as the hand entering an area defined with reference to a point on the shoulder, then it is a consensible particular. Considered generically, such a particular has as constituents (a) the physical efforts of parts of a human body and (b) the other body parts that are sensitive to those efforts. Extending out from such a result are other results, which also depend ultimately on effort, such as changes in the up-down state of a button. Considered generically, such results have as constituents (a) the forces exerted on an object located outside a human body by parts of a human body, (b) the objects that are sensitive to those forces, and (c) the relevant body parts and bodily activities. Extending out further from the body are other results (e.g., changes in the on-off state of a computer screen) that depend on the immediate results of effort (e.g., button depression). The results of human effort that occur beyond the body (e.g., screen flashes) have as constituents one or more causally related objects (e.g., screen) *and* the body parts (e.g., arm) that bring about the immediate results of bodily effort *and* the bodily efforts that move them (e.g., muscular contractions).

All these results exemplify human control of objects ultimately, though never exclusively, by bodily effort (e.g., muscular contractions). Control of objects can occur at various body parts *and* can extend to objects located beyond the boundaries of the body, depending on (a) the physical capacity of the body to change the available objects, (b) the available objects, and (c) the causal linkages among the available objects.

Many of the results of human effort meet Walker's (1942) aim of bringing organism and environment together in a single event. This is *not* a restatement of the belief that psychology's subject matter comprises organism-environment relations. Rather, it shifts the focus from (a) the organism to (b) the results that human effort achieves. This is a temporally- and spatially-distributed subject matter that depends on the physical efforts of a human body, but it is not the same as those physical efforts even though those efforts are among the constituents of its basic particulars. This subject matter also depends on the sensory effects both of motions of the body and of changes effected by an individual at various objects, but that is beyond the present scope. Detailed discussion about overcoming organism-environment dualism by concentrating on the results of effort can be found in articles by Järvilehto (e.g., 1998, 2000).

This subject matter, which consists of the results of effort, is grounded in the body *and* much of it is observed by looking beyond the body. It is accurately conceptualized neither as bodily activities, as studied by physiologists and others, nor as a conceptual nervous system inside the body. Part of it is found at the interface of bodily effort and of whatever bodily effort immediately changes *and* it extends out as far as it is supported by subsequent causal linkages. Kantor long ago identified the problem this subject matter presents to psychologists. Instead of working out in detail what they observe, psychologists have rushed in to build a science based largely on what Kantor (1924) called "folklore thinking" (p. 31). To work out in detail what we observe requires psychologists to study, in Kantor's (1924) words, "the logical background of psychological science" (p. 32). That includes giving up abstract nouns, such as "cognition," "intelligence," and "learning," and working out how to talk literally and concretely about what we observe. Perhaps then Costall's hope for a more sensible psychology might have some chance of being realized.

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Chapter 9

The Narrative Turn in Social Psychology

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Introduced by J. R. Kantor in the 1920s, the concept of *reactional biography*, although weighty with implications for a more complete science of psychology, was left untilled and neglected until the 1970s. Even with the behaviorist-tinged "reactional" as a modifier, "biography" as a working metaphor remained undeveloped as a feature of theory building, perhaps because it appeared to have been borrowed from soft literary rather than hard scientific sources. To be sure, the case history form of biography had become a standard procedure in the clinical arts, but it failed to serve as a central feature in systematic psychology. The "reactional biography" concept re-emerged when psychologists borrowed narrative concepts from the field of literary studies. Subsequently, some personality and social psychologists, for example, Bruner (1986), Gergen and Gergen (1986), and McAdams (1985), began to employ a fresh set of constructions, among them, "self-narrative," "life-narrative," and "identity."

The increasing use of narrative conceptions in the 1980s and 1990s arose from shifts in psychological theory occasioned by the poverty of positivist approaches to guide research and theory (for a sampling of articles and books that reflects the narrative turn, see Bruner, 1986; Gergen & Gergen, 1986; Hermans & Kempen, 1993; Howard, 1989; MacIntyre, 1981; McAdams, 1985; Mishler, 1986; Polkinghorne, 1988; Sarbin, 1986; Spence, 1982). The narrative turn appears to have been stimulated by efforts to cure the often-cited malaise in social psychology. Elms (1975) had identified the doldrums in social psychology as a crisis. The grand theories of the 1950s and 1960s—consistency theory, for example—had been reduced to narrowly defined efforts. In part, this was because attempts at experimental verification had resulted primarily in significant interaction effects associated with the experimental situation and few significant main effects. The claim for law-like social processes was further weakened when the inclusion of women and minorities in research designs had the unexpected consequence of pointing out the major influences of cultural variables. "Social psychologists were forced to reconsider the generality of their narrowly based findings, as well as their own biases in interpreting and applying those findings" (Elms, 1975, p. 971). To compound matters, social psychologists were unable to argue that the crisis was a matter of a paradigm shift in the Kuhnian sense (Kuhn, 1972) because there was no evidence of an overarching paradigm. The dissatisfaction with conventional theory-building and with research designs that eliminated historical and cultural contexts prepared the way for a shift in approach and for the corresponding search for a root metaphor that was more satisfying than metaphors drawn from the prevailing reliance on a positivist ontology and epistemology.

In the past 20 years, the shift has been reflected in the choice of metaphors to describe and explain human action. A refiguration has taken place. Instead of continuing to rely on force, energy, and machine metaphors borrowed from the natural sciences, psychology and other social sciences are now borrowing freely from humanistic studies, among them, drama, rhetoric, hermeneutics, game-playing, and narrative. The concept of narrative, in particular, was adopted from literary studies as a useful way of representing the actions of persons in concrete situations. Studies of narrative as a form of representation have served as preliminary to construing narrative as a root metaphor and thus assign narrative an ontological status, that is, we live in a story-shaped world.

In the following, we first discuss the root metaphor method outlined by Pepper (1942). Our aim is to make a case that psychologists replace the world view of mechanism with the world view of contextualism, the root metaphor of which is the *historical act*. In so doing, we claim that narrative is a refinement of this root metaphor and opens more avenues for social psychological analysis. Second, we describe a precedent to the development of the narrative turn: the entry of social constructionism into social psychological analysis. Third, we discuss the narrative approach to understanding human action. And fourth, we provide an illustrative narrative analysis of identity.

Contextualism

Having referred to the "root metaphor" in our argument, we briefly sketch the root metaphor concept as advanced in Pepper's (1942) *World Hypotheses*. Pepper traced the history of metaphysics and concluded that any metaphysical posture, or world hypothesis, is derived from a basic root metaphor. The root metaphor constrains the kind of philosophical or scientific models applied to observing and classifying or interpreting and explaining behavior.

Pepper identified four types of "relatively adequate" world views, two of which, mechanism and contextualism, are pertinent to the present discussion. However, the other two world views, formism and organicism, also have their practitioners. Formists, who follow in the footsteps of Plato, see the world as made up of transcendental forms. Organicists–among them, some developmental psychologists–construe human beings as evolving through built-in stages of maturation by which fragmented features become organized into a final unity (e.g., Chandler, 1993).

Mechanism, however, is the dominant world view in Western civilization. The world is often characterized as a billiard ball universe. The root metaphor of mechanism is the machine, characterized as the transmittal of forces which, in psychology, is translated into the search for *causes* of behavior. Modern science and the notion of the transmittal of forces are virtually coterminous. From the time that psychology became a scholarly discipline, seeking independence from philosophy, the structure of psychological science has evolved from this root metaphor. To confirm this conclusion, one need only review a sampling of papers in the standard psychological journals. The search for causal entities is central, whether the locus of causality is in the mechanisms of the mind, the brain, or the environment. Mechanistic systems have one drawback, however. The conduct of persons, purportedly the subject matter of psychological science, is construed as machine-like actions. The person is seen as without agency, without the power to make choices or to have intentions or purposes.

Contextualism, a competing world view, is reflected in the writings of such historical figures as James (1890), Dewey (1929), and Mead (1934). The root metaphor of contextualism is the historical act, not as an event in the past, but as an event alive and in the present. Pepper described this root metaphor as the dynamic dramatic act. The imagery called out by the metaphor of the historical act is that of an ongoing texture of multiply elaborated actions, each leading to others, each being influenced by collateral episodes, and by the efforts of multiple agents who engage in actions to satisfy their needs and meet their obligations. Contained in the metaphor is the idea of constant change in the structure of situations and in the positions occupied by actors.

The proposal has been advanced that "narrative" might be an equally felicitous term to denote as the root metaphor for contextualism (Sarbin, 1986). Unpacking the meanings of "historical act" leads to the conclusion that "narrative" and "historical act" have approximately the same semantic structure. Contained in the adjective "historical" are the meanings of the noun "history." The historian, like the novelist, *renders* a story from always incomplete data. Both novelists and historians are narrativists, differing only in emphasis. The novelist tells stories about fictional characters in a context of real world settings; the historian writes about presumably actual events, populated by reconstructed people, the reconstruction being carried out through the interpretive *rendering* of historical records. Both kinds of narrativists make use of "facts" and, importantly, of constructed categories and plots to make the facts cohere. The foregoing comments are consistent with the claim that the three constructions, "historical act," "narrative," and "reactional biography," are cut from the same cloth.

Bruner (1986) contributed to the refiguration of psychological science by pointing to the distinction between paradigmatic and narrative modes of "doing" psychology. The practitioners of the paradigmatic are guided by the world view of mechanism. They rely on quantification and direct their efforts toward discovering laws, invariance, and universal principles. The practitioners of the narrative, in contrast, are patently contextual. They rely on the analysis of discourse, look for verisimilitude, and regard change and novelty as fundamental categories. Methodologically, paradigmatic researchers cast nets. They look for universals and focus on specimens, recognizing that generalizations can apply only in a bounded time and space (Runkel, 1990). The paradigmatic researchers' criterion of truth is correspondence with "reality"; narrativists' criterion is coherence in the sense that the stories that are told hang together internally and are also consistent with stories that are lived (see Pepper, 1942, pp. 275-279, on qualitative confirmation as one of pragmatism's operational theories of truth). This criterion of coherence stems from the pragmatism of Dewey, James, and Mead. Consistent with pragmatism is the relativism inherent in truth claims. The coherence of the narrative does not satisfy claims to universality or invariance, but to concurrent socially constructed standards of intelligibility.

Bruner's distinction is far reaching and prepares the way to entertain the proposition that narrative is more than an alternate way of representing the world. If we accept the claim that narrative is an apt root metaphor for contextualism, then we can extend its meaning, namely, that narrative is a significant feature of our ontology. The reframing of narrative from its historical function as a mode of representation to a focus on ontological status has occurred in a number of disciplines besides psychology, for example, in law (Jackson, 1996), anthropology (Turner, 1974), and feminist studies (Gergen & Davis, 1997). Prior to this reframing, most writers regarded narrative as no more than a form of literary representation imposed on the unorganized nature of social life. This characterization is fast giving way to a more fundamental construal—that social conduct is *storied*—thus assigning ontological status to narrative as a fundamental condition of social life.

Social Constructionism

An important antecedent development to the narrative as an ontological condition of social life is the epistemological perspective known as social constructionism. This perspective is well-established within the discipline of sociology, building on the foundations laid down by Mannheim (1936), Schutz (1967), and especially by Berger and Luckman (1967) in their *Social Construction of Reality*. In this framework, social phenomena are not given in the world, but are constructed, negotiated, reformed, and organized by people in their efforts to make intelligible the occurrences that surround them. The work of urban sociologists associated with the University of Chicago in the 1920s and 1930s, among them, W. I. Thomas, gave additional impetus to the claim that the phenomena of everyday life are socially constructed. Thomas (1923) enunciated the aphorism that served as a guiding principle for several generations of social scientists: "If men define situations as real, they are real in their consequences" (p. 42). More recently, a wealth of empirical studies has flowed from the adoption of *ethnomethodology*, a set of research practices that focuses on detailed observations in field settings to describe social behavior in everyday life from the viewpoint of the group members under study. Currently, the social constructionist perspective has been adopted by a large variety of social scientists (see, e.g., Nencel & Pels, 1991; Sarbin & Kitsuse, 1993).

These developments in the neighboring discipline of sociology at first had little impact on social psychological theorizing. The historical figures in psychological science had provided no contexts for building theories that centered on *meanings* rather than faculties, instincts, drives, traits, and other conceptions that made claims for internal causes of behavior. Noteworthy is the fact that Wilhelm Wundt, the progenitor of scientific psychology, is principally remembered for having adopted laboratory methods that generated data in the positivist tradition (Wundt, 1896). Ironically, psychologists paid little attention to his later ten-volume work, *Völkerpsychologie* (Wundt, 1900-1909), which recognized the postulate central to constructionist theories–that social objects are created in social interaction (Kroger & Scheibe, 1990).

Psychologists, though, have not completely overlooked the problem of meaning. As early as 1932, Bartlett proposed a theory of memory as reconstruction. This was a radical departure from the traditional theory that remembering had to do with pictures in the mind. Bartlett demonstrated that rememberings are constructed and reconstructed under the guidance of social and linguistic contingencies. After lying dormant for many years, Bartlett's constructionist interpretation of remembering was revived and now serves as a foundation for contemporary studies of learning and remembering (see, e.g., Neisser, 1982).

The writings of Mead (1934), especially his commentaries on role-taking, influenced the constructionist formulations of a number of psychologists, for example, Newcomb (1951), Cameron (1947), and Sarbin (1954). Also affecting the efforts of social psychologists were the constructionist accounts of everyday life provided by Goffman (1959) in a series of books and papers, beginning with the *Presentation of Self in Everyday Life*. Central to these efforts was the emphasis on role enactment, a concept that demands attention to historical and cultural influences.

Among psychologists, Gergen has been the most penetrating in making sense of social constructionism as a preferred epistemology for the psychological sciences. In a number of books and papers, he has promulgated a set of propositions outlining the main dimensions of the social constructionist program (see, especially, Gergen, 1994). His central proposition is that we do not experience the world through a set of cognitive categories. Rather the process of "world-making" is linguistic not cognitive. "It is through an a priori commitment to particular forms of language (genres, conventions, speech codes, and so on) that we place boundaries around what we take to be 'the real'" (Gergen, 1994, p. 37). The terms through which we achieve knowledge of the physical and social worlds are social products, created historically and culturally through interactions between and among people. As a consequence, any account of events does not depend exclusively on the "objective" features of the events, but on the contingencies of social process. The intimate relation between social constructionism and language has cleared the way for narrative as the natural form not only for construing the world, but also for making sense of the actions of people with proper names.

The Narrative Approach to Understanding Human Action

A moment's reflection will provide the reader with observations that support the granting of ontological status to narrative. When one examines his or her own phenomenology, the conclusion is compelling: Narrative plots guide thought and action. Consider the ordinary experiences of living a life. Our daydreams and fantasies are storied–the stories have beginnings, middles, and ends, or "the sense of an ending" (Kermode, 1967). Our dreams are experienced and reported as storied sequences, sometimes reported with mythic undertones. The rituals of daily life provide emblematic actions for constructing a narrative. Rites of passage, rites of intensification, and funerary rites are dramatized stories. Narrative plots guide our hopes and fears–projections into the future–as well as constructed rememberings of the past. Survival in a world of socially constructed meanings is problematic for persons unskilled in making up and interpreting stories about interweaving lives.

The readiness to emplot actions into a narrative structure has been repeatedly demonstrated. The now classic experiments of Michotte (1946/1963) and Heider and Simmel (1944) are exemplary. In both, the experimenters constructed films of apparently random movements of little rectangles and circles. Viewers of the films emplotted the meaningless movements of the figures into recognizable narrative plots. The viewers tended to agree on the personal qualities of the constructed characters in the stories. The observation that some of the observers laughed at the projected antics of the geometrical figures suggested that they had emplotted the narrative as comedy. In this connection, Mishler (1986) has remarked, "That stories appear so often supports the view...that narratives are one of the natural cognitive and linguistic forms through which individuals attempt to order, organize, and express meaning" (p. 106). Observed universally, the readiness to emplot sequences of human events into recognizable stories has been labeled the narratory principle (Sarbin, 1986).

The growing corpus of research on narrative is of two kinds: textual and contextual. The focus of textual research is on variables that, for example, dissect children's storytelling into its linguistic elements (see, e.g., Mandler, 1984). Contextual research, in contrast, focuses on the functions of stories, for example, on how they serve as templates for social perception and as guides for action. Our interest is in the contextual analysis of narrative, explicitly recognizing the contributions of textual analysis to understanding the narratory principle, the readiness to organize random text into emplotted narratives.

Although lip service has been paid to the necessity of studying behavior in context, the standard universalistic theories of social psychology that stimulated laboratory experiments precluded any serious attention to historical and cultural contexts. This lack of attention to contexts often resulted in limited or trivial generalizations. In a seminal paper, "Social Psychology as History," Gergen (1973) advanced the argument that theories of personality and social psychology are reflections of concurrent history. He pointed to a feedback loop from the promulgation of social science studies to the public that provides the pool of subjects for the next wave of scientific studies. Publicizing the results of such studies in textbooks, in the media, and in film may influence the values and attitudes of potential subjects for scientific study. He cites as an example the conduct of a subject who has learned that “field independent” behavior is somehow superior to “field dependent” behavior. Such information may influence the responses given to research instruments that presumably assess such characteristics.

During the complex process of acquiring knowledge about the influence of membership in historical, cultural, social, and familial groups on social behavior—the central mission of social psychology—psychologists unwittingly communicate their cultural and personal values. In the typical experiment, two types of communications are offered to the subject: (a) explicit statements about beliefs, values, and attitudes, which the subject endorses or rejects, and (b) tacit prescriptions of conduct, indications of what kinds of responses are more desirable. Although aware that their communications may contain tacit prescriptions, experimenters generally have not been able to control for them. Gergen (1973) notes the potential evaluative significance of widely-used variables, for instance, “Most of us would feel insulted if characterized as low in self-esteem, high in approval seeking, cognitively undifferentiated, authoritarian, anal compulsive, field dependent, or close-minded” (p. 21).

Metapsychology of Social Psychology

The argument that social psychology is history is supported by an examination of the metapsychology of social psychologists in the context of political ideology. The concept of individualism, for example, is an ideology that has guided the destiny of America and perhaps other Western industrial nations. Individualism emphasizes the self in the present and minimizes connections with the past and the future. From such a perspective, social psychologists could go about their work with little attention to the historical context. The commitment to ideological individualism has guided the research and theoretical activities of psychologists. American social psychologists are “children of Hobbes” (Lynn & Oldenquist, 1984). The “hyperindividualism” of American social psychology is reflected in the insistence on methods that partition the experimenter from the subject, in the Hobbesian assumption that human nature is primarily egoistic, and in the reluctance to incorporate into their methods and theories the collectivism of the neighboring disciplines of sociology and anthropology.

To show psychologists’ disinclination to construe conduct as historical acts and the avoidance of a contextualist world view, we review the conclusions of an exercise carried out by Rosenberg and Gara (1983). They obtained judgments of experts in personality and social psychology to identify the theoretical and methodological structure of the discipline. The experts sorted 61 individuals who had been nominated as important in the history of psychology. Multidimensional scaling of the sortings disclosed two orthogonal dimensions: (a) internal v. external determinants and (b) holistic v. atomistic perspective. The resulting configuration was plotted into four cells. The cell for internal determinants and holistic perspective contained the great names of psychiatry: Freud, Adler, Jung, and Horney, among others. The cell for internal determinants and atomistic perspective included such luminaries as Galton, Thurstone, and Cattell, scientists who employed sophisticated mathematical procedures in efforts to isolate the dimensions of the mind. The cell for external determinants and atomistic perspective contained the well-known mid-20th century leaders in the field of social and personality psychology, for instance, Allport, Bandura, Lewin, and Mischel. The fourth cell, external determinants and holistic perspective, is virtually empty save for two entries–Mead and Cooley, who were leading contributors to sociological theory. Rosenberg and Gara (1983) describe the near-empty cell as "the study of the individual in his or her natural surroundings, in context, in the culture, and in historical time–the individual and his or her context are inseparable" (p. 71). They might well have added to their description the concern with "meaning," a topic not found in the work of psychologists located in the other three cells.

The search for external determinants of conduct guided by a holistic, synthetic framework reflects the adoption of a contextualist world view. The other three cells reflect various forms of the mechanistic world view. Parenthetically, had Kantor been included in the individuals to be rated, given the description of the fourth cell, he would undoubtedly have been included with Mead and Cooley.

A critic might argue that the search for external determinants directed by a holistic perspective is properly in the province of sociology, thus excusing social psychologists from the burdensome task of taking into account history, politics, economics, and cultural forms, as well as kinship and family structures. Sarason (1981) addressed this issue directly:

> Built into psychology, part of its world view, is the polarity man *and* society. Call it a polarity or a dichotomy or even a distinction, it makes it easy for psychology to focus on one and ignore the other, to avoid dealing with the possibility that the distinction is arbitrary and misleading, that it does violence to the fact that from the moment of birth the individual organism is a social organism, that social means embeddedness in patterned relationships rooted, among other things, in a social history and a distinctive physical environment. (p. 175)

To follow the implications of the metapsychology represented by Mead and Cooley (and Kantor), social psychologists would have to abandon the impoverished setting of the laboratory and instead employ biographical and ethnographic methods to bring to the fore the full context of action, including the relations between and among actors. Narrative analytic techniques (e.g., McAdams, 1985) are available as research methodologies, but the rhetoric of science also changes in narrative research (Mishler, 1986). Instead of the search for causes with its reliance on quantification and passive voice, the search is for *reasons* with its emphasis on personal agency. The primary objective is the search for the intelligibility of narrative formulations. The concern is with the plausibility of the interpretation of a narrative and a search for alternative interpretations to answer questions about the representativeness, reactivity, reliability, and replicability of the interpretation (Katz, 1983). Being an agent, though, should not be interpreted as the actions of an encapsulated individual. In the search for intelligibility, the person as agent is always in a field of relationships.

The Narrative Construction of Identity

To further the discussion, we have selected the narrative construction of identity to elaborate the narrative turn in social psychology. More than any other subdiscipline, social psychology has been concerned with self and identity (Scheibe, 1993). The phrase "the narrative construction of identity" is, however, only partially satisfactory as a descriptor because it carries the connotation of precise manipulation of materials such as practiced by architects and carpenters. A more apt metaphor is "the poetics of identity." "Poetics" is a word that calls up images of a person creating, shaping, and molding multidimensioned stories. The use of "poetics" also reminds us that stories, in the main, are fashioned by means of spoken and written language. At the same time, we are reminded that stories are the stuff of discourse and are thus inevitably rhetorical, that is, they serve strategic purposes.

Conventional psychologists have tried to trace the sources of identity to factors, traits, motives, and similar internal categories. This is in the tradition of positivist science. Conceptually, these categories have a proximal relation to identity formation; they are perceived as lying within the actor. Narratives, in contrast, may be thought of as distal—the time frame of an influencing narrative may be the recent past or may go back hundreds of years. Such narratives may reflect mythic themes that are unbounded by conventional time and space frameworks.

Most discussions of identity formation begin from the observation that 19th century psychological conceptions of self were formed on the model of the unitary soul, a formist construction that had been a commonplace abstraction for many centuries. In the early part of the 20th century, Mead and Cooley, following the lead of James, articulated constructions that centered on a social dimension for self reference. Central to their contributions was the claim that the self was generated in social life. Their writings, however, had little effect on the work of early psychologists who were guided by Cartesian mentalist constructions, including the postulate that the unitary self developed independently of its social context. When scholars saw the merits in a social constructionist position, they could then fashion conceptions of self-reference from inferences arising from social interaction. This realization paved the way for the development of theories of social identity, especially the theory that identities emerge in the emplotment of self-involving narratives (Sarbin & Scheibe, 1983; Tajfel, 1982).

From the standpoint of a social constructionist, a person's identity is comprised of voiced and unvoiced answers to the mute but ever present question: "*Who am I?*" A moment's reflection on this premise leads to the inference that the form of the answer is dictated by the social context, by the usually unvoiced answers to the reciprocal question: "*Who are you*?" Thus, identity cannot be divorced from social relationships. One's identity, then, is not invariant but a poetical construction that places an actor in a role set. Identity is a concurrent product of social relationships. For simplicity and brevity, we define identity as the composite of answers that an actor constructs to the "*Who am I*" questions. Implicit is the caveat that the answers are always context-dependent, and therefore changing as contexts change. If the context, for example, includes the presence of a man and a woman, then the actors would locate each other on the superordinate construct of gender. The voiced and unvoiced answers to the "*Who am I*" questions, then, would reflect gender identity.

We emphasize that one's identity is a construction that arises in dialogic interaction. This conception is useful in the context of story making and story telling. Identity as the outcome of dialogue helps to clarify and to give body to a central feature of narrative psychology, to wit, that self-narratives are the products of interactions with others. Contrary to the implications of a monological view of self, one's identity is fashioned in the narrative construction and reconstruction of encounters with others, including muted dialogues with imagined others.

The answers to the ever-present "*Who am I*" question are most often rendered in the vocabulary of social roles. We can paraphrase James' (1890) statement that "a man has as many social selves as there are individuals who recognize him and carry an image of him in their mind" (p. 294) and assert that a person has as many identities as social roles. Every human actor enacts multiple roles. A person could legitimately claim to being a woman, a mother, a daughter, a psychologist, a Unitarian, an African-American, a Republican, and a Little League coach. So, one may speak of, for instance, gender identity, religious identity, and ethnic and national identity. Thus, a person is involved in multiple identity-forming self-narratives, some operating synergistically, some at cross purposes. Some identities are also pre-emptive, assigning to a particular role a special over-riding status.

How do people acquire skill in using narrative syntax in the course of their participation in social life? The answer would follow from involvement in stories heard, stories read, stories lived. Observations of infants and young children make clear that the actions denoted by adults as features of emotional life, for example, are socially constructed texts rather than patterns of action that are products of evolutionary design (Mancuso & Sarbin, 1998). A review of recent literature makes clear that young infants are capable of information seeking. As caretakers respond to motoric actions initiated by the infant, sequences of communications are established. Such sequences become the elements of narrative syntax (Fogel, 1993).

Consistent with the view that we live in a story-shaped world and that survival depends on skills in interpreting the storied actions of others, we propose the thesis that as children elaborate their knowledge of the social construction, *story*, they become more adept at constructing narratives about social life. Young infants, of course, do not tell stories. However, they are capable of participating in sequences of actions with dialogue partners that are contingent upon temporal ordering. These conversations, or protonarratives, have the basic structure of narrative save for the use of speech. Peek-a-boo play is an example. The fundamental element of a spoken narrative is the temporal ordering of two clauses, as in "I heard a gunshot" and "then the police arrived." Practice in the use of this a-then-b formula in the early conversation of gestures prepares the child for later narrative competence. Almost forgotten is that Mead (1934)–the progenitor of role theory–anticipated current descriptions of mother and infant interactions when he wrote detailed accounts of the conversation of gestures. The early conversation and the later telling a story reflect the operation of the narratory principle.

When this narrative give-and-take is carried on by the self, we have a multi-voiced dialogical self (Hermans, 1996). This construction pays attention to the simultaneous existence within the self of distinct, interacting voices, some dominant, some undesirable, and some in conflict with others. In the dialogical self, the elements function in a relatively autonomous way. "They may agree and disagree, interrogate, criticize even ridicule one another" (Hermans, 1996, p. 42). The elements of the self occupy imaginal positions and are constantly in movement. "From this perspective, a self-narrative is a form of communication (with oneself and others) that may show variations, varying emphases, and significant developments dependent on the actual communicative context in which the story is told and retold" (Hermans, 1996, p. 44). Identity is constructed narratively.

Conclusion

In summary, we noted the surge of interest in narrative as a belated recognition of the theoretical significance of reactional *biographies*. We identified two conditions that appear to have influenced the narrative turn in social psychology. First, we pointed to the "crisis of confidence" in the discipline, a crisis that was attributed to the failure to produce law-like statements, the goal of commitment to a positivist ontology. Seeking more satisfying ways of understanding human action, some psychologists and other social scientists turned away from positivism with its emphasis on mechanistic causality and incorporated into their programs a recognition of the importance of historical and cultural contexts. In so doing, they were consistent with the world view of contextualism with its root metaphor of the historical act. We offered an analysis in which "historical act," "narrative," and "reactional biography" are virtual synonyms.

A second condition for the turn to narrative was the widening influence of social constructionism as a way of creating an ontology. Social constructionism invites new forms of inquiry into the construction of human relationships, rather than the search for correspondence with an *a priori* "reality." Narrative becomes the privileged conception for organizing chaotic text into syntax, concrete events into episodes.

Finally, to illustrate the narrative turn, we discussed the concept of identity as the constructed answers to the ever-present "*Who am I*" question. Such answers flow from variable involvements in role-taking. The form of any role enactment is influenced by stories told, stories read, and stories lived. And stories of any kind are formed and negotiated through gestural and linguistic discourse.

Besides the obvious connection between Kantor's focus on the reactional biography and self-narrative, Kantor was clearly an unlabeled contextualist in his insistence on taking into account cultural features. He anticipated the psychological study of meaning not only in his writings on grammar and linguistics, but also in his insistence on the constructionist distinction between stimulus and stimulus function. Throughout his writings, Kantor insisted on observations of concrete events as the epistemological base for a scientific psychology. But the multitude of concrete social events encountered in everyday life would remain as random text in the absence of the narrative as an organizing principle. Concrete human events become intelligible only when they are guided by the reactional biography and rendered as "episodes" within cultural and historical contexts. Such episodes are potential chapters in an ever-expanding narrative identity.

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We are grateful to John I. Kitsuse for his pointed critique of an earlier version of this chapter. Tom Morrione and Marc Flacks provided us with bibliographic assistance.
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Commentary on Sarbin and Carney

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J. R. Kantor presented, as foremost, a philosophy by which to view science (e.g., Kantor, 1938). He then presented an interbehavioral theory within that philosophy (e.g., Kantor, 1959). The relevance of both to the use of narrative merits attention. The philosophic ground rules that Kantor advanced were clear and strict. Nowadays, owing to less philosophic training and more incentive toward empirical and funding volume, the formulations of research in psychology are more diverse but rarely as exact and disciplined as he would have it.

If anything is "core" in understanding Kantor's ideas, it is the distinction between the event and the construction of the event (e.g., Kantor, 1938). For Kantor, the event is the subject matter of science; events are what scientists observe. Being denotable in time and space, events are available to different observers. Implicit in Kantor's thinking was that events have orderliness; they are amenable to the pursuit of scientific lawfulness. A firewall, so to speak, should be placed between the event and the scientist's construction of it.

The construction of the event, by contrast, is arbitrary; it is the *result* of the scientist's labor. The trip from an event to the construction of the event is, Kantor held, a linear one (i.e., sequential). Observing the event under study is the first step. A representation of the event, made in a protocol, is the second step. The representation may be a paper trail of counts, measures, or verbal description. It may be a photograph, tape recording, tracing, sensor reaction, or the like. Third usually comes the application of logic and mathematics to this protocol record (e.g., statistical description, statistical inference). Fourth comes the scientist's construction of the event. This construction may be a linguistic formulation, a set of propositions, or a mathematical formula or function (i.e., something that can be shared with fellow scientists). Each of these four steps may be viewed as events, each contingent upon the prior ones.

If the progress from an event to the construction of the event has been good, then fellow scientists can replicate the itinerary. This replication attests to the reliability of the observation. The interrelations found among the stimulus objects that comprise the event under study reflect the validity of the observation. The four steps are a story of how scientists do business. How is psychology different from the other sciences? Kantor asserted that science is all an arbitrary division of labor. Psychology chooses for study those events that entail the interaction of the individual with stimulus objects in a time-space field. Other sciences choose other events. For purposes of the present commentary on narrative, the stimulus objects in question, with which the individual interacts, are very often other people across various points of time and loci of space.

Kantor spent much of his life as the scrutinizing hawk of scientific language. He detected and came down upon the carrion, that is, the inappropriate, unnecessary, and logically flawed formulations which were continually offered as “science.” To tell of ways he did this will help provide context to the stance he would take to the use of narrative.

Kantor’s distinction between the event and the scientist’s construction of the event is worth reemphasizing. Not only the initial event but also the steps from the event to its construction must be viewed in the time-space field. Although the event (and its direct observation) is where the story begins, the story may take different turns. That is, different levels of construction of a single event are possible (and likely). Although some of these constructions fail to reach the level of scientific certitude, others are acceptable. Even so, the acceptable ones do not constitute a *true* depiction or *identity* with the originally observed event. In short, from one event may come alternative constructions. Kantor had very little truck with philosophical interpretations external to the publicly shared time-space field. Perhaps “disdain” for them is the more apt term. That is, he discarded such matters as whether the observed event represented (a) a “reality out there,” (b) a transom to absolute truth, (c) a case of each observer dealing solely with his or her own universe of experience, or (d) a case where reality is merely a social construction (an inversion of his proposed four-step train of scientific activity). Instead, Kantor, I believe, was in effect saying, “These are kinds of metaphysical questions up with which I shall not put. People have wasted their time for centuries on such, and I will not do so. Other issues of philosophy are of value (e.g., logics and mathematics), but these are not.”

Kantor was indeed willing to deal with the separation of event and construction of event. And deal with it he did, with vigor. This may be seen in the logical errors he could identify with alacrity in scientific discourse. Let us consider three types: *dualism*, *constructionism*, and *reductionism*.

The first, *dualistic explanation* (e.g., Kantor, 1947), occurs when the scientist posits a universe that is by definition unobservable to explain the observable universe of events. Most prominent among this type of explanation are the mind-body dualisms, that is, the use of mind or a mind-related construct to explain behavior or bodily function. Just as prevalent in psychology, however, are the “latent dualisms” as by followers of John B. Watson in the early 20th century. Electron-proton aggregates of the brain were viewed by them as the ultimate goal by which to explain behavior (Pratt, 1939). In this instance, the latencies are not only dualistic but also reductionistic, as we shall see in a moment. Whether of mind, spirit, or the latent variety, no hypothesis can be tested to confirm directly the unobservable-to-observable link. No observable antecedent anchor point is there. All such explanation is a fouled excursion away from the rich trove of interbehavioral relations, which could indeed be hypothesized and empirically tested within the time-space field. Trained psychologists today, likely the majority of them, espouse dualistic propositions but are unaware of doing so. Such untestable propositions retard the precision and progress of their science.

A second logical error is the *constructionistic error*. Some scientists refuse, even emotionally, to accept their error. Even more so, observers fail to detect the impediment that their linguistic shortcoming creates in enabling progress of knowledge.

Consider, for example, the problematic statement that gravity, as a construct, causes objects in a vacuum to fall toward earth. Such a proposition is so engrained in our language that it is often stoutly defended. The fact is that for ages–before the construct of gravity was ever formulated–objects have fallen toward earth. Finally, someone develops a construct of gravity to describe this event and to generalize across events involving moving bodies. Even a mathematical formula was devised to help the linguistic description pinpoint more precisely the time and space coordinates of the "fall." All such construction came later as a part of the arbitrary work of the scientist. "Gravity" is not a cause of such events but instead is a useful linguistic and mathematic construction that allows a more precise prediction of the earlier to later stages of the "falling" event. While current to the thinking of our time, "gravity" is nevertheless an arbitrary construct. Thus, another alternative construction, likewise arbitrary, may potentially allow even more precise prediction of an even broader range of events. If so, the construct of gravity would be superseded or discarded as a construct. When the scientist has the security-blanket of absolutism in thinking that "gravity" is "causing" the "falling," then the envisioning of any options that could potentially extend our scientific knowledge is precluded.

Other common examples of constructionistic error include the way some observing clinicians build a construct of their client's own phenomenal (subjective) field. A clinician might recklessly propose that this phenomenal (subjective) field of the client, as constructed by the observing clinician, determines what the client will say and do (i.e., her behavior). For some psychologists, it is a bit easier than with gravity to recognize the error. One cannot propose that a construct like phenomenal field determines behavior when the clinician's construct of "phenomenal field" must be defined in terms of the same observed behavior that it is causing! This constructionistic version is commonly recognized as the "circular" argument.

Schizophrenia, as a typological third example, does not cause a person to have hallucinations and delusions. When we ask ourselves how we have operationally defined schizophrenia, we must inevitably admit that it is, at least in part, in terms of these same hallucinations and delusions that schizophrenia is purported to cause. In analyzing this foolish error, it may be of merit to remind the reader of Kantor's emphasis upon the "firewall." The subsequent construction of the event must be kept separate from and not be contaminated with the observation inherent in the initial event under study.

A fourth example is included to show that not all scientific propositions "sucker" people into constructionistic errors. A map does not cause the territory it depicts. Constructionistic fallacies are avoided by simply remembering that our goal in science is to identify the interrelations (interbehaviorism) of events, sometimes in antecedent-consequent or unfolding fashion, and to build constructions of them. A predicate cannot serve at the same time as a definition of and a cause of the subject.

Reductionism is a third common type of flaw in scientific discourse. It assumes that one level of scientific construction causes another level (e.g., Kantor, 1947). Examine the following examples of non-reductionism:

1. Biological variables do not serve as a causal basis (or foundation) for behavior, any more than the reverse;
2. Nuclear or theoretical physics does not provide the basis for all science and for life in general, any more than the opposite; and
3. Psychologists should not view themselves as laying down the foundation on which the more molar sciences of sociology, anthropology, political science, economics, and the like, are built.

To assume that more molecular constructs (with smaller time-space definitional parameters) provide the basis for more molar constructs is commonly called *the error of reductionism*. Indeed, some events in science are better explained by "parsing" or reducing the size of the unit construct, but other events in science can be explained only when expanding the size of the construct into a more molar or social collective. Kantor provided a valuable framework for doing interdisciplinary research by removing the "pecking order" among molecular and molar disciplines.

Rarely, one may encounter the logical error of expansionism rather than reductionism (Cantor & Cromwell, 1957). To predict a physical altercation between two people in a barroom, some may argue, requires an assessment of economic or ethnic (i.e., more molar) constructs. Kantor would argue that the logically determined single direction of the arrow of effect is just as invalid as when used in predicting the detonation of an atomic device (more molecular). The empirical observations of the events, not logical prerequisites in direction of cause, are the proper basis for scientific construction. In short, for molecular and molar constructs the arrows go both ways.

Within the framework of these explicit rules "for removing the garbage from science," Kantor was highly permissive and heuristic in the encouragement of alternate types of construction, so long as they can be submitted to scientific scrutiny. Among them, the possibility of narrative, as a way of construction, clearly fits. As Sarbin and Carney so impressively point out, human behavior may be formulated as a story. This story may have powerful implications that other modes of construction do not. As already stated, the four steps Kantor described–from event to construction of event–is a story of the scientific enterprise itself.

Kantor argued that, when people talk to each other, perfect communication can never occur. For each word of each speaker, meaning derives from the reactional biography (the history or personal story) that each has had with the particular word.

These reactional biographies inevitably differ, even for people of identical cultures or twinships (e.g., Kantor, 1959). Sarbin and Carney's assertion that reactional biography should be considered synonymous to narrative and to "historical act" is an astute one. To emphasize and support this point, I suggest that a distinction be made between reactional biography and reactional dictionary. I believe Kantor would have viewed Skinner's notion of "environmental controls" (reinforcers) over behavior as the accumulation of a reactional *dictionary*. In contrast, the reactional *biography* encompasses the transaction between the person and stimulus objects, the unfolding of the story. In contrast to Skinner, the direction of the arrow between the person and the environment goes both ways. Kantor abhorred the unidirectional arrow of environmental control over behavior. To him, Skinner's psychology was exquisite but only "half a psychology."

Another support for the narrative thesis concerns the treatment of the psychiatrically disabled with a nosological typecasting. At its very best, this diagnostic approach for psychopathology (e.g., American Psychiatric Association, 1994) allows the linkage of four domains: (a) historical/antecedent factors, (b) current manifestations of disorder, (c) known treatment or preventive interventions, and (d) dimensions of outcome (prognosis), in an empirically validatable way for groups of people at a time. But those constituent ingredients are seldom, if ever, complete. In the language used above, current psychiatric diagnosis attempts to function by dictionary, not by biography. How exciting it would be to have a formal approach to psychodiagnosis where each person is characterized by this or her own personal story. In the best tradition of Kantor, the story could be interleaved with biologically, physiologically, and socially described happenings; it need not be unidisciplinary. For each individual, the story must spell out for us better interventions, prognoses, and preventions.

Kantor, the ever-vigilant hawk, would not admit the idea of narrative uncritically. Many questions would be raised. Is narrative in the language of individuals observed in the target event distinguished from narrative as a mode of scientific construction of events? Failure to make this distinction would yield unacceptable confusion. Is one allowing alternative constructions (e.g., mechanistic) to compete with the narrative approach, each on its own merits of explanatory power? To have a narrative approach arbitrarily preempt an alternative construction, or vice versa, would represent a philosophical error. Is one being careful in defining the boundary conditions of a narrative construction? Narratives have a beginning, a middle, and an end. You let go of a rock; it falls; it hits the earth. To characterize this as occurring in a vacuum adds context. Thus, the equation for gravity tells a story, and the equal sign is a form of the verb "to be" (Gullberg, 1997, pp. 222-223). When one can pinpoint a landing on the moon, the story becomes even more interesting. In brief, Kantor would applaud narrative constructions of scientific events if indeed they passed muster for absence of dualism and other logical flaws.

Finally, if one is to use the construct of narrative, where is the scientific method for pruning? What criterion would be laid down by which some narrative constructions would be discarded in favor of others with greater scientific utility? Without a pruning hook, a narrative could exist for every person who attempts to describe an event. Scientific knowledge would have no basis to evolve, to cover more events in more accurate ways.

The press to test the limits of narrative construction in psychology is tempting. Each person is playing the leading role in her or his own story and usually wants to know how the story will turn out. Depending on the story, the outcome of interest may be in the next millisecond, the next hour, the next week, the next year, or when the ultimate impact one has on the history of humankind has been completed.

People "love" stories, "love" gossip, "love" to contemplate the solution to a mystery thriller. Child play is the playing out of a story, not a lexicon. That all this starts with the protonarrative of the infant is a well-made point by Sarbin and Carney. Even peekaboo is a story with a beginning, middle, and an end. The parent or caretaker may be seen, then disappear behind a couch, and then reappear. For this to be a predictable rhythm is not so interesting a story for the infant. Unexpected variations in the rhythm (time) and locus (space) of the reappearance evoke the child's laughter. It becomes a more interesting story. By way of supporting and extending Sarbin and Carney's thesis, this context for laughter and other emotion may afford a basis for understanding behavior that would leave behind the arbitrary separation of emotion, cognition, and conation, as used during the last three centuries.

The full story of narrative is yet untold.

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Commentary on Sarbin and Carney

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In "The Narrative Turn in Social Psychology," Sarbin and Carney present a case for the narrative stance as the basis for a systematic social psychology. In the process, they explicitly and implicitly describe some affinities between this stance and J. R. Kantor's interbehaviorism. Among the explicitly stated affinities are a shared ontology–the "historic event" (i.e., Kantor's "reactional biography")–and related emphases on holism-externalism (i.e., field theory), culture (e.g., setting factors), function (contra. form), and the uniqueness of events (i.e., specificity; contra. reified abstractions). Among the implicit affinities are a shared epistemology with respect to the situatedness of meaning (i.e., function), knowing as action (i.e., direct, as opposed to mediated, action), and the context-dependent nature of the self (contra. disembodied individuals).

More generally, Sarbin and Carney place the narrative stance in the traditions of contextualism (Sarbin, 1977, 1993) and social constructionism (e.g., Gergen, 1994), the former being Stephen C. Pepper's (1942, p. 107) referent for philosophical pragmatism (see James, 1907; Peirce, 1940). In related material, they associate the narrative stance with subjectivism; drama, role-taking, and game playing; metaphor, rhetoric, and hermeneutics; biographical, ethnographic, and phenomenological methodologies; and rationalism, qualitative analysis, and a coherence criterion of truth. By way of contrast, they dissociate the narrative stance from objectivism; realism, force, and mechanism; law-like regularities and universals; empirical and positivistic methods; and natural science, quantitative analysis, and a correspondence criterion of truth.

Given the affinities between the narrative stance and interbehavioral psychology, we might assume that this related material was correspondingly associated with and dissociated from interbehavioral psychology. That, however, would attribute to Kantor certain positions that he and some pragmatists did not hold (e.g., Peirce, 1940). Although this point needs to be better parsed, that exercise cannot be accomplished in a mere commentary. However, I shall make several points that bear on Kantor's inclusiveness of natural science, some of the forgoing associations and some dissociations to the contrary.

Sarbin and Carney correctly note that interbehavioral psychology is contextualistic in world view (Gifford & Hayes, 1999; L. J. Hayes, 1993). Contextualism, however, comes in varieties (Hayes, Hayes, Reese, & Sarbin, 1993), which causes confusion among nominal contextualists and critics alike (e.g., Capaldi & Proctor, 1994; Marr, 1993; see Morris, 1993, 1997). For example, Sarbin and Carney suggest that the contextualism associated with the narrative stance is also the contextualism associated with interbehavioral psychology. This implies that interbehavioral psychology denies psychology the status of a natural science, which it does not–and neither need the narrative stance, depending on the meaning of "natural science." This problem can be resolved, in part, albeit with tension, by distinguishing between (a) the defining characteristic of contextualism–its ontology–and (b) a derived characteristic that is freer to vary, depending on context–its epistemology (see, e.g., Zuriff, 1999, on varieties of social constructionism).

As described by Pepper (1942, pp. 232-233), contextualism's ontology is described in terms of root metaphor: the "historic event," that is, action in its historically-situated, ever-changing temporal context. Although interbehavioral psychology eschews foundational metaphors, preferring to address confrontable events, its unit of analysis–the interbehavioral field–is likewise historical (Kantor, 1946, 1959). It represents the strong, dynamic, and reciprocal interaction of functional relations contingent on interbehavioral history. Although the interbehavioral field is an irreducible whole, for analytic purposes, interbehavioral history can be partitioned into the organism's "reactional biography" (i.e., the development of response functions) and the environment's "stimulus evolution." On this account, every interaction between the organism and its environment is an act in a biographical, ever-evolving context. This "historical" assumption is consistent with the narrative stance.

The narrative stance and interbehavioral psychology are, however, seemingly opposed in their epistemologies. As described by Pepper (1942, pp. 270-279), contextualism's truth criterion is one criterion–"successful working." However, successful working is subject to differing meanings that, in turn, beget the varieties of contextualism. Among the most distinctive varieties are the narrative stance and radical behaviorism. In the former, the criterion for successful working is coherence. Here, according to Sarbin and Carney, truth lies in "stories that hang together internally" and that are "consistent with stories that are lived" (see James, 1907; cf. descriptive contextualism; Gifford & Hayes, 1999, pp. 304-306). In radical behaviorism, the criterion for successful working is prediction-and-control (Skinner, 1974; see Peirce, 1905; cf. functional contextualism; Gifford & Hayes, 1999, pp. 306-313). In associating interbehavioral psychology with a coherence criterion, Sarbin and Carney suggest that it is dissociated from prediction-and-control, but it is not (see Kantor, 1953). Rather, interbehavioral psychology allows both meanings of successful working, depending on contexts and constraints. It is not restricted to one or the other.

For example, when interbehavioral psychology seeks to emphasize action in the interbehavioral field from the perspective of individuals and their unique reactional biographies (a context), and prediction-and-control is not possible (a constraint), then an individual's action is "subjectively" related to relatively personal, local, and "experience-near" stimulus functions of the environment for that individual, usually described in ordinary language terms (e.g., Jane finds the classroom's atmosphere "chilly"; see Ruiz, 1998). Under these circumstances, the criterion of successful working is coherence among these biographically-based, ordinary-language descriptions of the environment's stimulus function with (a) the functions of related environments for that individual (e.g., Jane's sense that her workplace has a "glass ceiling") and (b) the functions of this and related environments for other individuals (e.g., Sally's perception that the classroom instructor is dismissive toward women). This is the narrative stance.

In contrast, when interbehavioral psychology seeks to describe action in the interbehavioral field from the perspective of generic functional relations (a different context), and prediction-and-control is possible (lacking this constraint), then the environment's action may be "objectively" related to relatively impersonal, distal, and "experience-far" stimulus functions of the environment for behavior, described in the technical terms of science (e.g., negative reinforcement for operant behavior; see Crosbie, 1998). Under these circumstances, the criterion of successful working is the prediction-and-control of generic—but not essentialist—functional relations. This is the radical behaviorist stance (see Hayes, Hayes, & Reese, 1988; Morris, 1988).

This analysis suggests that contextualism comes in varieties depending on the meanings of successful working. These varieties, however, are not incommensurable. Rather, they are different naturalistic descriptions of the same events made under different circumstances (i.e., contexts and constraints). Neither of them is essentially appearance nor reality, nor is either of them essentially True. They are figure and ground, each necessary for a complete account of an individual's action—action understood both in terms of its content (a "chilly" atmosphere) and its processes (a negative reinforcer), depending on one's province of knowledge (e.g., natural history, natural science).

In comparison with these varieties of contextualism, interbehavioral psychology is more catholic in its epistemology. Although the narrative stance and radical behaviorism may be respectively aligned with but one criterion of truth—coherence and prediction-and-control—interbehavioral psychology encompasses both. This point is overstated, of course, because radical behaviorism (e.g., Skinner, 1945, 1974) has been aligned with several characteristics of the narrative stance, for instance, with hermeneutics (Day, 1988; Dougher, 1993), existentialism (Fallon, 1992; Woolfolk & Sass, 1988), phenomenology (Giorgi, 1975; Kvale & Grenness, 1967), social constructionism (Freeman & Locurto, 1994; Guerin, 1992), feminism (Ruiz, 1995, 1998), and post-structuralism (Andresen, 1990; Miller, 1994).

Where these latter points remain generally unexplored, perhaps due to their "political incorrectness" in science, interbehavioral psychology serves as a corrective. In particular, where psychology evinces (a) parochialness in perspective (e.g., either a coherence or a prediction-and-control criterion of truth, independent of context), (b) prejudices for certain provinces of knowledge (e.g., a natural history of behavioral content vs. a natural science of behavioral processes), and political allegiances with certain "isms" (e.g., cognitivism vs. behaviorism), interbehavioral psychology offers a comprehensive (world view), consistent (coherence), and pragmatic (prediction-and-control) perspective that makes psychology one discipline, one profession–not many. This will be resisted because interbehavioral psychology makes parochialness in perspective one-sided. No one way of knowing (e.g., subjective, objective) provides a complete psychology of the individual (see Delprato, "Converging Movements in Psychology," this volume). It takes prejudices for and against certain provinces of knowledge (e.g., natural history, natural science) as only different perspectives on the same events, each necessary for understanding an individual's action (see Lickliter, this volume). And, it makes the "isms" into false dichotomies, thus psychologizing behaviorism and naturalizing cognitivism (see Costall, this volume).

In doing all this, interbehavioral psychology also destroys the myth of the psychologist as a disembodied individual. Psychologists are situated, context-dependent, non-mediational knowers. This is not an acceptable psychology in the Western tradition, nor is it acceptable to purely subjectivist or objectivist psychologists, or to most behaviorists or cognitivists–at least not yet–at least not until psychology is naturalized within a field-theoretic perspective.

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Chapter 10

Q Methodology and Naturalistic Subjectivity

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... the objectivity of psychological subjectivity remains a minority opinion.
(Observer, 1981, p. 104)

I never had the opportunity to meet J. R. Kantor, but I did have occasion some years ago to correspond with him briefly, at which time he provided a glimpse of the way in which he viewed subjectivity. I had initiated the correspondence in my capacity as editor of *Operant Subjectivity*, a small journal devoted to the works of William Stephenson, inventor of Q methodology, and I had asked Kantor if he would be willing to comment on Stephenson's ideas inasmuch as Stephenson had recently commented on his (Stephenson, 1982; see also 1984, 1987). Kantor declined my invitation due to the press of other obligations, adding that "it is very difficult for me to deal with subjectivity, although no doubt you only mean by that term individual or personality" (personal communication, March 11, 1983).

Kantor's acknowledged difficulty concerning subjectivity was perhaps in part linked to its myriad connotations, but his own position was clear. He referred to subjectivity at the event level not as the opposite of objectivity, but as uniqueness or specificity of occurrence (Kantor, 1982, p. 9). There is behavior and that is all. My headache and my digestion, for instance, are uniquely mine in the sense that no one else is experiencing them, but then no one else at the moment is looking at the screen of my computer terminal either. The singularity of these events makes them no less real, however, and in no way precludes the sciences of neurology, gastroenterology, and optics. It merely means that I am uniquely positioned to respond to events that have the capacity to stimulate.

A naturalistic approach to subjectivity is distinguished by the sharp line that it draws between confrontable events on the one hand and, on the other, those mystical, metaphysical, dualistic, and other non-natural involvements implied by virtually every other use of the term. Among the eight senses of subjectivity listed by Sabini and Silver (1982), for example, only subjectivity connoting *perspective* is obviously free of such associations; Rosaldo (1994) contrasts subjectivity with detachment and ultimately equates it with passion; and Pletsch (1985) refers to "people who cultivate subjectivity" (p. 358), as if subjectivity could respond to husbandry. In virtually all these instances, subjectivity as a concept has been treated as if it were substantive, yet strangely incapable of being confronted in any empirical sense.

In *The Study of Behavior*, Stephenson (1953) explicitly sided with Kantor, Bentley (e.g., 1935), and others in rejecting consciousness as mentalistic. He wished to distinguish consciousness from subjectivity, however, and to divest the latter of its mentalistic connotations so as to reserve it for denoting "the obvious fact that we have self-referent notions" (p. 248), that is, that we all have points of view which we express to others or keep to ourselves. "Subjectivity is behavior," he said, whereas "consciousness ... is something else" (p. 347)[1]; hence, as he later wrote, consciousness should be discarded as mentalistic and replaced with the empiricism of *subjective communicability* (Stephenson, 1968), the latter "in relation to functional-interactional situations" (Stephenson, 1981, p. 37; see also Good, 1998; Midgley & Morris, 2002).

To substantiate his position, Stephenson advanced *Q methodology* as a coherent body of theory, technique, and analysis designed for the study of subjectivity as natural behavior, and it is this possibility of measurement via Q technique that saves Stephenson's position on subjectivity from being just another categorical assertion. The purpose of this chapter is to elucidate some of the main features of Q methodology.

The Operations of Q Methodology

The technical side of Q methodology can be summarized as follows. Individuals in particular contexts enter into communication about all manner of issues, from the brands of toothpaste they purchase to what kinds of therapeutic strategies to employ with depressed patients. The volume of communicability on a topic is referred to as a *concourse* and is collected using note-taking, audio-taping, and other conventional recording procedures. For experimental purposes, a set of statements (called a *Q sample*) is drawn from the concourse and a set of persons (*P set*) is instructed to rank-order (*Q sort*) the Q sample according to a specified *condition of instruction* (e.g., agree/disagree). The resulting Q sorts are submitted to *correlation* and *factor analysis*, the result being natural classes of response.

Q methodology is not a statistical procedure for reading minds or for providing indicators of mental occurrences. Rather, its fundamental data–its "pristine events" (Kantor, 1983, p. 2)–consist of specific individuals operating with the objects in the Q sample and in relation to the field conditions of the concrete situation. The entire procedure is nonetheless subjective from top to bottom. The Q-sample statements are matters of opinion rather than fact, hence subjective in that sense. They are also *self-referential*–not in the sense of the self taking itself as an object of cogitation (Kaplan, 1986), but in the sense that any assertion implicates the person who expresses it. The assertion that "It is a lovely day," for instance, implicitly carries the prefix "*I believe that* it is a lovely day." In addition, the Q sorting consists of the individual's rank-ordering the statements from his or her own standpoint–that is, the situation "as I see it"–and hence is subjective in that respect as well.

Yet all remains purely empirical and above board, and as naturalistic as one might wish. Furthermore, the responses are thoroughly amenable to sophisticated statistical analysis, resulting in factors of *operant subjectivity* (Stephenson, 1977). These factors eventually have to be conceptualized through interpretation by the investigator, but they are not simply theoretical constructs. They emerge naturally from the Q-sort operations of the persons under examination. As such, they are functional, naturally occurring, and capable of standing on their own without reference to consciousness, mentalism, or other props from *spiritus mundi*.

Concrete Exemplification

Problem selection. As stated previously, subjectivity is ubiquitous, and so the concepts and principles of Q methodology could be rendered ostensible in terms, literally, of any subject matter under the sun–of the public's reactions to the September 2001 terrorist attack or the subsequent war in Iraq, for instance, or to the tragic death of Princess Diana, or about the possibility of life on Mars, or of the potential of Black capital as a way to renew the inner cities, or of psychologists' understandings about the results of their latest experiment ... *anything*.[2] All of these possibilities are, of course, accompanied by large doses of objective fact–for example, of terrorists' travel itineraries and troop movements, of skid marks and blood-alcohol levels, of digitized analyses of rock samples, of investments and debits, and of *F*-tests–but like prey in the coils of a python, facts are inevitably wrapped in conjecture, debatable points, personal assertion, and in some cases even cosmological and metaphysical presumption.

For purposes of illustration, consider a person reading a fictional story, which by most accounts would qualify as subjective inasmuch as one person's understanding may not match another's. The reading would also easily qualify as a psychological event in Kantor's (1959, pp. 15-16) sense, with the story providing the stimulus (expressed via characters, events, plots, etc.) and the reader's responses being a function of prior experiences plus influences in the immediate setting. The reading and the associations that it prompts are apt to be different if they occur in a library, on a bus, or at a fortnightly meeting of a literary guild, and the interaction of these influences will produce an outcome that is specific and unique.

The principles of Q methodology are illustrated below in terms of students' readings and interpretations of a fable. *Vuthsanya*, as the story is entitled, appears in Bronwyn Davies' "Women's Subjectivity and Feminist Stories" (1992, pp. 70-72), and is a mythic account of a daughter (Vuthsanya) rejected by her father (King Rian), who wanted a male heir. Vuthsanya leaves the kingdom, which then experiences years of crop failure, plague, and torment by a repulsive ogre (Teg-Mushrak), who slays all brave knights sent to kill him. An aging King Rian finally goes out to meet Teg-Mushrak and is easily defeated, but as the ogre is about to deal his deathblow, Vuthsanya appears, mounted on a black Pegasus and with sword drawn. In the ensuing battle, Vuthsanya nimbly dispenses with Teg-Mushrak and then, without further ado, departs astride the flying Pegasus. King Rian returns to his people, who rejoice at his having slain the ogre (or so they are led to believe). The story ends with author confiding to reader, “Only two people know what really happened that day, and so do you.”

Students in a senior seminar were asked to read the story and provide written critiques based on their understandings of it. The students’ essays were then combed for statements of subjective assertion, such as the following: (a) By denying his own daughter simply because she is female, the King appears both arrogant and ignorant; (b) The story shows a person who risks her life for totally unselfish reasons, despite what occurred in the past; (c) The sexism is most obvious when Teg-Mushrak laughs at Vuthsanya, even after she has already dealt him a terrible blow; (d) The monster was the obvious evil; the more subtle evil was the hatred of the King for his daughter, which came in the form of discrimination; and (e) It is unclear whether Vuthsanya fought because she forgave her father or to protect the people that liked her. And so forth in boundless profusion, which is a distinguishing feature of subjectivity. Statements *of* objective fact typically have no extension beyond themselves: For example, “12 inches equals one foot” or “water boils at 212°F” go no farther than their utterance. Statements *about* facts, however, are limitless. Facts are, in a sense, dead thoughts that just sit there like trophies of past intellectual achievement, while swirling around them are dynamic and expanding volumes of subjective *communicability*. It is this swirling dynamic that Q methodology models and measures.

Consciring, Q samples, and Q sorting. The students’ essays about *Vuthsanya* were in the common everyday language of the culture, hence constitute what Stephenson (1980) referred to as *consciring*, or shared communicability. This is not to say that the students were in agreement with one another’s understandings and interpretations. This is an empirical matter, and it is the role of Q technique to model this process and to reveal its structure.

This modeling is accomplished by presenting participants with a subset of comments, a *Q sample*, drawn from the larger *concourse* (Stephenson, 1978). There are formal procedures, rooted in the principles of experimental design, that are available for the systematic selection of statements (for details, consult Brown, 1970; Stephenson, 1953, pp. 62-85). In the present case, however, a less sophisticated route was taken by making certain to include such aspects as the plot and characters in the story, matters of interpretation, use of literary devices, perspectives on the moral of the story, and other considerations contained in the student essays. Eventually, a Q sample of size $N = 36$ was selected, the purpose of which was to present participants with a stimulus situation that had “ecological validity,” that is, that was *representative* in the methodological sense advanced by Brunswik (1949).

Seminar members were then instructed to represent their responses to the story in the form of Q sorts. This was accomplished by rank-ordering the statements in the Q sample from agree (+4) to disagree (-4) in a forced distribution, that is, with a fixed number of statements beneath each score and with the entire distribution being quasi-normal in shape. The Q-sorting procedure therefore brings to a focal point all the major features of Kantor's psychological event, including the stimulus functions of the story (its characters, their actions, the plot, etc., as represented in the Q sample), as well as each reader's capacity to respond in certain ways based on personal history with the words and ideas constituting the stimuli. The Q sorting is, of course, influenced by the specifics of the classroom setting, and these elements interact in a dynamic field (Smith & Smith, 1996).

Statistical mechanics. Q sorts were provided by 10 members of the seminar (9 students plus myself), and these were intercorrelated (Pearson's *r*), producing a 10 × 10 correlation matrix in readiness for factor analysis. As conventionally employed, correlational analysis reveals relations among *variables*, with coefficients calculated by summing the cross-products of trait scores across all individuals in the sample. By way of contrast, Q methodology reveals relations among *persons* (Stephenson, 1935), with correlations calculated by summing differences in scores between persons across all Q-sample statements (for simplified computational details, see Brown, 1993). The correlation matrix is rarely of any direct interest itself, however, and only serves as a statistical way station where the data are prepared to display their structure via factor analysis. For various reasons, Stephenson relied on *centroid* factor analysis rather than the statistically more advanced component and principal axes methods: The latter are widely regarded as the more "objective" due to the determinacy of their solutions (based on maximum-variance and related principles), but the downstream factors are dependent upon the quirkiness of the correlation matrix from which they flow. The centroid method, by way of contrast, is indeterminant and, as Stephenson (1953) said:

> ... leaves open for us innumerable possible solutions, and the concreteness of inferential interbehavior ... contemplates, no less, innumerable possibilities in the pursuit of scientific investigations: it is difficult, therefore, to imagine a better *modus operandi* than these two, together, make possible. (p. 39)

Due to its indeterminacy, the centroid method has no single correct solution; its nature therefore parallels the indeterminant character of subjectivity and of the formulations that it shares with quantum theory (Stephenson, 1982, 1987). It is this conceptual heritage that is incorporated into Q-methodological computer software packages such as *PQMethod* (Schmolck, 2002) and *PCQ* (Stricklin, 2000).

Factor Loadings			
	A	B	C
1	-04	**69**	-14
2f	**64**	20	-01
3f	**61**	-10	-02
4	**77**	06	-03
5	-36	01	**56**
6	**51**	-10	23
7	17	-01	**74**
8	04	**36**	14
9	13	**50**	21
10f	**53**	03	-11

Table 1. Operant Literary Responses. Note: Significant loadings in boldface; decimals to two places omitted. f=female.

In the present example, three significant factors emerged from the correlation matrix and were theoretically rotated to the position shown in Table 1. Factors in general are dimensions underlying a correlation matrix. In Q methodology, they are mathematical representations of different classes of Q sorts–in this case, of different reactions to reading the Vuthsanya fable. Had there been but one understanding of the story, only a single factor would have been evident; different understandings would occasion Q sorts with different statement orderings which, in turn, would lead to additional factors, their final number being an empirical matter unknowable in advance.

Consequently, what begin as stimulus and response functions, setting factors, and other considerations encapsulated in Kantor's equation for a psychological event are ultimately reduced in a science of subjectivity to the functional segmentations documented by factor analysis. The Q factors are independent of observer interference. That is, they are "natural expressions, independent of the instrumentation in any causative manner" (Stephenson, 1987, p. 99), and hence free of *a priori* categorizations and normative considerations of the kind that permeate psychometric and sociometric devices in widespread use in psychology and the social sciences.

Theoretical factor rotation. The issue of the theoretical rotation of factors deserves a chapter all to itself since it was at this point that Stephenson most often referred to interbehavioral principles. He remarked, for example, that "all scientific behavior is *concrete inferential interbehavior*," and, of factor analysis, that "the *permissiveness* of the *centroid* solution in factor analysis is precisely what one requires for the doctrine of the concreteness of inferential behavior in experimentation" (Stephenson, 1953, pp. 40-41). Conventional factor analysis typically relies on prepackaged algorithms (varimax being the most popular) for positioning vectors so as to achieve a solution that is meaningful in some sense. However, this prepackaging is at cross-purposes with the *principle of specificity* (Kantor, 1983, p. xi), which seeks generalities only under conditions in which particularity is preserved. As Kantor (1978) said, "the specificity principle operates as a reliable intellectual tool to keep investigators ... close to realistic interactions with things and events" (p. 131).[3]

Kantor's principle no doubt appealed to Stephenson's training as a physicist, and so he used factor rotation as a way to incorporate into the inquiry the investigator's own guesses, hunches, and predilections as these arise in relation to events under scrutiny. That is, he left room at this stage of the investigation for the scientist's own history of interactions with the subject matter and for the "cues" given off within the scientific situation–matters that cannot be computer-programmed, but must be left to judgment. It is to be noted that factor rotation, judgmental or otherwise, has very little impact on the factors insofar as the amount of variance is concerned; that is, the relationships among the Q sorts produce a certain amount of variability, and rotation merely configures this variability in different ways. The advantage of judgmental rotation is that it endeavors to find a factor structure that has theoretical meaning (Thompson, 1962).

Detailed exemplification of factor rotation has been addressed previously (Brown, 1980, pp. 224-239; Brown & Robyn, in press), but the factors arising from interpretations of *Vuthsanya* provide an opportunity to illustrate a few simple principles. Due to the character of the story, female students were expected to respond appreciatively, and so the factors were rotated in such a fashion as, in effect, to test this presupposition against the reality of the subjectivity contained in the correlation matrix. Specifically, the factors were displayed as Cartesian coordinates, and the individual Q sorts were positioned in two-dimensional space as a function of their factor loadings. The vectors were then repositioned by directing one of them through the center of gravity of the space occupied by the female readers (the other factor remaining orthogonal), and revised loadings were then calculated for the new factors.

As Table 1 shows, the correlation matrix gave support to this presupposition, that is, readers 2, 3, and 10 (the only females in the seminar) all provided Q sorts that were sufficiently similar so as to define factor A. They were not alone, however; male students 4 and 6 also defined this factor. Unanticipated (and unpreventable) consequences such as this constitute Q methodology's abductory strength, that is, its ability to make discoveries not anticipated beforehand.

Kantor's (1983) principle of *relevant factors* takes into account "the cultural and intellectual climate surrounding the interpretation of events" (p. xi), and in this regard a consideration influencing the course of factor rotation consisted of isolating the perspective of the observer (myself, reader no. 1 in Table 1), which in part defines factor B. As is evident, locating the observer within the observational field makes explicit the frame of reference within which interpretation of the factors takes place—or the "situativity of knowing," as Greeno (1998) has phrased it—and serves to heighten the interpreter's awareness of potential biases arising from differences in perspective. Factor C was formed as residual to A and B, and is defined by readers 5 and 7.

Hermeneutics: Factor interpretation. The character of the factors is revealed in the *factor scores*, which are the scores (from +4 to -4) associated with each of the 36 statements in each of the three factors. Each factor consists of a group of Q sorts that are similar, their commonality being the result of a common understanding of the fable, and a factor score can be thought of as the average score attached to each statement by all the Q sorts comprising the factor (for computational details, see Brown, 1980, pp. 239-247). As a composite of several highly similar Q sorts, each factor can be considered an *operant possibility*; that is, as the Q sort that would be given by an individual whose viewpoint epitomized those of the others on the factor. Space precludes going into great detail, but consider those statements to which Factor A (which includes the three female readers) assigned the highest scores (factor scores in parentheses for A, B, and C, respectively):

3. (+4 +3 +1) The story is a lesson in the ability of women and of what can happen when a woman is both underestimated and stereotyped.
6. (+4 0 -2) It is a classic tale that teaches the lesson that women are on an equal level with men in all aspects.
29. (+4 -1 0) The lesson is: Never underestimate the strength and intelligence of a woman.

The feminist character of Factor A is unmistakable from the very beginning and is consistently displayed throughout the factor array.

Factor B was the view ventured by three males (including myself). What characterizes this response is the enjoyment of reading the story (scores for factors A, B, and C):

31. (-1 +4 -4) The aspect of the story that I enjoyed most was the non-traditional *denouement* of the female-as-hero.

2. (-2 +3 -2) The story has enough old-fashioned excitement and action to make it an excellent yarn.
35. (-4 +2 0) A story with a king, a battle, and an evil tormentor makes for enjoyable reading.

Factor B, compared to A, is not absorbed by the feminist theme, nor by any other interpretive theme, but by the story *qua* story. In this context we are reminded of Stephenson's (1967/1988) other classic, *The Play Theory of Mass Communication*, of which psychologists are largely unaware. Factor B is manifestly *ludenic* (playful) in its reading and has enjoyed the story apart from its ideological message. Note, however, that although the heroine carried the day, Factor A does not report having enjoyed the reading, primarily because Vuthsanya's accomplishments in the end went unrecognized (as Factor A class members declared).

At least on the surface, the Factor C readers (also male) did not understand the story or, perhaps more accurately, felt they had not been provided sufficient information to enable understanding. Compared to the other two factors, Factor C desires more information and considers the story obscure:

5. (-1 -2 +4) Vuthsanya had the potential to be such an interesting character. I wish the author had given more information about her.
15. (-3 +1 +3) It was well-written and entertaining, although somewhat opaque.
8. (-4 -4 +2) There was not enough background: Who were the ancient tormentors? Why did the kingdom go into 10 terrible years? Questions like these needed to be addressed.

These interpretations of the three factors are necessarily superficial, but hopefully transmit at least an impression of what is involved. The interpretive task requires a certain measure of empathy and ability to place oneself in the mindset of the various factors. In certain respects, it is similar to interpreting individual Thematic Apperception Test stories or depth-interview transcripts, save that factor scores are present to serve as both guides for and restraints on the hermeneutic exercise (McKeown, 1998). Moreover, having prior knowledge of one's own factor location facilitates the intellectual navigation involved by alerting the observer to the observational terrain. Being forewarned of membership in Factor B, for instance, deprives the interpreter of a hiding place and helps guard against minimizing Factors A and C behind a pretense of objectivity, no less than against being overly generous with Factor B.

Eco (1992, p. 64) has speculated that texts are conceived to produce a certain kind of reader, namely, one capable of making conjectures coincident with the intention of the text—and there is little doubt that Davies' *Vuthsanya* had something akin to a Factor A response in mind. Nor is there much doubt that Factor A would have approximated Davies' own response had she taken the Q sort. Nonetheless, the existence of Factors B and C points to alternative readings, aimed not so much at the theme of the story (to which Factor A has mainly responded) as to its structural features (Factor B) and ambiguity (C), which are other stimulus functions and response functions about which Davies may have been unaware.

Were we inclined to probe this situation in more detail, we would be interested in determining whether and to what extent Factor C's frustration with the story was due to a lack of experience in dealing with literary interpretation, or perhaps to a certain defensiveness about feminist themes. With regard to Factor A, we might be interested in determining the extent to which the response was attributable to *doctrine* (Richards, 1929, pp. 271-291), that is, to incorporation of a strongly held belief system as a way of coping with the ambiguity of the story. In this latter respect, consider Factor A's reaction to the following statement (scores for factors A, B, and C):

> 27. (-4 +2 -3) Despite his shortcomings in his relationship with his daughter, the King is not entirely bad. It took a lot of courage to challenge the monster when he realized that he would probably fail and be killed.

From Factor A's standpoint, the King apparently is "entirely bad" even as he is prepared to forfeit his life for his subjects. As far as this factor is concerned, it is his past treatment of his daughter that is of overriding importance, to the exclusion of other considerations. Ideological commitment would naturally be suspected, and this is important for literary engagement, for as Richards (1929) has said, the adhesion of emotion to intellectually acceptable ideas is a strong urge that can threaten literary discernment and block other response functions. As he concludes, "For those whom it [doctrine] conquers it means 'Good-bye to poetry'" (p. 278); that is, goodbye to the wider spectrum of alternative perspectives upon which deeper understanding depends.

Conclusion

Kantor (1938) asked, "Why the term subjective in psychology?" which he lays at the door of medieval *philosophical* influences. From an *observational* standpoint, however, he sees little more at issue than "an activity of a particular organism which may vary from that of some other organism" (p. 17), that is, uniqueness of occurrence. But at the risk of making too fine a distinction, what Kantor is referring to is *subjectivism* (that all knowledge is private and relative) rather than *subjectivity* in the sense in which Stephenson intended, and this perhaps accounts for Kantor's "difficulty," noted at the outset, in openly embracing Stephenson's contributions. The difficulty appears to have been semantic more than a difference in philosophical starting point.

Stephenson was fully conversant with Kantor's position and in agreement with it on main points. As he wrote in an unpublished manuscript three years prior to his death, "I have been a Kantorian for over fifty years" (Stephenson, 1986, n.p.).

However, he wished to reserve for scientific regard that which was empirical in "subjectivism," namely, the obvious fact that people have opinions about things. That Stephenson nominated the term *subjectivity* to refer to this domain was perhaps unfortunate due to the many meanings that have accreted to it. However, he was always clear about his referents so that even if he used a term such as *mind*, it was always as "so-called mind" or limited by some other qualifier. *Consciousness* he was prepared to dispense with altogether (Stephenson, 1968).

One advantage that Stephenson had, born of his physics training, was not only a commitment to scientific operations, but also possession of procedures with which to implement that commitment. Stephenson would therefore have had no difficulty agreeing with Kantor's (1938) insistence that "only such concepts and hypotheses as are based on previous operations with things ... can be scientifically valid" (p. 5). Indeed, he said something resembling that himself: "The truth is that it seems unprofitable to draw any distinctions between what is objective and what is not, except in terms of dependable *operations*" (Stephenson, 1953, pp. 87-88). Stephenson could therefore advance farther out on the limb of subjectivity, secure in the knowledge that whatever words he used were tied to the "previous operations" of Q sortings and factor analysis. Self and subjectivity for him were therefore methodological rather than substantive designations. That it is I (rather than you) doing the Q sort is what makes it subjective and self-referential, and not a single mentalistic shot has to be fired.

It is unfortunate that Kantor, so aware of the impact of cultural antecedents on thought in general, seemed less aware of it in himself in this particular instance, which perhaps explains his reluctance to jump to the defense of subjectivity in the same way that Stephenson had championed interbehaviorism. Their alliance would have been well nigh irresistible. But ever the sturdy opponent of dualism, Kantor was on guard against the slightest sign of compromise and was perhaps wary of those whose rhetorical flourishes included terminology (such as subjectivity) that was in common coinage on the dark side of the science-nonscience divide–hence the defiant note (cited in Mountjoy & Hansor, 1986) found on his nightstand the morning after he died: "No spirits, wraiths, hobgoblins, spooks, noumena…," and so on down a long list of imaginary psychisms, which Stephenson (1953, p. 96) had also rejected. On this, the two of them were in agreement. It was with respect to subjectivity specifically that Kantor equivocated, yet had the two of them met, I feel certain that Stephenson would have wanted to issue reassurances that subjectivity was well within the boundaries that Kantor had spent a lifetime defending. That is, subjectivity, for Stephenson, was never anything more than behavior: no spirits, no wraiths, no hobgoblins, no invisible hands–simply behavior.

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Endnotes

[1]Through secondhand book sources, I have recently acquired Kantor's own copy of Stephenson's *The Study of Behavior*, and in it the abovementioned quote is underlined and carries an asterisk, as if of special importance to Kantor. In its entirety, the underlined portion reads, "Subjectivity is behavior; consciousness as ordinarily regarded is something else. This is our standpoint" (p. 347), and this was very likely Kantor's standpoint, too.

[2]Originally restricted to psychology, Q methodology has more recently been applied to a wider variety of subject matters, of which the following selective list is meant to convey a sense of the range: Child phenomenology (Taylor, Delprato, & Knapp, 1994), family therapy (Rohrbaugh, Shoham, Spungen, & Steinglass, 1995), bereavement (Hurd, 1999, 2002), feminism and gender (Gallivan, 1994; Kitzinger, 1999; Senn, 1996; Snelling, 1999), medicine and health (Barbosa, Willoughby, Rosenberg, & Mrtek, 1998; Dennis & Goldberg, 1996; Mrtek, Tafesse, & Wigger, 1996; Valenta & Wigger, 1997), consumer behavior (Kleine, Kleine, & Allen, 1995), program and policy evaluation (Focht, 2002; Wright, Riggle, & Wright, 1998), decision making (Brown, 2002; Durning & Brown, forthcoming; Popovich & Popovich, 1994), politics, policy, and administration (Addams & Proops, 2000; Brewer, Selden, & Facer, 2000; Brown, Durning, & Selden, 1999; Freie, 1997; Kramer, de Hegedus, & Gravina, 2003; Maxwell, 1999; Pelletier, Kraak, McCullum, Uusitalo, & Rich, 1999; Rhoads & Sun, 1994; Salazar & Alper, 2002; Van Eeten, 2001; Wilkins, Kraak, Pelletier, McCullum, & Uusitalo, 2001), geography (Robbins & Krueger, 2000), religion (Braswell, 1994; Parker, 1994-1995), education (Allgood, 1999; Moseman, 2003), autobiography (Trahair, 1997), law (Casey & Needham, 2001), and literature and communication (Bublic & Sitaraman, 1998; Robinson, Popovich, Gustafson, & Fraser, 2003; Thomas & Baas, 1994; Trahair, 2003). Q has also proved compatible with the newer genre of postmodernism (Durning, 1999), including deconstruction (Thomas, McCoy, & McBride, 1993), rhetoric, narrative, and discourse analysis (Byrd, 2002; Dryzek & Holmes, 2002; Febbraro, 1995; Knight & Doan, 1994), identity (Aalto, 2003; Davis, 1997; Robyn, 2000, 2005; Wong & Sun, 1998), social construction (Curt, 1994; Stainton Rogers, 1995; Stenner & Stainton Rogers, 1998), and the so-called qualitative methods (Brown, 1996; Stenner & Stainton Rogers, 2004).

[3]The principle of specificity is elsewhere referred to as the specificity thesis or specificity theorem, and it serves as a reminder that all logical and scientific activities involve actions that are to a greater or lesser extent particular (rather than universal), that are performed on materials of greater or lesser particularity (rather than universality), leading to varying degrees of particularity in outcome. Universals are extrapolations from such event specificities (Kantor, 1945).

Author's Note

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Commentary on Brown

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When Kantor introduced his interbehavioral system of psychology, it might not have struck many psychologists as extreme or revolutionary. After all, psychology had already adjusted to Watson's behaviorism and had virtually eliminated introspection as its proper method. It did not, however, effectively eliminate consciousness or private experience. Methodological behaviorists, for example, retain private experience, not as data for psychology, but as the background on the basis of which all science is erected. Kantor's proposal effectively refuted this position by denying that what is called consciousness or private experience can be anything other than behavior. As non-spatial and transcendental constructs, consciousness and private experience have no place in scientific psychology.

Kantor proposed that psychology be seen as the study of the interactions of organisms with objects, events, or other organisms. Such concrete actions are all observable in principle even though such behaviors as thinking and imagining can be extremely subtle in their operation. But, because sense data theories were still powerful and protopostulatory in our culture, Kantor's words fell mostly upon deaf ears.

One who did read Kantor carefully and found that he agreed with him was William Stephenson, whose paper "Postulates of Behaviorism" (1953) might be said to have launched Q methodology for the study of human subjectivity. In this paper, Stephenson took issue with the neo-behaviorist, Spence, over Spence's assertion that the task of psychology is to bring order into events provided by immediate experience, with the implication that behavior and immediate experience are somehow different. Spence's position was also held by such other prominent psychologists as Tolman, Boring, Stevens, and Pratt. Stephenson's position was clear: At no point does psychology need to concern itself with anything other than behavior and its conditions. He then went on to outline a plan for an objective approach to subjectivity, which became Q methodology.

Stephenson was particularly impressed by Kantor's concept of the behavior segment and by his formula for a psychological event (*PE*):

$$PE = C(k, sf, rf, hi, st, md),$$

where *sf* and *rf* refer to stimulus and response functions, *hi* to the interbehavioral history, *st* to setting factors, and *md* to interbehavioral media; "*k* symbolizes the uniqueness of interbehavioral fields and *C* that the field consists of the entire system of factors in interaction" (see Kantor, 1959, pp. 15-16; italics added).

Stephenson made the behavior segment basic, but whereas Kantor concentrated on abstract analysis of behavior segments, Stephenson took larger segments from everyday life. However, neither approach excluded the other. Here is where Stephenson and Kantor agreed, and their agreements extended to many aspects of the philosophy of science. On many points, they might have disagreed in detail, but they shared a basic interbehavioral position.

Turning to Brown's chapter, we find that he has shown a mastery of interbehavioral principles, as well as Q methodology. Considering the complexities of Q methodology, Brown's overview is excellent. Many readers have found Stephenson's writing hard to understand, but Brown has presented his views with clarity and precision. At the same time, he has not burdened the reader with the technicalities or controversial aspects of factor analysis.

The *Vuthsanya* story provides an engaging means for describing such Q-methodological concepts as consciring, Q sort, Q sample, concourse, factors, centroid factor analysis, and rotation. A careful reading reveals how Brown brings all this into a system of analysis and keeps the entire enterprise on a sound, naturalistic foundation.

Several characteristics of Q methodology are of undoubted interest to the interbehaviorist. Most notably, we mention "abduction" or the "hypothesis generating" character of Q methodology, that is, discoveries are made that could not have been anticipated beforehand. In addition, the open-endedness or indeterminant character to the findings without any necessary finality is what interbehaviorists might expect, given their appreciation of the influence of the cultural climate on interpretations. Q methodology has also been compared in some ways to projective techniques although, as Brown notes, factor scores may both guide and restrain interpretation.

Did Kantor have a problem with subjectivity? Brown has presented evidence that he did. Kantor was a severe critic and could detect dualism where there was only a slight basis. To the best of my knowledge, Kantor never criticized Stephenson for references to subjectivity as defined in terms of self-reference. I have assumed that Kantor simply disliked the word "subjectivity" because of certain unfortunate connotations. Brown has handled Kantor's attitude regarding subjectivity very well. Kantor regarded all words as polysemous, but at the same time he could be critical of anything but exact usage of a scientific term. I definitely agree with Brown that Kantor's problem with subjectivity was a semantic, not a substantive, one.

What was Kantor's opinion of Q methodology? Kantor said little about factor analysis, but at least once he suggested that it might be leading us back to a type of faculty psychology. Stephenson was quick to point out that while this might be true of R methodology, it does not apply to Q methodology.

As to the actual procedures involved in Q methodology, Kantor would probably have had no criticism; with regard to research methods, Kantor was eclectic and pragmatic. He insisted only that psychologists deal with confrontable events, stay close to their data, and avoid entangling traditional assumptions. As to the question of where Q methodology might stand in relation to interbehaviorism, Kantor might well have seen it as a component of the broader interbehavioral system, just as he tended to regard Skinner's analysis of behavior.

Both Kantor and Stephenson were deeply influenced by behaviorism and committed to psychology as a natural science. Once dominant in psychology, behaviorism is now reduced to a minority opinion. Modern psychology is a vast enterprise with many areas of specialization and it badly needs direction. Scientific psychology can provide that direction and Q methodology, interbehavioral psychology, and behavior analysis–which should be closely allied–can contribute to that end.

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Commentary on Brown

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Brown provides a valuable service in presenting Q methodology to an interbehavioral audience. For although Stephenson (1986, n.p.) wrote, "I have been a Kantorian for over fifty years" and Kantor (1983) himself remarked, "[Stephenson] wrote a book in which he's an interbehaviorist," the interbehavioral community seems largely unfamiliar with Q methodology (Delprato & Knapp, 1994; for some exceptions, see Lichtenstein, 1988; Smith, 2001b, pp. 319-343; Swain & Delprato, 1994).

In this commentary, I examine three topics raised by Brown's chapter, with the intention of providing an interbehavioral interpretation of Q methodology, albeit a tentative and necessarily incomplete one. To be sure, Brown himself is well acquainted with interbehaviorism, as his chapter demonstrates. I hope merely to supplement Brown's chapter by demonstrating that some of Q methodology's tools, procedures, and concepts can be further explored from an interbehavioral point of view. I begin with Q samples and conditions of instruction as probes, turn to the stimulus functions of Q-sample statements, and end with factors as derived constructs.

Q Samples and Conditions of Instruction as Probes

Q sorting is an interaction between participant and Q-sample statements (R⇔S), itself a product of current and historical conditions. The statements of the Q sample are not the causes of the responses (e.g., putting a statement in one pile or another). Instead, the "cause" of the participant-statement interactions is found among the setting factors, the medium of contact, the concurrent stimuli (i.e., other Q statements), and, primarily, the participant's interbehavioral history (cf. Parrott, 1987; Ribes-Inesta, this volume). That is, the relative placement of the Q-sample statements suggests something about the participant's history by showing how it affects current interbehavior (cf. Kantor & Smith, 1975, p. 147). Fundamentally, then, Q methodology provides a way of probing "the current state of behavior" (Sidman, 1960, p. 121; see Skinner, 1953, pp. 213-216, 245-246), where Q samples and conditions of instruction are the probes (Brown, 1980, p. 54; Good, 2003; Stephenson, 1953, pp. 94-99). This interpretation suggests that Q methodology is not unlike projective tests, such as the Rorschach, the Thematic Apperception Test, and even Skinner's (1936) verbal summator (Brown, 1980, p. 190; Kantor & Smith, 1975, p. 147; Keller & Schoenfeld, 1950, pp. 394-395; Skinner, 1953, pp. 215-216).

The main difference between Brown's use of probes and, say, that of a typical experimental analyst concerns the independent variables. In Brown's study (this volume), the independent variable refers, not to the *Vuthsanya* fable, but to the participants (Brown, 1980, pp. 191-192). The former was "held constant" (i.e., all participants read the fable), whereas the latter were "varied" (as *they* had to be). Thus, variations in the Q sorts and factors (the dependent variables) are attributable to variations among the participants, presumably, to variations among their interbehavioral histories (e.g., degrees of training in literary analysis). Precisely what these variations are, though, is unknown. However, a lack of experimental precision is not a necessity in Q methodology.[1] It serves merely to illustrate a point: Whereas the typical experimental analyst uses probes to answer questions about the effects of known independent variables on the current state of behavior (e.g., Sidman, 1960, pp. 120-121), the Q methodologist uses probes to discover something about the current state of behavior and may or may not be interested in systematically identifying the independent variables.

Thus, interbehavioral psychologists might regard Q methodology as an exercise in the taxonomic description of behavior (Delprato & Knapp, 1994; cf. Stenner & Stainton Rogers, 2004). More than describing behavior, though, Q methodology provides constructs that are derived from, not imposed on, behavior (Delprato & Knapp, 1994). It does so by first identifying the stimulus functions of the Q-sample statements.

Q-Sample Statements and Their Stimulus Functions

Brown explains that once all Q sorts are recorded, factor analysis and factor rotation performed, and factor scores derived, the factors themselves are interpreted. Ultimately, the Q methodologist is concerned with what the factors "mean" to the participants who define them, which is part of what makes Q methodology subjective. It strives to understand the participant's behavior or its product–the particular arrangement of statements in a Q sort and a factor–from the standpoint of the participant. Like interbehavioral psychology, then, Q methodology is concerned with "meaning" (Smith, 1984, pp. 480-481) and with understanding events "from the standpoint of the events themselves" (Parrott, 1987, p. 10) or, at least, from the "standpoint of the individual being studied" (Brown, 1980, p. 1).

This concern puts Q methodology in touch with stimulus functions (and response functions). That is, Q methodology assumes that Q-sample statements have no inherent or *a priori* meaning (Brown, 1980, p. 191; 2003). As Stephenson (1980) argued, "the same statement can have different meanings for different people and different meanings for the same person in different functional situations" (p. 884; cf. Morris, 1982). Q methodology seeks to discern the functions of the statements. For any particular Q sort or factor, the functions are inferred from the placement of the statements with respect to one another and from interviewing the participants (Brown, 1980, pp. 200-201). Collectively, each arrangement of the statements results in a *perspective* or *point of view* (Brown, 1980, p. 46; McKeown & Thomas, 1988, p. 12; Stephenson, 1968).

Given Q methodology's concern with describing Q sorts and factors from the participant's standpoint, factors have all the earmarks of what Kantor referred to as derived constructs, to which I now turn. I begin with some general comments on events and constructs.

Factors as Derived Constructs

Kantor argued that scientists must always be careful to distinguish between events and constructs (see Cromwell, this volume). The former refer to "anything that happens which may or may not become known or studied" (Kantor, 1959, p. 258). The latter, in contrast, refer to:

> products derived from interbehaving with events…. [These include] words of description, records of measurements or manipulations, mathematical or symbological equations, or formulae in all of their various forms…. The range of constructs is very wide, and often constructs are acts themselves…. In general, the term "construct" may be applied to acts as well as [to] products of action. But constructs in any form or style are not to be confounded with the events or stimulus objects in connection with which they are engendered. (Kantor, 1959, p. 259)

In other words, events refer to the world (e.g., interactions between individuals and the environment), whereas constructs refer to what scientists write, say, record, and otherwise do with respect to the world (e.g., descriptions, equations).

As Brown notes, among the events of Q methodology is Q sorting (see Smith, 2001a). This is what the participants do; they sort the cards of a Q sample along a distribution according to a condition of instruction. Among the constructs of Q methodology are factors. As noted, these are descriptions of the participants' behavior or, more accurately, of the products of their behavior. Brown describes factors, though, as "functional" and "naturally occurring"–terms that seem more descriptive of events than of constructs. This paradox, however, is only apparent. Indeed, it emphasizes another distinction that Kantor made, this one between two varieties of constructs: derived and imposed.

Kantor (1947) argued, "On the whole, constructions *derived from* events are likely to be legitimate, whereas those *imposed upon* events will only by the merest chance be anything but illegitimate and useless" (p. 121, emphasis added). Derived constructs are drawn from events and describe their characteristics. Imposed constructs, in contrast, are drawn from sources other than the events of interest and are imposed on them (e.g., computer models of remembering).

Derived and imposed constructs are pertinent in the present context because they put into interbehavioral perspective something well appreciated in Q methodology (S. R. Brown, 1993, p. 97; personal communication, April 24, 26, 1998). As Brown (1993) notes, factors "represent functional as opposed to merely logical distinctions" (p. 97). An interbehaviorist could exchange Brown's functional and logical distinctions with Kantor's derived and imposed constructs and not alter the meaning of Brown's passage. Thus, to return to my earlier concern, when Brown argues that factors are "functional" and "naturally occurring," he is emphasizing that they are constructs ultimately derived from, not imposed on, the events, that is, the behavior of participants. This is consistent with Kantor's interbehaviorism (Smith, 2001a).

Conclusion

Brown has provided interbehaviorists–and other psychologists–with a scholarly and accessible introduction to Q methodology. I have attempted to supplement his chapter by interpreting a few aspects of Q methodology from an interbehavioral perspective. As has been noted, "a small bridge at present connects the two realms" of Q methodology and interbehaviorism (Delprato & Knapp, 1994, p. 22). I hope more will cross it.

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Endnote

[1]For example, Q methodologists have elsewhere employed group experimental design (Freie, 1997) and intensive "small N" analysis (see Brown, 1980, pp. 58, 112-172; McKeown & Thomas, 1988, p. 36).

Author's Note

I thank Steven R. Brown, Dennis J. Delprato, and my co-editor, Edward K. Morris, for comments, conversations, and insights that shaped the content of this commentary. I also acknowledge the late Donald M. Baer for similar contributions. Correspondence should be addressed to Bryan D. Midgley, Department of Behavioral Sciences, McPherson College, McPherson, KS 67460.

Chapter 11

Behavior Analysis

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When John B. Watson (1913) founded classical behaviorism, he founded two behaviorisms–one methodological, the other metaphysical (Bergmann, 1956; Morris & Todd, 1999). Methodological behaviorism dismissed the introspective analysis of consciousness for not being intersubjectively verifiable. Ultimately, though, under the aegis of logical positivism (Stevens, 1939), psychology retained mind as its subject matter, knowable through objective inferences drawn from behavior (Moore, 1995). This was, in part, the tradition of the prominent neobehaviorist learning theories (e.g., Hull, 1943), later, of cognitive behaviorism (Meichenbaum, 1977), and subsequently of cognitive psychology (Gardner, 1985). Today, methodological behaviorism is mainstream experimental psychology (Leahey, 1992b).

In contrast, metaphysical behaviorism was never well accepted. Only a few psychologists advanced the position that consciousness, mind, affect, and cognition are relations between the actions of integral organisms and their physical, biological, and social contexts–not processes occurring in separate hypothetical, conceptual, or physiological domains. The most renowned attempts at such a naturalistic psychology were Watson's (1930) metaphysical behaviorism (Todd & Morris, 1994), J. R. Kantor's (1959) interbehaviorism, and B. F. Skinner's (1953) radical behaviorism (Todd & Morris, 1995). Classical behaviorism, however, is now largely dead; interbehaviorism retains its singular identity, but is not widely known; and radical behaviorism lies increasingly outside mainstream psychology, as it has evolved into the discipline of *behavior analysis* (see Michael, 1985; Reese, 1986, for overviews).

As a discipline, behavior analysis comprises three interrelated subdisciplines. (a) The experimental analysis of behavior entails research on basic behavioral processes (e.g., reinforcement; Skinner, 1966b; see Catania, 1997) and extensions of those processes to everyday behavior (e.g., cooperation, competition; Hake, 1982; see Guerin, 1994). (b) Applied behavior analysis addresses problems of individual, social, and cultural importance (e.g., developmental disabilities), alters conditions responsible for them or develops techniques, procedures, and programs for preventing or remediating them, and disseminates solutions that are replicable and accountable (Baer, Wolf, & Risley, 1968; see Cooper, Heron, & Heward, 1987). (c)

And, the conceptual analysis of behavior involves philosophical, theoretical, and ethical considerations in the science of behavior (e.g., epistemology, units of analysis; Skinner, 1945; see Day, 1980).

Just as radical behaviorism is evolving, so too are the three subdisciplines of behavior analysis. The experimental analysis of behavior, for instance, increasingly addresses more molar levels of analysis (e.g., the correlation-based law of effect; see Davidson & McCarthy, 1988), the conditionality of stimulus functions (e.g., establishing operations; Michael, 1993), and behavioral history (e.g., schedule history; Wanchisen, 1990). Applied behavior analysis increasingly draws on contemporary concepts in basic research (e.g., the matching law; see Epling & Pierce, 1983), undertakes functional analyses in both clinical and field settings (e.g., Kohlenberg & Tsai, 1991; O'Neill, Horner, Albin, Storey, & Sprague, 1990), and today entertains a more broadly ecological perspective (e.g., Schroeder, 1990). As for recent trends in conceptual analysis, these are the focus of this chapter, which addresses (a) the aim of behavior analysis, as it interrelates prediction-and-control with "understanding"; (b) the behavior-analytic unit of analysis, as it has progressed from a context-free stimulus-response psychology to a functionally-defined, context-dependent three-term contingency; and (c) the behavior-analytic worldview, as it has evolved from a mechanistic to a contextualistic perspective.

Skinner made fundamental contributions in each of these three areas (Skinner, 1938, 1945, 1947), but the received view sometimes misunderstands or misportrays them–these areas and Skinner's contributions (e.g., Mahoney, 1989; see Todd & Morris, 1992). The recent trends in behavior analysis addressed here clarify Skinner's contributions, as well as extend them, as the discipline continues to evolve in the post-Skinner era (see Table 1). Skinner (1938) himself expected no less of his own work: "It would be an anomalous event in the history of science if *any* current system should prove ultimately the most convenient (and hence, so far as science is concerned, correct)" (p. 438).

	Skinner's Contributions	**The Received View of Behavior Analysis**	**The Evolution of Behavior Analysis**
Aim	Prediction and Control	Arbitrary Control	Understanding
Progress	Three-Term Contingency	S-R Psychology	Context
Evolution	Radical Behaviorism	Mechanism	Contextualism

Table 1. The Aim, Progress, and Evolution of Behavior Analysis

The Aim of Behavior Analysis: Prediction-and-Control and Understanding

In 1892, William James wrote that the goals of the natural sciences were "practical prediction and control" and that, for psychology to become a natural science, these too must be its goals (James, 1892, p. 148)–and they became so. Prediction and control became the goals of a psychology that achieved independence from philosophy and a place in the culture of the United States through university and foundation support and from support from the culture at large (O'Donnell, 1985). This was the goal of Watson's (1913) behaviorism: "Its theoretical goal is the prediction and control of behavior" (p. 158).

Watson spoke about this goal in several contexts, in the beginning, for example, in the experimental analysis and synthesis of behavior (Morris & Todd, 1999). Later, however, he was remembered for addressing control in the context of social engineering, where it became a sometimes superficial criterion for the validity of behaviorism (see Buckley, 1989). Skinner, in turn, made prediction and control the often-stated goals of his science (see Lacey, 1979; Smith, 1992), but he extended their meaning beyond what we remember of Watson and pointed to still further implications.

The Science of Behavior

For Skinner, control had two interdependent referents. First, it described a fundamental assumption about behavior: Behavior is lawful and orderly, that is, controlled. Second, control is the general goal of behavior analysis, being common to the specialized goals of the three subdisciplines, but not in itself their goal (Morris, Todd, & Midgley, 1993).

The experimental analysis of behavior. In the experimental analysis of behavior, control is implicit in the very conduct of science. As Skinner (1953) put it:

> When we discover an independent variable which can be controlled, we discover a means of controlling the behavior which is a function of it. This fact is important for theoretical purposes. Proving the validity of a functional relation by an actual demonstration of the effect of one variable on another is the heart of experimental science. (p. 227)

The role of control is to discover functional relations, especially those with broad generality (i.e., principles of behavior), and then proving their validity through further experimental analyses (see Sidman, 1960). Control is thus a means to these ends, not an end in itself.

Applied behavior analysis. In applied research, Skinner (1972) pointed out that "…an important difference lies in the reasons why [basic and applied] research is undertaken and supported. The applied researcher...carries on, in part, because he will make someone healthier or wealthier rather than simply wiser" (p. 279). In other words, applied behavior analysis is not concerned with discovering principles of behavior, but with preventing and remediating behavior that has relatively immediate social importance. In this context, control refers to (a) empirical demonstrations that behavior-analytic techniques, procedures, and programs can prevent or remediate clinically significant behavior and (b) the discovery of variables of which this behavior is a function, so as to alter them and the behavior. Here, control is a means for making people healthier and wealthier–and wiser.

A finer distinction should be drawn between demonstrating and discovering controlling relations. Just because we can control behavior does not mean we understand it. The distinction depends on what we mean by "analysis" (see Pierce & Epling, 1980). "Analysis" may mean either (a) the experimental demonstration that behavior can be controlled (e.g., behavior modification) or (b) the experimental discovery of variables of which behavior is a function (i.e., functional analysis). Demonstration alone–that is, control without discovery–may sometimes be necessary, but the discovery of controlling variables is closer to what it means to understand behavior. Demonstrating control may promote the growth of behavior analysis, but discovery promotes its development.

The conceptual analysis of behavior. As for the conceptual analysis of behavior, Skinner (1947) implicitly addressed the role of control in this context by making the following distinction between basic and applied research: "We need not blush to express this [distinction] in rather general terms. The experimental psychologist is fundamentally interested in *accounting* for behavior, or *explaining* behavior, or in a very broad sense *understanding* behavior" (p. 26, emphasis in original). By accounting for, explaining, and understanding behavior, Skinner did not mean cataloging functional relations as "facts." Instead, he argued: "Behavior can only be satisfactorily understood by going beyond the facts themselves. What is needed is a theory of behavior" (p. 27). For Skinner, a theory was based on the analysis of behavior and environment in interaction (Skinner, 1950), for which control is a means to this end.

Skinner suggested still another goal in which control was embedded, this one concerning the behavior of scientists. In writing his book, *Verbal Behavior* (Skinner, 1957), he observed:

> I decided to leave out all experimental data. (An interesting question then arose: what survived to reinforce writing or reading the book?...My reinforcers were the discovery of uniformities, the ordering of confusing data, the resolution of puzzlement.) (Skinner, 1979, p. 282)

Discovering uniformities, ordering confusion, and resolving puzzlement are the consequences of problem-solving, decision-making, and intellectual self-management (see Skinner, 1953, pp. 227-294; 1974, pp. 113-131). These are the consequences of the control scientists exercise over the variables of which their own behavior is a function, and which are ultimately maintained by effective action with respect to their subject matter.

Conclusion: Control, Goals, and Pragmatism

Control, then, is implicated in the goals of behavior analysis, but not in the usual sense. First, it is a means for attaining the specialized goals of the discipline's three subdisciplines and validating their usefulness or "truth." This is a form of philosophical pragmatism in the tradition of Charles S. Peirce (1905). On this view, pragmatism is a matter of *finding* the truth of a "belief," finding it in a public, social, and objective manner. This is an operational theory of truth; its criterion is successful working. In behavior analysis, successful working is effective action or, more specifically, prediction-and-control (Hayes & Brownstein, 1986).

Second, control is a means by which scientists manage their own intellectual activities. This, too, is a form of philosophical pragmatism, but one closer to that of William James (1907), where pragmatism is a matter of *making*, not finding, truth. Here, the truth of a "belief" is found in its conceivable bearing on the private, personal, and subjective conduct of life. This is a coherence theory of truth; its criterion is qualitative confirmation. In behavior analysis, qualitative confirmation entails understanding behavior in terms of what else we understand about it, for instance, through coherent behavioral interpretation (see Morris, 1997).

When we examine the meaning of control in behavior analysis, we find that it is richer and deeper than what is usually suggested. It entails understanding–understanding grounded in effective empirical and conceptual action with respect to the science of behavior and the behavior of scientists. As Mach (1905/1976) once wrote: "The worth of scientific inquiry can be judged by the extent to which an investigator's behavior really leads to practical and intellectual advantages" (p. 11). Skinner was a philosophical pragmatist in this sense, which makes behavior analysis a variety of contextualism because, as described by Pepper (1942/1960), contextualism is another term for pragmatism. This is one sense in which behavior analysis is contextualistic in worldview (see Hayes, Hayes, & Reese, 1988; Morris, 1988, 1997) (see Table 2).

1. Pragmatic Criterion of Truth
2. Functional Relationships
3. The "Historic Event"
4. Context Dependency
5. A World View

Table 2. Five Senses of Contextualism

The Unit of Analysis: Contingencies and Context

Having introduced the aim of behavior analysis, I now turn to its unit of analysis. Here, I describe progress that has been made in moving from a stimulus-response psychology to a three-term contingency. In the latter, the terms are functionally related and context-dependent (see Morris, 1992).

Functional Relations

Prior to Skinner, behaviorism was largely a two-term, stimulus-response ($S \rightarrow R$) psychology, where stimuli lay in a causal relation to responses, linked by a one-way arrow through time and space. Skinner (1938) proposed instead a three-term contingency ($S^D \rightarrow R_o \rightarrow S^R$) among responses and stimuli that were functionally defined–and with functions different from those in the $S \rightarrow R$ unit. The consequent stimulus is a reinforcing stimulus (S^R) for responding (e.g., food, social approval). It is a cause of behavior, but not a push or a pull; rather, it selects behavior. The antecedent stimulus is a discriminative stimulus (S^D) (e.g., presence of conspecifics, gestures). It sets the occasion for responding previously reinforced in its presence, but does not physically impel it. The response is an operant (R_o) (e.g., bar pressing, verbal behavior), not a reflex. It acts on the environment, the consequences of which differentially affect its strength.

In behavior analysis, the events described by these three terms are defined in relation to one another; that is, they are functionally defined (Skinner, 1938). For instance, the function of a stimulus is defined by its relation to operant responding, not by its form (e.g., a smile may be either a reinforcer or a punisher). The function of a response, in turn, is defined by its consequences (e.g., either a temper tantrum or a verbal request may terminate a boring task). The three-term contingency, then, is better depicted as a three-term functional relation–$S^D \Leftrightarrow R_o \Leftrightarrow S^R$–not a linear cause-effect sequence (see Skinner, 1935). Construing behavioral relations in this fashion is a second sense in which behavior analysis is contextualistic (Table 2). Functional relations–not formal or mechanical ones–are categorical in contextualism.

Context

Whether the behavioral unit is a two- or a three-term contingency, neither unit explicitly includes terms to account for variability among their relations. Many behaviorisms handled this problem by expanding the $S \rightarrow R$ unit into an $S \rightarrow O \rightarrow R$ unit (see Woodworth, 1940), where the O stood for the organism. On these accounts, the link between stimulus and response was through a mediational or representational medium–mind, cognition, or affect–which in turn explained variability in their relation (see Beidel & Turner, 1986; Morris, Higgins, & Bickel, 1982a). This is cognitive psychology's unit as well, with the O standing for organicist schemas and structures (Piaget & Inhelder, 1969) or information-processing mechanisms (Baars, 1986).

Skinner (1931) handled the problem of variability differently. Before proposing the three-term contingency, he expanded his earliest unit of analysis, $R = f(S)$, into $R = f(S,A)$, where A referred to "third variables." Third variables were events, factors, and operations that changed the functional relations between stimuli and responses, and accounted for their variability. For Skinner (1931), these variables were largely "conditioning, drive, and emotion" (p. 454), but he included as well such factors as drugs and physical injury. What the O accounts for in cognitive psychology, third variables accounted for in Skinner's radical behaviorism.

By the end of the 1930s, Skinner no longer systematically included third variables in his unit of analysis, but instead dealt with them as particulars, and reconstrued his unit as the three-term contingency (see Coleman, 1984). This temporally ordered, linear sequence of events, however, could not—at least on its surface—account for variability in the relations among the events, that is, for individuality among them and changes within them (see Russo, 1990; Wasserman, 1981). There were no "third variables." Behavior analysis continued evolving, though, and new concepts took the place of third variables, among them, *setting events* (e.g., Bijou & Baer, 1978, pp. 26-28; Wahler & Fox, 1981; cf. Kantor, 1933, on setting factors), *establishing operations* (Michael, 1993), *conditional stimuli* (Sidman, 1986), and *history* (e.g., Wanchisen, 1990). For present purposes, I refer to these events, factors, and operations as *context*, which I parse according to their formal and functional relations to behavior, both along historical and current dimensions.

Formal relations. Both the organism and the environment have formal or structural characteristics that influence or *enable* what behavior *can* (or cannot) occur, some on account of historical context, some due to the current context. Phylogenic and biological histories account for structural differences across and within species (e.g., having opposable thumbs) and within individuals (e.g. brain damage) that influence what behavior can occur in what environments (see Skinner, 1966a, 1981). The formal possibility of behavior is thereby a function of current structural differences in biology (e.g., illness, physical disabilities) and the environment (e.g., architecture, ergonomics; see Nordquist, Twardosz, & McEvoy, 1991).

Functional relations. The functional relations within the three-term contingency are likewise affected by their historical and current contexts. Phylogenic and behavioral ontogenic histories influence or *establish* what unconditioned and conditioned stimulus and response functions *may* (or may not) occur, for instance, unconditioned respondents (e.g., the eye-blink reflex) and unconditioned reinforcers (e.g., food, water), as well as the basic behavioral processes themselves (e.g., operant conditioning). In turn, behavioral history (i.e., reinforcement history) accounts for differences with respect to acquired behavioral relations (e.g., conditioned stimuli and reinforcers, discriminative stimuli; see Barrett, 1986).

This historical dependency means that the functional relations within the three-term contingency are forever changing, as the present continually becomes the past for more present (Hayes, 1992). Behavior, then, is emergent from the ongoing interaction of organism and environment; behavior is an historical subject matter (Donahoe & Palmer, 1989). This is a third sense in which behavior analysis is contextualistic. The root metaphor of contextualism is just this—the ever-changing "historic event" (Pepper, 1942/1960, pp. 232-233) (see Table 2).

Given that phylogenic and ontogenic histories establish behavioral functions, the current context determines or *actualizes* which of them *will* (or will not) occur. For example, given that stimuli can and may have unconditioned reinforcing functions, or conditioned or discriminative stimulus functions, whether they will or not depends on such factors as establishing operations (e.g., deprivation; see

Michael, 1993) and conditional stimuli (e.g., rules; see Sidman, 1986). Context, so construed, is a fourth sense in which behavior analysis is contextualistic (Table 2). Stimuli and responses have no inherent or immutable functions; their functions depend on context.

Conclusion: Contingencies, Context, and Behavioral Systems

In being more explicit about the functionally-defined, context-dependent nature of the three-term contingency, behavior analysis acknowledges the interrelatedness of all the variables–contingencies and context–that affect behavior. If behavior is dependent on all of them, then no one of them is more important than any other, except perhaps on pragmatic grounds. That is, the effect of any independent variable is dependent on the presence and properties of all the other variables within a unit of analysis. Conceptualized thusly, the behavior-analytic unit becomes a behavioral system (Midgley & Morris, 1988; Moxley, 1987). It is a system of functional relations in context wherein the function of each variable changes as a function of ongoing changes in the others. This is a systems, ecological, or field-theoretic orientation to behavior (cf. Bernstein, 1982).

The World View: Mechanism and Contextualism

Finally, I turn to the behavior-analytic worldview, suggesting that it is evolving into a contextualistic perspective (Hayes et al., 1988; Morris, 1988, 1992). Here, I consider the evolution of science and the mechanistic and contextualistic worldviews, illustrating where features of the latter do and do not inhere in behavior analysis.

The Evolution of Science

As a whole, the sciences are alike in seeking an account of nature, all the while varying across several dimensions, most obviously with respect to their subject matter (e.g., physics, biology, psychology). They also vary in their evolution, both with respect to the accumulation of empirical content (Toulmin, 1972), as well as in their epistemology (see Popper, 1972) and ontology (Morris, 1997). Unlike epistemology, ontology is not taken to have an evolutionary course. However, as a summary description of what scientists explicitly or implicitly assume of their subject matter, ontology is subject to selection in terms of its consequences–the usefulness and effectiveness of the claims and the behavior. As such, it evolves. To support this assertion, I turn to three accounts of the history of science that converge on a common ontological lineage, as found in physics, psychology, and philosophy (Delprato, 1986, pp. 65-68; see Table 3).

One account of the evolutionary perspective I am suggesting is found in Einstein and Infeld's (1938/1961) description of the evolution of physics from substance theory, to the mechanical view, and then to field theory. A second account was offered by Kantor (1946), who described corresponding changes in science from the substance-property stage, to the statistical-correlational stage, to an integrated-field theory. The third is found in Dewey and Bentley's (1949) analysis of three "levels of action"–self-action, interaction, and transaction (see Pronko & Herman, 1982).

Physics	Biology	Psychology	Worldview
Formism	Vitalism	Self-Action	Organicism
Mechanism	Mechanism	Interaction	Mechanism
Field Theory	Systems Theory	Transaction	Contextualism

Table 3. The Evolution of Science

Integrating across these accounts, we have, in the first phase, physical events produced by their self-contained, self-actional substances whose inherent properties account for them. Examples of self-action include phlogiston in physics, vitalism in biology, and soul, psyche, and mind in psychology. In the second phase, we have the lineal, mechanical view of causal determinism, wherein independent causes lie in factors acting on dependent objects in absolute time and space. Examples of mechanism include the stimulus-response psychologies and the computational models of mind. In the third phase, events and actions are particular points in the ever-changing relations among their interdependent conditions, for instance, in the evolving relations within a field or system.

With these three descriptions of the evolution of science as precedents, we can conceptualize the world views described by Pepper (1942/1960)–organicism, mechanism, and contextualism–in a parallel fashion. This may, in part, explain an ongoing debate about whether behavior analysis is mechanistic or contextualistic (see Morris, 1993b, 1997), for the discipline is presumably still evolving.

Mechanism and Contextualism

As I pointed out, behavior analysis is already contextualistic in several respects. Its epistemological aim is fundamentally grounded in a pragmatic theory and criterion of truth, which are also contextualism's theory and criterion of truth–successful working (see Zuriff, 1980). Its unit of analysis is increasingly explicit in addressing functional relations, the current context, and the historically situatedness of behavior, the last being contextualism's root metaphor–the "historic event" (Hayes, 1992). Taken as a whole, these interrelated features make behavior analysis contextualistic, not mechanistic, in worldview.

Not all behavior analysts, however, disavow mechanism; some embrace it (e.g., Marr, 1993). For the most part, though, they advocate mechanism in the sense that to be a mechanist is to take behavior as a suitable subject matter for the natural sciences (see Zuriff, 1985, pp. 186-192). As Malone (1990) has stated: "The premise of *mechanism* is the assumption that explanations of natural phenomena must not refer to outside agents. This is what is meant by determinism in science... Every scientist must be a mechanist" (p. 45). There is no necessary harm in this. For instance, although physics has evolved through the three phases described above, mechanism is retained where it is effective enough, enough of the time, with middle-sized facts (e.g., in Newtonian mechanics). But where it must account for more molecular (e.g., quantum physics) or molar phenomena (e.g., relativity theory), and where we move from the subject matter of physics to biology and then to behavior, the scope of mechanism's effectiveness seemingly declines. Mechanism entails a metaphysic quite unlike behavior analysis in at least five ways (Morris, 1988, 1993a).

1. Mechanism adheres to associationism, elementarism, and reductionism, where putative basic behavioral atoms have immutable properties. In behavior analysis, however, responses and stimuli are not immutable in form; they are class concepts, functionally defined. Moreover, their functions are not inherent in their forms; stimuli and responses vary in function. The three-term contingency is a molar and inherently dynamic relation (Branch, 1977).

2. In mechanism, behavior change is little more than change in response form (e.g., temper tantrums). Behavior analysts, however, speak of change in "acts," for instance, in operant functional relations (e.g., communicative acts; see Lee, 1988), in addition to change in response forms.

3. Mechanism assumes contiguous cause-and-effect relations between S and R or between S, O, and R, whereas behavior analysis focuses on functional relations and interdependencies that may exist across spatial and temporal gaps. In a sense, behavior analysis is a theory of "direct action," that is, of unmediated functional relations (Costall, 1984; Morris, 2003).

4. Mechanism views change as continuous in a linear sequence of cause and effect. In behavior analysis, however, the emphasis is on the evolving relations within the three-term contingency–relations that may be qualitatively reorganized to the point of producing emergent relations (Krapfl, 1977).

5. Mechanism takes behavior to be an inherently passive phenomenon–dependent on stimuli. The three-term operant relation, in contrast, is a unit of analysis in which the functions of stimuli and responses for one another are co-defining, context-dependent, and ever-evolving.

Summary: Evolution and the Death of Behaviorism

Like its subject matter, then, behavior analysis is also subject to a selectionist account. That is, it is evolving as a discipline in its empirical content, epistemology, and ontology. It was never foreordained or forever. Skinner's philosophical pragmatism and empirical epistemology would not have countenanced that (see Hackenberg, 1988; Smith, 1986, pp. 259-297). Indeed, as Skinner himself once observed:

> Behaviorism, as we know it, will eventually die–not because it is a failure, but because it is a success. As a critical philosophy of science, it will necessarily change as a science of behavior changes... (Skinner, 1969, p. 267)

Conclusion

In this chapter, I have described three modern trends in behavior analysis, focusing primarily on the conceptual analysis of behavior: its *aim* in understanding behavior, its *progress* in developing a context-dependent unit of analysis, and the *evolution* of its contextualistic perspective. These are just observations. Indeed, to prejudge the truth about how the aim of behavior analysis must be described, how its unit of analysis must be depicted, how its world view must be conceptualized, or how all three must evolve would be the antithesis of a behavior-analytic perspective. Nonetheless, the extent to which the aim, progress, and evolution of behavior analysis resonates to contextual themes affirms the validity of the changes within them. These changes, in turn, strengthen and are strengthened by their integration with one another. As a result, the emerging trends contribute to behavior analysis as a whole in ways that are greater than through the sum of their parts.

As these trends become better recognized, important commonalities might be discerned in the relation between behavior analysis and like-minded perspectives in the natural and social sciences and the humanities. Behavior analysts may then join, and be joined by, other scientists and scholars seeking to understand behavior, solve clinical and community problems, and clarify long-standing conceptual issues. Among the perspectives where commonalities can be noted are analytic philosophy (Day, 1969a), cultural anthropology (Glenn, 1988), developmental systems (Midgley & Morris, 1992), ecological approaches to cognition (Leahey, 1992a, pp. 467-468), evolutionary biology (Catania, 1997), existentialism (Fallon, 1992), feminism (Ruiz, 1995), hermeneutics (Miller, 1994), linguistics (Andresen, 1990), memory (Watkins, 1990), parallel distributed processing (Donahoe & Palmer, 1994), perception (Costall, 1984), phenomenology (Day, 1969b), philosophy of science (Batts & Crawford, 1991), pragmatism (Moxley, 2002), and some forms of post-structuralism (Freeman & Locurto, 1994) and social constructionism (Guerin, 1992) (Morris, 2003; see Delprato, "Converging Movements in Psychology," this volume).

Behavior analysis is not, of course, consistent with every facet of these perspectives. However, exploring the points of congruence might contribute to the evolution of a natural science of behavior by producing variants on which selection-by-consequences may operate. Skinner said this first in his analysis of cultural practices (Skinner, 1953, pp. 415-449; 1971). I make over one of his observations into a comment about scientific practices and the survival of a science of behavior. After changing some of Skinner's (1953) words for my own, his observation reads as follows:

> Since a science of behavior is concerned with demonstrating the consequences of [scientific] practices, we have some reason for believing that such a science [of behavior–one that is concerned with demonstrating the consequences of scientific practice] will be an essential mark of the

> [science or sciences] which survive. The current [science] which, on this score alone, is most likely to survive is, therefore, that in which the methods of science are most effectively applied to the problems of [scientific] behavior. (p. 446)

Whether the recent trends in the conceptual analysis of behavior described in this paper are effectively applied to the problem of scientific behavior remains to be seen. Where they are applied, the product may bear some semblance to interbehavioral psychology (Midgley & Morris, 1988; Morris, 1982, 1984; Morris, Higgins, & Bickel, 1982b; see Kantor, 1970; Moore, 1984; Mountjoy, 1976).

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Commentary on Morris

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Until the early 1960s, when behaviorism was identified with learning theories, scientific efforts were directed at the construction of a system or theory of behavior (Guthrie, 1952; Hull, 1943; Mowrer, 1960a, 1960b; Skinner, 1938; Tolman, 1932). The logical strategy that followed proved ultimately unsatisfying, however, and the behaviorism that followed took two different routes: (a) increased emphasis was placed on data-collection procedures and experimental technology but with minimal theoretical involvement (Ferster & Skinner, 1957) and (b) explicit cognitive theories of animal behavior were formulated that bridged the differences between animal and human processes (Festinger, 1961; Mackintosh, 1965).

In this crucial moment, the scientific endeavor of the last great behaviorist, B. F. Skinner, and his followers inadvertently changed from behavior theory to behavior analysis. This radical move was facilitated by Skinner's own personal opinions regarding theory (Skinner, 1950) and by the technological paradigm underlying his conception of science, which looked to prediction and control (Smith, 1992). Behavior analysis emerged around the 1960s as a powerful experimentally-validated methodology that could be applied to diverse social and natural problems involving the behavior of individual organisms. The birth of the *Journal of the Experimental Analysis of Behavior* and the *Journal of Applied Behavior Analysis* certified the transformation of behaviorism as a theory about behavior into a methodology and a technology oriented to behavior, its change, and its maintenance. This pragmatic orientation produced a growing divorce between theory-based experimental research and the design of procedures with applied purposes (see Ribes, 1977).

With its basis in the three-term contingency, behavior analysis has recurrently searched for the foundation of its research strategies (Hayes, Hayes, & Reese, 1988) and for the logical role of different operations and procedures (Michael, 1993; Schlinger & Blakely, 1987; Sidman, 1986). Nevertheless, the theoretical analysis of basic concepts and the systematization and explanation of central phenomena of operant behavior have been scarce (Schoenfeld, 1966). The contribution by Morris is an attempt to look for theoretical grips that may give sense and logical consistency to the experimental and applied work done under the methodological umbrella of behavior analysis.

Elsewhere, I stressed the differences between J. R. Kantor's and B. F. Skinner's contributions to the construction of psychology as the science of behavior (Ribes, 1984):

> ...while J. R. Kantor was concerned with the formulation of the paradigmatic structure of psychology, Skinner was concerned with the development of an experimental technology powerful enough to produce valid and reliable data... ....Paradoxically, nevertheless, the incredible amount of systematized and contrastable data generated by the normal science procedures of the experimental analysis of behavior allowed for the emergence and recognition of contradictions and anomalies framed by conditioning theory. (p. 571)

Recently, some behavior analysts have shown an unusual interest in identifying the philosophical framework of so-called radical behaviorism or behavior analysis (Hayes, Hayes, & Reese, 1988; Hayes, Hayes, Reese, & Sarbin, 1993; Morris, 1993). In particular, contextualism (Pepper, 1942, pp. 232-279) has been advocated as its philosophical foundation, both in terms of its world conception (i.e., the historical act) and its theory and criterion of truth (i.e., pragmatism). The adoption of contextualism, unsuspected twenty years ago, may be due to two facts: First, Skinner's "philosophical" papers merely amounted to hermeneutic exercises employing the terminology of operant conditioning in relation to biological analogies (e.g., survival, adaptation, selection, evolution, etc.); second, behavior analysts forgot the original sources of historical behaviorism, not only in reference to the use of concepts, experimental findings, and observations, but also in regard to the basic assumptions that grounded modern behaviorism (Holt, 1915, 1931; Hull, 1937; Tolman, 1922/1951; Watson, 1924; Weiss, 1929). It would be naive to assume that univocal relations may be identified between general or particular philosophical approaches and behaviorism. Behaviorism can be traced back to varied philosophical approaches: phenomenology (Day, 1969; Fuentes-Ortega, 1986), original Aristotelian thinking (Kantor, 1969), dialectical materialism (Kvale, 1976; Reese, 1993), Bacon's empiricism (Smith, 1992), and so on. Schoenfeld (1983) identified some of the fundamental influences of historical behaviorists. Since behaviorism can be traced back to different, and not always compatible, approaches, the main concern for behaviorists should be to conceive again of behaviorism as a philosophy of psychology, irrespective of the various converging historical and present influences. To look for a univocal philosophical framework for behaviorism would be as misleading as looking for a philosophical framework for mechanicism. Behaviorism and mechanicism are some of the philosophical frameworks of psychology and physics, respectively.

J. R. Kantor clearly formulated a metatheory of psychology in two of his writings: *Principles of Psychology* (1924, 1926) and *Interbehavioral Psychology* (1959) and, in doing so, defined (a) what he correctly called psychological behavior and (b) the conceptual logic required to deal with this subject matter.

Behaviorism, itself, never dealt adequately with the definition of behavior. Watson's (1913, 1924) conception of behavior–as what people say and do–was only a valuable intuition delimiting psychological behavior from transcendental constructions. Kitchener (1977) identified a great variety of definitions of behavior among various theorists and contributors to behaviorism. These definitions seemed to fit the specific problems being dealt with, without taking into account the general epistemic domain distinguishing psychology from other scientific disciplines. Eventually, behaviorism adopted the conditioning paradigm (Skinner, 1931, 1938; Watson, 1916) as the logical and conceptual framework for the new science, a paradigm that was borrowed from physics and biology but foreign to the subject matter of psychology (Ribes, 1985, 1986, 1996).

Kantor distinguished psychological behavior from other behaviors (e.g., physical, chemical, biological). Psychological behavior could be characterized by its: (a) variability, (b) differentiation, (c) modifiability, (d) integration, (e) delay, and (f) inhibition. In Kantor's conception, the subject matter to be studied is the relation between the response functions of an individual organism and the stimulus functions of an individual stimulus object or event. From this perspective, the individual's or organism's behavior, per se, pertains to the domain of biology. Psychological behavior includes both the environment's and the individual's behavior.

Since psychological behavior, or interbehavior, consists of an interaction, no one of the individual components of the interaction may be part of its own explanation. Kantor's logic of description and explanation radically departs from that usually developed in the frame of the three-term contingency. The field concept provides a logic for describing and explaining stimulus-response functions in relation to the additional factors and dimensions that delimit the behavior segment. Explanation does not rest in a single dominant variable like reinforcement but rather as the interdependencies of the factors in a field. In addition to the stimulus-response function–including its necessary referents: the organism, reactional systems, responses, stimulus objects, and stimuli–the logical categories describing an interbehavioral field are the medium of contact, field boundary, and setting factors, which include situational events and interbehavioral history.

Whereas these factors deal with what behavior analysts ambiguously refer to as contextual variables, for Kantor they referred to different functional categories of interactants. The medium of contact describes the enablers of the interactions (e.g., the physio-chemical, ecological, or conventional dimensions of the situation). The field boundary describes the extent to which a particular interaction overcomes the physical circumscription in which it takes place. And, setting factors include the facilitating and\or interfering variables that influence specific interactions. These variables may refer to the organism's states, to the environment's states, or to the history of interaction of the organism. The logic of these factors is comprehensive of any functional relation to be described and resorted to in accounting for any psychological phenomenon.

If behavior analysts could turn their eyes to this indigenous model for describing psychological behavior, the search for philosophical frameworks, the ambiguous use of ad-hoc terms, and the adaptation of misleading models borrowed from other disciplines might fade away.

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Commentary on Morris

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Anyone who has traveled with young children is aware of how long such a journey can seem for both adults and children. Depending on one's perspective, even an objectively short distance can seem either an eternity or all too brief. The progress of behavioral science can sometimes be seen in a similar light. In his chapter, Morris elegantly and succinctly describes an analogous journey in behavior analysis, and it also can be seen from at least two perspectives. One perspective is a more conservative, step-by-step approach wherein some scientists and philosophers cautiously embrace new developments and concepts only after much empirical investigation and debate. The other perspective, no less valid, is one in which limitations of the current model are addressed conceptually by scientists and philosophers who wish to "push the envelope" of the discipline. These two perspectives are not meant as pejorative contrasts or to imply the superiority of one over the other. Rather, we simply acknowledge that they exist and note that scientific advances emerge in part from some resolution of the two. Indeed, this is much the sense that one gains from reading Kantor's (1970) friendly critique of the experimental analysis of behavior, in which he challenged behavior analysts to expand their inquiry to include more of the behavioral field and to give a natural science account of memory, perception, cognition, and emotion.

Morris, too, has been a persistent proponent of conceptually expanding behavior analysis, his writings informing us of the rich, sometimes controversial, history of the field (e.g., Morris, 1982). In the current chapter, he argues that behavior analysis, in general, as well as the branches for basic, applied, and conceptual analysis, in particular, have made substantial progress. The classical behaviorism of Watson began as an environmentally limited, mechanistic model in which certain definable events (stimuli) caused other events (organismic responses). A conceptual and methodological shift occurred with Skinner's operant model and that of his successors. Cause-and-effect was replaced by functional analysis of the relations between environmental events and behaviors. These relations were synthesized into a comprehensible and comprehensive conceptual model, in which the two-term model (S-R) was replaced with a three-term model: S^D - R - S^{R+}. Further advancement occurred with the integration of a contextual factor, making it at least a four-component model: Surrounding Context - S^D - R - S^{R+}. This expansion was anticipated by Skinner's (1931) own "third variables" and, especially, by the later incorporation of elements from Kantor's (1959) interbehavioral psychology, such as setting events and interbehavioral history. Subsequently, others elaborated and clarified this contextual expansion (Baer, Wolf, & Risley, 1987; Brown, Bryson-Brockman, & Fox, 1986; Kantor, 1970; Michael, 1982; Morris, 1982; Wahler & Fox, 1981).

While acknowledging and briefly documenting progress in basic and applied behavior analysis, Morris analyzes contextual trends, focusing primarily on the expansion of conceptual analysis. He makes a rather convincing case that behavior analysis has expanded to include variables such as setting events, establishing operations, and interbehavioral history. To some degree, he provides evidence that these factors have begun to find their way into basic and applied research. Figuratively speaking, Morris might say that, given where and when this journey began, we have come a long way in a relatively short time.

At this point, however, we become less sanguine and, like children on that long trip, we have to ask, "Are we there yet, daddy"? Indeed, the persuasiveness of Morris' chapter reminds the reader of what has been accomplished in conceptual analysis but also of what has been and, to a large extent, continues to be missing from contemporary basic and applied behavior analysis. Beyond periodic theoretical discussions of contextual variables (e.g., setting events, establishing operations, motivational operations), an evolving contextual perspective should be driven by empirical investigations of contextual factors, not simply by conceptual analysis. Such an empirical agenda, we believe, has been and remains limited. We focus the remainder of our comments specifically on the applied realm.

Our quick perusal of the *Journal of Applied Behavior Analysis* indicates that, in its three cumulative indices (1968-1977, 1978-1987, 1988-1997) and individual journal indices (1997 - present), the total number of articles indexed as referring to setting events, setting, or contextual factors was three, two, and five, respectively, with no listing since 1997. In the same time period, another 37 articles dealt with a related concept, establishing operations (Michael, 1982), with 24 of these articles occurring within the past 6 years. Although an increasing trend may be discerned, the list of only 47 articles in 35 years is not compelling. It clearly represents a miniscule proportion of the published articles.[1] In addition, unquestionably, the more recent literature has moved from examining context from a broader interbehavioral perspective, typically referred to as setting factors or setting events, to the more narrow perspective of establishing operations.

Our concern, however, rests not only on the narrow conceptual direction or the paucity of articles that have investigated contextual factors. It also extends to the methodology used to identify and evaluate their function. One of the significant contributions of behavior analysis has been the careful measurement and control of variables. Operational delineation of variables, direct measurement of behavior, and systematic manipulation of independent variables have led to clear statements of how specific changes in target behaviors are related to specific changes in antecedents and consequences. This, in turn, has led to a clear and cohesive conceptual model.

Few investigators, though, have studied contextual factors with the explicit purpose of analyzing their role in the determination of behavior (Conroy & Stichter, 2003). Even fewer investigators have included measurement operations and experimental methods that clearly delineate the function of setting events (Conroy & Stichter, 2003; Davis & Fox, 1997). What is needed are not simply more studies on contextual factors but more studies that provide: (a) clear definition and measurement of antecedents and consequences, as well as of a target behavior; (b) experimental demonstration of a specific functional relation between antecedent, behavior, and consequence (A-B-C unit); (c) clear definition and measurement of a contextual factor; and (d) systematic manipulation of at least two levels (e.g., presence/absence) of the contextual factor while the A-B-C unit continues to be measured (Baer et al., 1987; Conroy & Stichter, 2003; Fox & Conroy, 1995; Mahon, Shores, & Buske, 1999). Such information would enable investigators to evaluate whether changes in contextual conditions increase or decrease: (a) the action of particular consequences to reinforce (or punish) particular behaviors or (b) the ability of certain antecedents to occasion or elicit specific behaviors (i.e., a setting event function of contextual factors).

With the advent of smaller, portable, and more powerful computers, the technology to achieve this level of analysis is available in the form of real-time complex observation systems (see, e.g., Tapp & Wehby, 2000). In addition, descriptive (correlational) and experimental (reversal) designs can be used in a complementary way to elucidate further the operation of contextual factors (Baer et al., 1987; Fox, 1990; Fox & Conroy, 1995; Stichter, Conroy, & Boyd, in press; Wahler & Fox, 1981). But, this area of research will not be easily or quickly accomplished. Some important contextual factors (e.g., marital conflicts, intimate conversations of teenagers, parental abuse of a child) will be difficult to measure directly, and perhaps even less amenable to direct manipulative control.

The expansion of behavior analysis continues. For behavior analysis to grow further and address the confrontable phenomena of behavioral fields, empirical analysis must keep pace with developments in conceptual analysis. This is best accomplished by staying close to our empirical roots and developing a database of contextual factors that, in turn, mutually informs and shapes the contextual-behavioral conceptual model.

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Endnote

[1]We understand that our analysis is not a complete, systematic review of all published articles. Nevertheless, our simple and straightforward analysis serves to illustrate our point that studies of setting events, contextual factors, etc. are not prevalent in the major publication organ of applied behavior analysis.

Appendix

Bibliography of J. R. Kantor's Published Work

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In addition to the publications listed here, Kantor was founder of *The Psychological Record* and served as its chief editor from March 1937 to October 1945, volumes 1-5. Although his dissertation was never published, it is included here in order to provide all of his completed works. His papers are available at the Archives of the History of American Psychology at The University of Akron in Akron, Ohio.

Those articles that appear in collections of Kantor's works are marked [AP] for *The Aim and Progress of Psychology and Other Sciences* and [SW] for *Selected Writings in Philosophy, Psychology and Other Sciences*. Works that appear under one of his two pseudonyms, Observer and Mitsorg, are so marked, as are the two instances in which he collaborated with a second author and in one instance with two. All of the Observer and Mitsorg articles are available in the collected *Psychological Comments and Queries*, which was also the name of the series in *The Psychological Record* under which "Observer" wrote.

The items are arranged in chronological order. Entries with split years are placed at the end of the list for those with the earlier date of the split (e.g., 1922-23 is at the end of the 1922 entries, and dual volumes of 1963-69 appear at the end of the 1963 list). When more than one item appears in the same journal in a given year, page numbers are used for the continuing chronology. When more than one appears on the same page they are listed in the order in which they appear on that page. When items appear in different journals in the same year, the journal titles are alphabetized; and books (and dissertation) precede journals. In the case of a chapter in a book, the book title is treated as a journal title. This arrangement is slightly complex but preserves the chronology within journals of each year as well as between years.

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Endnote

[1]The *Mexican Journal of Behavior Analysis* is also titled *Revista Mexicana de Análisis de la Conducta*.

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