Some Reciprocal Roles between Behavior Analysis and Institutional Economics in Post-Darwinian Science

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Behavior analysis and institutional economics are viewed as having common origins in the early 20th century effort to benefit from the conceptual revolution spurred by Darwin's synthesis. Institutional economics, initiated by Thorstein Veblen, appears to have failed to develop a progressive scientific technology, while behavior analysis has done so. It is suggested that institutional economics has been held back by lack of a synthesizing scientific mechanism that elucidates the relation between technological and ceremonial processes, the two cultural forces described by Veblen. The theory of institutional economist C. E. Ayres, built on Veblen's distinction, is used to clarify the concepts of technological and ceremonial processes for the reader. An analysis of the behavioral processes that might underlie the cultural processes described by Veblen/Ayres suggests that the experimental analysis of behavior has provided concepts that might function as a synthesizing mechanism for the social sciences and, in particular, institutional economics. The Veblen/Ayres dichotomy, now seen in terms of underlying behavioral processes, is used to examine the field of behavior analysis in terms of its origins, its relation to psychology and its current state. The paper concludes with a few practical suggestions as to how behavior analysts might work to enhance survival.

Darwin's scientific synthesis (1859) of biological phenomena via the concept of natural selection created a cultural crisis comparable, perhaps, only to that which precipitated the Copernican revolution. The scientific power of the concept of natural selection lay in the fact that it provided a mechanism¹ for the evolution of biological structures and functions that cumulatively led to the differentiation of species from common ancestors. Biological phenomena could now join inanimate matter as amenable to scientific study without recourse to explanatory concepts outside the natural universe.

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¹ Throughout this paper the term *mechanism* is used, somewhat metaphorically, to denote a common process underlying a group of phenomena that become conceptually linked or "bundled" with elucidation of the mechanism. The discovery (or invention) of such scientific mechanisms seems to involve the re-bundling of events along functional dimensions where previous conceptual groupings had been along structural dimensions only.

Darwin's inclusion of the human species in the evolutionary process at once liberated scientific imagination about human affairs, but also set in motion counter-scientific cultural forces, as has been documented by numerous biographers and historians (e.g., Glick, 1974; Himelfarb, 1959/1962).

The crisis-producing nature of Darwin's synthesis lay in its threat to established pre-scientific conceptions of the place of human beings in the universe of nature. Until Darwin, even the naturalists, whose scientific interests centered on the earth and its creatures, did not consider their science applicable to the human species. Scientists and non-scientists alike were deeply affronted by the image of themselves as simply one more species owing its existence to the vagaries of some blind environment.

Despite the affront, the intellectual power of Darwin's careful argument was compelling to at least a few of his contemporaries (Irvine, 1955). Their vociferous support appears to have had three outcomes. Of most immediate scientific relevance, the defenders of Darwin served to maintain scientific interest in the concept of natural selection until further confirmation was obtained. Another out-

come was the positive effect on the behavioral and social sciences to be discussed below. Less positive, however, was the emergence of the doctrine of Social Darwinism, represented by a plethora of untenable extrapolations on the meaning of Darwin's concept as applied to human affairs (Barzun, 1941).

The positive effects of evolution on the biological and social sciences was their adoption of the notion that human activity is orderly and understandable within the framework of a natural science, even without appeal to natural selection as an explanatory concept. The notion of evolution, if not natural selection, remained prominent in an astonishing array of creative work that emerged during the first half of the 20th century. Revolutionary concepts and syntheses in virtually every field of human behavior marked a transition from pre-scientific to a scientific conception of human activity.

Some efforts seem more successful than others. Montessori (1955) in education and Piaget (1950) in psychology could not give up teleology. Dewey (1925, 1928, 1949) appears to have come remarkably close to an intuitive understanding of the interactive process underlying behavioral development. Watson (1924) successfully directed attention to behavior as a phenomenon worthy of scientific study in its own right. Mead (1934) dealt with concepts of mind and self without reverting to Cartesian dualism. Veblen (1898, 1919) provided a post-Darwinian conceptual framework for economic activity. Freud (e.g., 1957, 1966) offered a perspicacious grasp of the interplay of phylogenetic and ontogenic sources of human behavior, but he also created a mentalistic superstructure that was especially unfortunate. And, without recourse to mentalism, J. R. Kantor (1924, 1926) did develop a sophisticated theoretical framework for a science of behavior, a system similar in many ways to Skinner's radical behaviorism (cf. Morris, 1982).

Despite the conceptual creativity characteristic of this period, the third quarter of the 20th century brought an intellectual backlash of significant proportions. A growing trend in the behavioral and

social sciences has been to invent constructs that are the functional equivalents of ghosts and gods, minds and wills, to explain behavior. How can we account for the retreat from the conceptual progress made in the early 20th century? I propose two reasons. First and most important, the absence of a commonly understood mechanism underlying human behavior among the earlier writers (e.g., Dewey, Veblen, and Kantor) prevented the synthesis needed for a science of behavior to go forward. Second, the oppositional flow provided by cultural counter-forces has blocked the scientific movement. Behavior analysis, however, also within the intellectual tradition of the first half of the 20th century, but unlike the other great beginnings, appears to thrive. This is so, perhaps, because behavior analysis provides the missing mechanism that accounts for its growth—the contingency of reinforcement. With that mechanism, behavior analysis can provide the basis for conceptual synthesis among the sciences dealing with human behavior, and revitalize those whose earlier beginnings were so promising. To exemplify this possibility, I describe the contributions behavior analysis can make to the field of institutional economics and, in turn, how institutional economics can enlighten the current and future evolution of behavior analysis.

INSTITUTIONAL ECONOMICS AND THE VEBLEN/AYRES DICHOTOMY

Institutional economics grew from the work of Thorstein Veblen (1898/1919) who argued that classical economics failed to address, or even recognize, the fundamental nature of economic activity, which is evolutionary in character. Veblen broadened the concept of economic activity to include all the behavior that cumulatively led to cultural complexity. He explained evolving economic activity, and the concomitant cultural growth, as a bootstrapping operation, parallel to the evolution of biological creatures over time.

Veblen (1899/1934) dichotomized cul-

ture into two opposing processes that have been termed *technological* and *ceremonial*. According to Lerner (1948), Veblen equated the technological process with science, "the matter of fact," tool development, and the concept of cause-and-effect. The ceremonial process was equated with animism, superstition, magical powers, privileges of status, and empty tradition. Economic progress was a function of technological development, but also systematically restrained by ceremonially maintained social institutions.

Veblen's vision has been explored and extended by a group of economists who stand in relation to classical economics much as behavior analysts stand to contemporary psychology. A key figure in the history of institutional economics is Clarence Ayres, whose erudite and thoroughly readable book *The Theory of Economic Progress* (1944/1962) is recognized as "the last major theoretical publication in the field" (Sturgeon, 1984). Ayres appears to have taken the theoretical position as far as it could go in the absence of a synthesizing mechanism that would allow further scientific development. As mentioned earlier, behavior analysis provides such a mechanism, but before describing how it does so, I briefly present the key points in Ayres's analysis.

Ayres's central thesis is that classical economics, the science of price, is bound to a theoretical framework derived from pre-scientific conceptions of human behavior. The reciprocal nature of buying and selling allows for a conception of economics as a kind of homeostatic process balanced on the fulcrum of "value." And value in classical economics had its theoretical origins in a teleological, and rational, account of human activity. Ayres points out that the classical conception derived from 18th century efforts to incorporate the natural science of Newton into the faith of medieval fathers. In the absence of a scientific concept of man, classical economics was born, a hybrid created by grafting together the concept of "the laws of nature" (i.e., universal relations in nature described in this case by Galileo, Newton, et al.) and the concept of Man-For-Whom-Nature-Was-In-

tended.² Thus, the pre-scientific concept of man was altered to fit exigencies occasioned by Galileo and Newton; likewise, those concepts derived from a naturalistic approach to inanimate nature were twisted to fit fundamental assumptions about human nature that inhered in prevailing concepts not yet challenged by the assumptions of natural science.

Ayres's analysis of the intellectual origins of classical economics reflects the previously described antithetical cultural processes of technological and ceremonial behavior. Ayres defines technology as "all human activities involving the use of tools." Tools are, in slightly revised terminology, any and all physical products of behavior-operating-on-the-environment: shovels and steam engines, violins and musical scores, calculators and pages of mathematical formulae, paintbrushes and instructions for mixing colors, operant chambers and publications on the science of behavior. These response products provide the environment out of which the next generation of tools will be formed. This evolving process is economic progress. Ayres unequivocally states that it is not the "nature of man" that progresses with successive generations, but the tools of successive generations. This point can be readily understood if one imagines finding and bringing to birth a frozen embryo left over from the days of ancient Greece. There is no reason to believe that the resulting individual reared in 20th-century America would be any less competent in dealing with 20th-century tools than with Athenian tools. On the contrary, such a person would be in a position to behave, intellectually and manually, in ways that would have been impossible for that person in ancient Greece because the enabling environment was absent.

² Even today, and even in the physical sciences, students have difficulty grasping that nature does not "follow the laws of nature" and that natural laws are simply descriptions of apparently universal functional relations. The earlier way of thinking is much less readily recognized in, for example, linguistics, where the child is thought to be following innate "laws of grammar" as language is acquired.

The other kind of behavior fostered and maintained by cultures is ceremonial behavior, which is intimately associated with "status, mores, and legendary beliefs" and which does not build on itself. Ceremonial behavior tends to be static, resistant to change, and when widespread establishes institutional patterns that bind the culture to the past. Three of society's oldest institutions—the family, the church, and the state—exemplify, and maintain, ceremonial behavior. The social function of all three is the investiture and transmission of power and status.

In summary, technological behavior is the foundation of economic progress, while ceremonial behavior is the stumbling block, built of legends and mores that mitigate against the evolution of culture. Ceremonial behavior changes only when it must be revised to keep up with changes in the environment produced by technology; it does not evolve from earlier forms of ceremonial behavior. One of the best examples of Ayres's brilliant analytical abilities is his answer to the question: Why did the industrial revolution take place in western Europe? Many co-existing cultures had technologies as well advanced as western Europe. In fact, the technologies of those older civilizations were carried to the frontier of the ancient world—western Europe. The pioneers also carried their ceremonial behavior with them, but it did not fare so well when pitted against the institutions of western Europe. The rich technological endowment in an institutionally fluid culture resulted in the rapid evolution of European civilization.

Ayres elaborates his evolutionary economics, relating it to standard economic concepts such as consumption, production, value, and price and, briefly, to the history of ideas and the philosophy of pragmatism. For present purposes, however, the above summary will suffice. The point of the rest of the paper is to demonstrate how concepts derived from the experimental analysis of behavior may be used to understand the mechanism underlying technological and ceremonial processes, and how the field of behavior analysis might view its evolution as a cul-

tural process involving technological and ceremonial contingencies.

BEHAVIOR ANALYSIS OF THE VEBLEN/AYRES DICHOTOMY

From a behavior analytic framework, Ayres's economic progress is the result of operant behavior reinforced by its response products—tools—which function as reinforcers primarily because they make the environment more responsive to human behavior or, conversely, because they make human behavior more effective in subsequent environments. Whether controlling the environment is an unlearned reinforcer or a conditioned generalized reinforcer, such consequences do appear to shape and maintain exquisitely refined topographies and stimulus control relations.

The increasing complexity of tools enabled and required increasingly complex behavioral relations between people and their environments. For example, the invention of written symbols corresponding to the sounds produced in speech complicated the environment tremendously. The new tool required the behavior of reading, which effectively allowed the dead to control the behavior of the living and the living to control the behavior of others spatially separated from them. As tools became more complex, education must have become more important. The young had to be instructed, and early stages of technological behavior in the young had to be maintained via contrived, socially mediated, reinforcers. The importance of rules must have grown as accurate descriptions of predictable relations between behavior and its products became increasingly necessary to maintain technological behavior. From this vantage point, modern science appears to have emerged when technology became complex enough to provide the occasion for statements about universal relations that obtain in the world of nature.

Along with the importance of rules came the importance of social reinforcement to bridge the temporal gap between the behavior of following rules (or their

truncated version, instructions) and the eventual consequence which was often not able to function as reinforcement because of impeding temporal relationships. Social reinforcement serves a progressive function when it is closely related to technological competence or has its roots in phylogeny (thereby holding people together in social units long enough to enable technological development). However, it serves a retrogressive role when it is tied to ceremonial behavior because ceremonial processes provide institutional resistance that suppresses economic (technological) progress.

In contrast to technological behavior, ceremonial behavior is not maintained by changes in the inanimate environment; nor is it maintained by the immediate uncontrived effects of certain social reinforcers (e.g., affection); nor is it maintained by contrived reinforcers that ultimately relate to technological behavior and its consequences. Rather, ceremonial activities are held together by social reinforcement unrelated to consequences deriving from the uncontrived relations between behavior and the environment, including the human environment. From whence, then, might the social consequences maintaining ceremonial behavior have derived their reinforcing function? The power of social reinforcement in ceremonial behavior may have emerged historically for those who abstracted rules from the contingencies in the natural environment. These rules must have been very important to progress, and individuals who formulated them probably acquired status that later broke from its original relation to technological behavior. Another source of status may also have emerged for those who accurately predicted future events, based either on rules (rule-governed predictions) or on unexamined responsiveness to the unspecified contingencies (contingency-shaped predictions).

People able to abstract useful rules and predict future events seem to possess magical powers, attested to by the awe and mystery with which we view "the human mind." The functional analysis of the verbal behavior involved in ab-

stracting rules and predicting events was not undertaken until mid-20th century, and even our technologically advanced society has difficulty understanding the functional equivalence of verbal and non-verbal behavior. The attribution of important powers to those able to predict natural occurrences, and those able to formulate rules leading to productive behavior, may have led to their acquiring generalized social control. For example, in our own century, the great technological achievements of Albert Einstein have led many to pay closer attention to his views on human behavior than those views may merit in terms of their usefulness.

Status may also have derived from the control certain people had over the behavior of others as a result of fortuitous personal characteristics. When people who were exceptionally strong, intelligent, or attractive learned to commandeer the technological behavior of others in asymmetrical relationships, the stage was set for the emergence of ceremonial power. Once status, or the power to control the behavior of others through social reinforcement (independently of the usefulness of the behavior to the one behaving) has been acquired, persons with such social reinforcing power would likely be highly inclined to maintain the status quo. Curiously enough, those without much status are also likely to find a threat to the status quo aversive. The reason for this may be that many of their own reinforcers have been mediated by those having status—parents, teachers, supervisors, bullies, and gatekeepers of all kinds. Disruption of the status quo would threaten the contingencies maintaining large portions of their behavioral repertoires. Those whose behavior is kept in place by status-derived social consequences "wouldn't know what to do" in the absence of those contingencies.

In whatever way some individuals acquired control over the behavior of others and the consequences deriving from that control, institutionalization of control was required if it were to be maintained. The rules emerging from ceremonial behavior function, then, to

maintain the status quo. If technology threatens to disrupt the status quo, rules that have the effect of suppressing technology will be devised. These rules are not abstracted from uncontrived contingencies but harken back to age-old authority, and the behavior under their control is negatively reinforced by the keepers of the mores.

The ceremonial process, then, not only disrupts the reinforcing relations between behavior and environment that characterize progress, but also seems to perpetuate aversive social control. An intimate connection between ceremonially maintained behavior and aversive control may be the most culturally destructive feature of institutional power. Before the ink is dry on the marriage certificate, the newly acquired "rights" of the partners lead to mutual coercion. The status of "parent" justifies tyrannies unheard of outside the institution of slavery. The church withholds salvation from those who question its authority or fail to tithe. In the land of the free, one cannot be sent to debtor's prison—unless one is indebted to the state. Iconoclastic college professors fail to receive tenure in institutions supposedly designed to protect creative intellectual activity from ceremonial control.

The difference in the rules derived from technology and those derived from ceremonial processes is critical. Consider the difference between a rule that describes contingencies of reinforcement inherent in nature, independent of the rule-maker, as opposed to one describing contingencies that exist solely by virtue of contrived human intervention. This is the difference between "touching hot stoves will result in burned fingers" and "touching your genitals will result in a spanking (or hell-fire and damnation)." On a cultural level, the difference is between "learning certain subject matters will result in your acquiring a behavioral repertoire that will allow you to take part in 20th century technological progress" and "going through certain ritualistic behavior, including mastery of arcane subject matters, will result in a diploma, confer-

ring on you the status of the brotherhood that defines and legitimizes 'knowledge'." The ceremonial rule cannot be falsified so long as those with status continue to reinforce following the rule. In contrast, any technological rule that does not adequately describe the uncontrived contingencies obtaining between behavior and the environment is found, later if not sooner, to be inadequate, and leads to change.

One wonders what a culture with minimal ceremonial behavior would be like. We have at least one hypothetical example in the case of B. F. Skinner's *Walden Two* (1948). Early in the novel, Skinner tosses in a passing reference to Veblen's *Theory of the Leisure Class* (the work in which Veblen established the distinction between ceremonial and technological cultural processes). Skinner then proceeds to portray Walden Two as a community in which ceremonial behavior has been reduced to near-zero and in which the consequences of its technological behavior are constantly analyzed and adjustments in its practices made accordingly. Skinner goes to great lengths to demonstrate the lack of current social reinforcement in the maintenance of work and leisure activities in Walden Two. Although the pleasure or satisfaction that a member's behavior provides for others is undoubtedly important in interpersonal relations, no expression of gratitude, approval, or praise occurs to contaminate the natural connection between behavior and the changes it produces in the environment, animate or inanimate.

Skinner clearly rejects status-derived reinforcement throughout the book, portraying a community where the government, the church, and the family have no ceremonial power at all. In his words, "In a world of complete economic equality, you get and keep the affections you deserve. You can't buy love with gifts or favors, you can't hold love by raising an inadequate child, and you can't be secure in love by serving as a good scrubwoman or a good provider" (Skinner, 1948, p. 147). He seems even to suggest that no behavior at all in Walden Two is main-

tained by contrived social reinforcement. For example, in describing the education of the children, he appears to suggest that all their learning is reinforced by natural consequences, perhaps portraying an idealized version of Dewey's (1940) educational philosophy.

Social reinforcement, however, is surely necessary in mediating both the contingencies between behavior and delayed technological consequences and the cooperative behavior required for the creation of complex tools—be they machines, mathematical formulae, or scientific laws. Skinner, himself, while not specifically acknowledging any change or development in his thinking, has recently suggested that contrived reinforcers must be used to mediate between present behavior and long range outcomes (Skinner, 1982). For example, social reinforcement must be used to shape reading and writing behavior because natural consequences will not be available in many contemporary settings until the behavior is well learned. Social reinforcement is also necessary to maintain behavior under stimulus control of rules describing contingencies where the natural consequence is too far removed from the behavior to function as a reinforcer (e.g., rules such as "Do unto others as you would have them do unto you").

The difference between contrived reinforcement that maintains technological behavior and that which maintains ceremonial behavior is in the contingencies establishing those behaviors. The social reinforcer in ceremonial behavior derives its functional control from the status of the person delivering it, and the social reinforcer maintaining technological behavior derives its functional control from its connection to the empirical relations between behavior and its long-term consequences.

In summary, the mechanism underlying the behavior in Ayres's theory is the contingency of reinforcement. By understanding the different kinds of contingencies underlying technological and ceremonial behavior, we are in a better position to understand the sources of in-

stitutional power, to evaluate where its effects are currently most detrimental, and perhaps to reduce its drag on technological behavior.

THE FIELD OF BEHAVIOR ANALYSIS IN LIGHT OF THE VEBLEN/AYRES DICHOTOMY

The revolutionary character of Veblen's distinction between the cultural processes of ceremonial and technological behavior lay in the functional nature of that distinction. Influenced by Darwin, Veblen saw the need for economics to become "an evolutionary science . . . a theory of a process, of an unfolding sequence (Veblen, 1898/1919, p. 58). Despite Veblen's success in focusing attention on economic activity as evolutionary, the behavioral processes underlying the distinction were not understood and technological development of institutional economics has been impeded.

Ayres's analysis, based on Veblen's distinction, clarifies the need for a functional account of the mechanism underlying cultural change. As Ayres points out: cultures do not behave, individuals do. Even so, the behavior of individuals in environments comprised of other individuals and their response products acquires form and function that would not materialize in the absence of those others and their response products. Thus, a network of contingencies in a given culture at a given time acquires characteristics that define the culture, or those institutions and technologies comprising that culture. Contingencies that appear to be operating in our current culture may be examined, then, in terms of their ceremonial and technological characteristics. For present purposes, interest is focused on the technological behavior involved in developing a natural science of behavior and the cultural institutions impeding that technological progress.

Perhaps more so than in any other realm where science has intruded, ceremonial explanations of human behavior have a long and continuous history. The history of natural science may be con-

ceived of as a history of technological development eventually leading to explanations of various phenomena solely in terms of the natural universe. Although scientific explanations change as science progresses, they remain naturalistic. The evolution of tools, most particularly scientific methods, has resulted in a series of crises where established compromises between current technological and ceremonial patterns have been disrupted by scientific breakthroughs, resulting in the reconceptualization of a subject matter in scientific terms. Such reconceptualizations render previous ceremonial behavior relatively useless in that field because the consequences of technological behavior are so powerful, resulting as they do in massive changes in the environment—intellectual, social, and material.

Although Copernicus's radical notion of the heliocentric universe derived from a mixture of technological advances and ceremonially derived notions (cf. Kuhn, 1957, in different terminology), those notions were contrary to the institutional beliefs prevalent in his culture. More important, the counter-cultural ceremonial roots were soon irrelevant as the technological power of Copernicus's formulation eroded all previous institutionally maintained conceptions of the subject matter of astronomy. As it was with Copernicus, so with Galileo. Institutional resistance is exemplified by Galileo's trial and three centuries later by the Scopes trial, and today by the creationists' attempts to stem technological progress in the field of biology through institutionalized ceremonial channels.

The subject matter of human behavior, most particularly what is ceremonially called "higher mental processes," might well be the ground today on which the most important clash between technological and ceremonial processes is occurring. Certainly, the encroachments of science advance ever closer to home. First, our world lost its special place in the universe; then our origin lost its unique status; and now we are surrendering our autonomy to a conglomerate of both phylogenetic contingencies (result-

ing in a genetic structure that defines the limits of our behavior) and ontogenic contingencies (that define the form, frequency, and controlling environment of our behavior).

The three individuals who seem to have posed the greatest threat to our culture's ceremonially maintained conception of human behavior are Freud, Watson, and Skinner. Freud set the stage for a scientific understanding of human behavior by insisting on the assumption of determinism. He, however, like all those before him who tried to bring the realm of human activity into the body of science, could not cut the Gordian knot. To cut the knot, one would have to be able to explain (and, ideally, produce) self-awareness, or consciousness, without recourse to "mind" as a causal agent. Freud simply took consciousness as a given and dealt with the empirical phenomenon of behavior in the absence of awareness by expanding the role of the causal mind to a realm with three regions, each having causal status with respect to behavior.

Although Freud espoused deterministic assumptions, the mental apparatus he created to explain human behavior has allowed latter-day Freudians to grant autonomy to the ego as it cleverly juggles the demands of the id (genetic imperatives) and the superego (cultural control). Riding on the post-Darwinian wave, Freud did not quite make it to shore, but he came close enough to necessitate some serious readjustments in the ceremonial behavior of western cultures. One of our most cherished beliefs, the rationality of human behavior, was shattered by Freud's convincing picture of people torn between biological and cultural demands, many of which they were totally unaware.

In contrast to Freud, Watson attempted to deny the Gordian knot was worthy of scientific attention because of its conceptual relation throughout history to metaphysical dualism. His achievement was to focus attention on behavior, as opposed to mind, as the subject matter of scientific interest, thereby opening the door for an experimental analysis of human activity. He had, following Pavlov,

identified the universe of the dependent variable and that of its independent variables as the same universe. In addition, he clarified the scientific challenge to dualistic explanations of human activity. Watson thus reached the new world shores of science and planted his flag where he landed. Unfortunately, not much technology was available there and Watson's mistake in denying human consciousness is what he is remembered for. Watson's call for revolution seems to have suffered the same fate as Veblen's, Dewey's, and Kantor's. They were all for the most part ignored, with or without some scuffling around the edges of institutional strongholds. The mechanism was missing, hence the technology needed for scientific development could not proceed.

The mechanism, of course, was finally discovered in the concept of the operant and the evolving functional relations that define and describe the behavior heretofore called voluntary, purposive, or autonomous. Although the science of behavior includes more than operant behavior, the experimental analysis of operant behavior has led to an extension of that analysis to include verbal behavior with its relation to consciousness or subjective awareness. Skinner (1957, 1969, 1974) appears to have cut the Gordian knot.³

At present, the field of behavior analysis seems to meet all the criteria of a scientific paradigm. It has adhered to the assumptions of natural science while tackling many of the problems defined by traditional philosophy; it has created an experimental methodology and derived a small number of universal principles; it has evolved a coherent analytical framework; and it has devised a variety of workable applications derived from the principles, researched through

the methodology, consistent with the analytical framework, and meaningful in terms of the underlying philosophy. The paradigm is so well developed that a nomenclature has emerged to distinguish its component parts: radical behaviorism, the experimental analysis of behavior, applied behavior analysis, and behavior technology. Though the origins of behavior analysis are in psychology, behavior analysis has been evolving independently of psychology for a number of years, evidenced in part by lack of mutual citations (cf. Krantz, 1972) and in part by lack of understanding (Todd & Morris, 1983).

Let us examine this 20th century puzzle in light of the Veblen/Ayres analysis of technological and ceremonial cultural processes. About the time that Darwin's synthesis was leading to reconceptualizations of social and behavioral phenomena as evolutionary and naturalistic, science itself was becoming the object of intense examination. Since scientific behavior is probably among the most complex of human activities, and since there was no science of human behavior in existence, any understanding of scientific behavior would likely have derived, in large part, from ceremonially maintained concepts of the nature of human activity. Also, if the behavior of scientists was to be studied directly, the scientists whose behavior was likely to be studied were physicists. Physics appeared to have the tidiest conceptual framework, depended most heavily on mathematics (a very tidy subject with its strict logical relations), and was least threatening to current cultural institutions. In short, physics had become a part of the institutional fabric of the western world, maintained at least partially by status-related social reinforcement.

The institutionalization of science itself may impede the advance of scientific progress. Spokespersons for ceremonially-maintained conceptions attempt to incorporate science into their pre-scientific frameworks, thereby to gobble up science before science gobbles them up. The situation becomes clearer when one realizes how philosophers of science often

³ The Gordian Knot metaphor was coined by Don Whaley. Though it has been many years since he so described the "problem of consciousness" and cast Skinner in the role of Alexander, the image has remained with me. He had a way of phrasing his flashing insights so that we, his students, could remember them until we finally knew enough to understand them.

prescribe scientific behavior while deriving many of their prescriptive mandates from pre-scientific conceptions of human activity. Their profound indifference to the concepts of a natural science of behavior suggests profound institutional commitments. Thus, about the time that a science of behavior became conceptually feasible, probably for the first time in history, rules were being formulated about how science proceeded (and, by implication, how it should proceed).

By the time Watson's proclamation spurred attempts to deal with behavior without recourse to mind, psychologists and social scientists were showing increasing sensitivity to social reinforcement for following the philosophers' prescriptions as to how science proceeded. Use of the hypothetico-deductive method, as well as the tools of inferential statistics, was probably precipitous since neither chemistry nor biology had made use of that methodology, or those tools, in their seminal stages. Furthermore, the methodology described the activities of only some physicists and those primarily in physics' more recent development. Institutionalization of a particular scientific methodology may not be harmful to well-developed sciences because they are far enough advanced to be pulled forward by their own technology—the scientific framework is well established, laboratory and mathematical techniques emerged from the technological requirements of the science. The effect on psychology, however, was profound.

At least one thoroughgoing attempt was made to establish psychology as a science by playing by the rules of the game. Clark Hull (1940, 1943) and his colleagues adhered to the assumptions of natural science while at the same time attempting to develop a theory of behavior (as theory was defined by philosopher/methodologists such as Cohen and Nagel, 1934). The failure of Hullian theory to lead to a coherent scientific framework resulted in the valuing of "eclecticism" as a way of life in psychology. For the most part, psychology has remained true to the form, but neglected the substance, of the sci-

entific approach. Baer (1984) identified the failure of psychology to progress as the repeated recycling of mentalism dressed in new clothes which "look different, more scientific, more complicated, more quantitative, more susceptible to mathematical models, and more modern (e.g., more computer-like), yet which nonetheless serve the same comforting functions that mentalism always has served"—that is, ceremonial adequacy.

What is interesting about post-Hullian psychology is that it seems to offer less and less promise of producing a unifying conceptual framework for all of its own subject matter, to say nothing of providing a unifying principle for the social sciences. From the present viewpoint, psychology has succumbed to the ceremonial control of pre-scientific concepts of the nature of human behavior. Following the failure of Hull's attempt to give psychology scientific standing, the field seems to have kept the aspect of Hullian psychology that was most inadequate—its methodology—and relinquished its hold on the post-Darwinian notion of behavior as a natural phenomenon. Despite occasional bright spots, psychology seems to hover perpetually on the outskirts of the scientific enterprise, maintained by socially mediated consequences unrelated to technological adequacy.

In contrast, behavior analysis (at least in its formative years) appears to have eschewed the rewards that accompany ceremonial adequacy. In what must have been a lonely pursuit of technological adequacy, B. F. Skinner laid the foundation for an experimental analysis of operant behavior. As Skinner recounts it (see Skinner, 1972, 1979), his behavior evolved, building on the products of previous interactions with the evolving tools—equipment, data, and formulations. Perhaps Skinner's most unique characteristic as an experimentalist was his apparent imperviousness to events likely to exercise social control over the scientific behavior of others. Skinner's technological behavior, followed by that of a few students and colleagues, established the foundations of a natural sci-

ence of that class of behavior previously characterized as voluntary, intentional, or purposive.

The rapid development of behavior analysis as a scientific enterprise has provided generous reinforcement for the technological behavior of behavior analysts. People in the field have generally managed to provide social reinforcement for the early and intermediate stages of conceptual and technical behavior of fellow participants in the field. Such social reinforcement would seem especially critical in the early stages of a developing science to counterbalance the aversive institutional counter-contingencies. Because few, if any, living adults grew up conceptualizing behavior within a scientific framework, a history of ceremonially maintained behavior has to be countered by ongoing technological contingencies and the social reinforcement that mediates those contingencies.

That a scientific challenge has been issued to ceremonially maintained concepts is apparent from the all but universal resistance to even the *concept* of a natural science of behavior. The resistance to the possibilities inherent in behavior technology is matched by resistance to the philosophy and science underlying that technology. The misrepresentation of radical behaviorism and behavior analysis in academia as well as in the press and other mass media is distressing, but similar misrepresentation has been documented in the case of every scientific advance.

CONCLUSION

The vacillation between optimism and pessimism that characterizes behavior analysts' assessment of the current situation may result from the shifting perspectives one has of the field. When viewed in terms of its internal growth and vitality or its objective achievements, optimism abounds. When one looks at the reluctance of our society to address critical social problems with experimental behavioral technology, or at the vilification of "behavior modification" by the

popular press, or at the retreat to mentalism in so many fields, pessimism seems unavoidable.

The tension produced by these differing perspectives may partially account for the increasing self-examination seen in recent years (e.g., Baer, 1981; Branch & Malagodi, 1980; Michael, 1981; Pierce & Epling, 1980). Papers and discussions in journals and professional meetings have been directed at identifying, analyzing, or resolving the kinds of problems behavior analysis presumably must deal with if its progress is to continue. The proposed solutions are varied. They range from (a) behavior analysis should officially remove itself from psychology, to behavior analysis should hang in because traditional psychology will eventually wither, like alchemy; from (b) the education of behavior analysts should be designed to produce sophisticated scientists and theoreticians, to the education of behavior analysts should include much practical material regarding the realities of settings where they are likely to use behavior technology; and from (c) behavior analysts should migrate into other academic disciplines, to behavior analysts should avoid going alone to the frontier because they are likely to succumb to control by the mentalistic verbal community.

No reason seems to exist why all of these alternatives cannot be explored. If the development of technology is a matter of the uncontrived consequences of operant behavior, the more behavior that occurs, the more likely that useful results will emerge. If institutional resistance threatens progress, then the more diverse the progress, the more difficult such resistance will be. If psychology departments can tolerate a vigorous program in behavior analysis, pursue such a program. If they cannot, a good argument can be presented for programs and courses as a field separate from psychology. Behavior analysts working alone in outposts where no one else is trying to behavioralize the culture might create for themselves an environment, within or without their work settings, that keeps

them focused on the relevant dimensions of their work (cf. Morse & Bruns, 1983). Behavior analysts interested in working with people can train in programs that will make it likely they will succeed in the everyday world; those interested in theoretical or philosophical issues can train in programs designed to produce such professionals; those interested in exploring experimentally the relations between behavior and the developing environment require the opportunity to study and work with scientists pursuing such knowledge.

In short, continued progress will likely depend on tolerance for diversity within the field along with (a) conceptual development consistent with the basic philosophy, (b) commitment to the experimental approach, (c) avoidance of ceremonial control, and (d) the maintenance of a relation between contrived, social reinforcers and technological behavior. An understanding of the behavioral processes underlying the technological and ceremonial functions of cultures will aid us in recognizing and creating the contingencies of reinforcement likely to enhance survival.

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