

RADICAL BEHAVIORISM: B. F. SKINNER'S PHILOSOPHY OF SCIENCE

JON RINGEN

University of Iowa

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The cause and root of nearly all evils in the sciences is this, that while we falsely admire and extol the powers of the human mind we neglect to seek for its true helps.

—Francis Bacon

I. RADICAL BEHAVIORISM AS PHILOSOPHY OF SCIENCE

In "To Know the Future," Skinner (1990) asserts: "Bertrand Russell once said that one of the two great aims of his life was to discover what could be known. I could say that one of mine has been to discover what it means to be a knower" (p. 103). In this way, Skinner identifies what he repeatedly (e.g., Skinner, 1983, p. 395) described as the first, most enduring, and most central concern of his career in psychology, the theory of knowledge. Surprisingly little discussion of the nature of this Skinnerian concern exists in the literature on Skinner's life and work. Yet, it is as a theory of knowledge that the nature and significance of radical behaviorism is most clearly exhibited.

In Skinner's view, scientific activities are exemplary epistemic activities. Skinner (1971) asks: "What, after all, have we to show for non-scientific or prescientific good judgement, or common sense, or the insights gained through personal experience? It is science or nothing" (p. 160). Hence, Skinner's concern with knowing naturally focuses on science. Radical behaviorism constitutes the philosophy of science Skinner offers as his contribution to the theory of knowledge.

Understanding radical behaviorism requires consideration of its relations to other aspects of Skinner's work. Skinner describes the basic relations in quite traditional ways. Thus, he distinguishes his science, the technology constituted by applications of this science, and the philosophy of this science and technology. His science consists of the experimental analysis of behavior and the distinctive instruments, experimental procedures, and concepts it deploys (e.g., the experimental conditioning chamber, operant and respondent behavior and conditioning, schedules of reinforcement, behavioral synthesis). Behavior technology or applied behavior analysis is the field concerned with applications of the science (e.g., applications to the design of better social practices in areas as diverse as behavior therapy, learner-paced and machine-assisted instruction, child rearing, and the practice of science itself). Radical behaviorism is the philosophy of this science and technology. What Skinner says about radical behaviorism as philosophy presents a challenge to traditional (and many contemporary) views about what the theory of knowledge could possibly be.

Skinner's radical behaviorism embodies the thesis that understanding science, in general, and the experimental analysis of behavior, in particular, is best achieved through the scientific analysis and interpretation of scientific behavior. In short, Skinner argues that understanding *knowing* requires scientific analysis of the activities of scientists. This is clearly a "bootstrap" operation that Skinner takes to exemplify the Baconian view that the more we learn the better we can learn. Skinner attempts to demonstrate that from a radical behaviorist analysis, better characterizations of science and better epistemic practices emerge.

Such an interpretation illuminates Skinner's consistent opposition to mentalism, clearly displayed in three exemplary essays: "The Operational Analysis of Psychological Terms" (1945), "Are Theories of Learning Necessary?" (1950),

and "Selection by Consequences" (1981). Reflection on themes in these essays and their development in Skinner's other work provides a basis for assessing Skinner's frequent complaint that he was misunderstood as well as for highlighting the fundamental challenge radical behaviorism presents to received theories of knowledge.

II. RADICAL BEHAVIORISM: THE BASIC ISSUES

According to Skinner (1969, p. 267), the basic issue raised by radical behaviorism concerns "the usefulness of mentalistic concepts." Skinner's antimentalism is a confluence of several themes that have been obscured by the mistaken presumption that radical behaviorism is a form of logical positivism (see also Smith, 1986).

On Skinner's (Baconian) view, a main aim or function of scientific activity is to develop descriptions and understandings of phenomena that enable prediction and control. It is this function that grounds the Baconian view that knowledge is power: Science enables more successful human action by forging better (descriptive and explanatory) tools for prediction and control of natural phenomena. Science provides a "fuel for success" by providing a means for more effectively realizing or pursuing human ends or goals.

Skinner clearly holds that modern science exemplifies a successful practice of this sort, and at its core is experimental investigation. In proper Baconian spirit, Skinner holds that science is the search for causes, that the identification of causes enables prediction and control, and that experimental investigation, properly conducted, enables the identification of causes. This much of Skinner's radical behaviorism is a rather traditional and unremarkable view of science. However, Skinner's elaboration of this traditional view reveals what is most radical about Skinner's radical behaviorist philosophy of science.

The experimental analysis of behavior is, for the most part, a straightforward extension of Skinner's traditional Baconian view to the study of human and non-human behavior. Thus, Skinner proposes and pursues the experimental study of the causal-functional relations between the behavior of whole organisms and the environment in which the behavior develops and occurs. What is unique, challenging, and largely misunderstood about Skinner's radical behaviorism is Skinner's argument that this view of science provides a basis for skepticism about mentalism, in particular, and about various influential approaches to the development of theories of learning and intelligent action, in general.

Discussion of this part of Skinner's work has been extremely misleading, yet it is central to his radical behaviorism. I aim to clarify how these various views, properly understood, constitute a coherent radical behaviorist philosophy of science and hence a serious contribution to the theory of knowledge and epistemic practice. I will first attempt a clear presentation of those themes and then indi-

cate how they are misrepresented by being treated as exemplifications of logical positivist doctrine, and underappreciated as a unique and fundamental challenge to the causal theories of the mind that underwrite most of contemporary (naturalistic and nonnaturalistic) epistemology. The discussion will illustrate how Skinner's radical behaviorism both instantiates and is in tension with the traditional view that

The philosophy of science can usefully be divided into two broad areas. The *epistemology* of science deals with the justification of claims to scientific knowledge. The *metaphysics* of science investigates philosophically puzzling features of the world described by science. In effect, the epistemology of science asks whether scientific theories are true, whereas, the metaphysics of science considers what it would tell us about the world if they were true. (Papineau, 1996, 1)

III. RADICAL BEHAVIORISM AND MENTALISM

Skinner's radical behaviorism highlights and criticizes two basic features of mentalism: privacy and intentionality. The first is the focus of Skinner's critique of introspection construed as a method for observing private mental states. Skinner's "The Operational Analysis of Psychological Terms" exemplifies his argument here. Skinner's approach to intentionality emerges in discussion of mentalistic explanation construed as causal explanation by states that (succeed or fail in varying degrees to) represent or copy (stand for or be about) aspects of the world in which their bearers act. Here "Selection by Consequences" is exemplary. The centerpiece of both these critiques is what Skinner rightly views as his fundamental achievement: the characterization and exploration of differences between operant and respondent behavior and conditioning. A key feature of this discussion is the emergence of a clear appreciation of the distinctive features of selection processes, exemplified in natural selection and operant conditioning, respectively. Skinner clearly recognizes that these distinctive features identify a causal mode that is different from both the mechanistic causation exemplified in respondent conditioning, S-R behaviorism, and various cognitive theories, and the "purposive causation" constitutive of the Aristotelian doctrine of final causation and embraced by various forms of vitalism (Ringen, 1993a). The significance of these points has been obscured by characterizations of radical behaviorism as an extremely constrained and antitheoretical form of logical positivism. On this interpretation, radical behaviorism is a form of analytical behaviorism. Criticisms of this misleading view will be discussed in relation to Skinner's "Are Theories of Learning Necessary?"

A. PRIVACY

An early argument against mentalism and for an experimental analysis of epistemic activity appears as Skinner's 1945 "The Operational Analysis of Psy-

chological Terms." This critical assessment of introspective psychology exemplifies Skinner's view that an experimental analysis of behavior can both illuminate epistemic practice and serve as an occasion for its improvement. Thus, Skinner notes that psychological terms are traditionally described as terms that refer to mental states, and (at least some) mental states are traditionally described as entities that the bearer (and only the bearer) can directly apprehend, perceive, or observe. It is this characterization of mental terms that encourages the practice of experimental introspection. Skinner argues that an experimental analysis of behavior indicates that this practice is epistemically problematic. The problems are revealed by analysis of variables controlling discriminative (verbal) responses. Skinner asserts:

A verbal response to a private stimulus may be maintained in strength through appropriate reinforcement based upon public accompaniments of consequences, . . . or through appropriate reinforcement accorded the response when it is made to public stimuli, the private case occurring by induction when the stimuli are only partly similar. . . . None of the conditions . . . permits the sharpening of reference which is achieved, in the case of public stimuli, by a precise contingency of reinforcement. . . . It is, therefore, impossible to establish a rigorous scientific vocabulary for public use, nor can the speaker clearly "know himself" in the sense in which knowing is identified with behaving discriminatively. (1945, p. 274)

Skinner maintains that "a similar analysis could be made of all terms descriptive of motivation, emotion, and action in general, including (of special interest here) the acts of seeing, hearing, and so on" (1945, p. 275). Here Skinner exhibits how a behavior analytic "interpretation" of introspection and observation can illuminate and provide a basis for improving epistemic practice. In traditional terms, one might be inclined to say that Skinner here illustrates how the metaphysics of science can illuminate and shape its epistemology.

Skinner makes two basic points: Differential reinforcement of publicly accessible responses to publicly accessible entities (e.g., stimuli and responses) can be more precise than differential reinforcement of responses occasioned by private entities. Given this perspective, Skinner argues that in the normal course of things, no verbal responses to private entities can be established that will serve to precisely discriminate one private state from another. Ergo, Skinner concludes, reports of introspection are problematic as a basis for investigating the private entities traditionally identified as constituents of conscious mental life. This point enables and provides justification for adopting improved epistemic practice: namely, experimental methods that, unlike introspection, facilitate the development of verbal repertoires that precisely and reliably discriminate entities in the various domains of inquiry. The main point of such verbal repertoires is what Skinner takes to be a main aim of science, namely, to facilitate more effective action by facilitating the prediction and control of phenomena in various domains of interest and inquiry. In this sense, the verbal practices of scientists are tools for the prediction and control of natural phenomena. The relative merits of various verbal practices are to be assessed in terms of their relative success in

(or promise for) enhancing prediction and control. Skinner notes that an experimental analysis of behavior, unlike traditional approaches to epistemology, makes clear the point of such improved epistemic practices. Thus, from the perspective of an experimental analysis of behavior:

We may understand why terms referring to private events have never formed a stable and acceptable vocabulary of reasonably uniform usage. This historical fact is puzzling to adherents of the "correspondence school" of meaning. Why is it not possible to assign names to the diverse elements of private experience and then to proceed with consistent and effective discourse? The answer lies in the process by which "terms are assigned to private events," a process which we have just analyzed in a rough way in terms of the reinforcement of verbal responses. (1945, p. 274)

Hence, "The Operational Analysis of Psychological Terms" provides an example of radical behaviorism in practice. The experimental analysis (or, more precisely, the behavior analytic interpretation, Skinner, 1957, pp. 11–12) of epistemic practices in psychology, specifically the practice of introspection and the use of psychological terms in introspective reports of conscious mental life, illuminates and provides a principled basis for criticizing that practice as well as for selecting better practices. Experimental analysis of behavior undermines the description of introspection as observation of private events and processes. This is a first step in Skinner's critical analysis of mentalism. The analysis here provides an early example of the significance of "the three-term contingency" for understanding laboratory practice. In this case, Skinner draws conclusions about the character of verbal responses to private states from the assumption that such responses are discriminative responses established through the process of operant conditioning. Skinner's argument here exemplifies discussion of that part of philosophy of science constituting the metaphysics of science, an account of what must be the case if a given scientific description of the world is true.

B. INTENTIONALITY

1. Positivism, Mentalism, and Theories

Skinner's conclusions about the inappropriateness of introspective methods in science are now widely shared (Lyons, 1986) but Skinner's style of argument for that conclusion is not so widely appreciated. In spite of what Skinner says in his discussion of introspection, radical behaviorism has been treated as a form of logical positivism (Fodor, 1968; Scriven, 1956; compare Ringen, 1993b; Smith, 1986).

Skinner cites "The Operational Analysis of Psychological Terms" as an occasion on which he explicitly rejects the logical positivist philosophy of science. Skinner is quite correct in so citing this article. Lest there be any doubt, consider the following:

The main purpose of this discussion has been to define a definition by considering an example. To be consistent the psychologist must deal with his own verbal practices by de-

veloping an empirical science of verbal behavior. He cannot, unfortunately, join the logician in defining a definition, for example, as a "rule for the use of a term" (Freigl); he must turn instead to the contingencies of reinforcement which account for the functional relation between a term, as a verbal response, and a given stimulus. This is the "operational basis" for his use of term; and it is not logic but science.

The philosopher will call this circular. He will argue that we must adopt the rules of logic in order to make and interpret the experiments required in an empirical science of verbal behavior. But talking about talking is no more circular than thinking about thinking or knowing about knowing. Whether or not we are lifting ourselves by our own bootstraps, the simple fact is that we can make progress in a scientific analysis of verbal behavior. Eventually we shall be able to include, and perhaps to understand, our own verbal behavior as scientists. If it turns out that our final view of verbal behavior invalidates our scientific structure from the point of view of logic and truth-value, then so much the worse for logic, which will also have been embraced by our analysis. (1945, p. 277)

The logical positivists emphasized "the logic of science." Many positivists took a Kantian view of the logic of science as describing the a priori conditions for the possibility of empirical science. In this sense, that logic of science was treated as foundational for science. The view that the methodology of science could itself be an empirical science was rejected (as viciously circular). (See Bon Jour, 1994)

Radical behaviorism is orthogonal to these positivist doctrines. It should, thus, come as no surprise that attempts to portray radical behaviorism as a form of logical positivism occasion some fundamental misunderstandings. Perhaps the most widespread of these misunderstandings concerns the relations between Skinner's antimentalism and his general skepticism about psychological theories.

In "Are Theories of Learning Necessary?" Skinner forcefully attacked the emphasis on theory construction in psychology. He gave expression to this skepticism in a number of other well-known publications. One constant in these discussions is the description of the kind of theory that Skinner is rejecting. This constant description is accompanied by a wide variety of criticisms of psychologists' concern with such theories.

Skinner (1950) argues against

theory . . . [which is] any explanation of an observed fact which appeals to events taking place somewhere else, at some other level of observation, described in different terms, and measured, if at all, in different dimensions. (p. 69)

Skinner identifies three types of theory in the psychology of learning that fit this definition: those providing explanations in terms of (1) physiological or electrochemical changes, (2) mental phenomena, or (3) "the Conceptual Nervous System" (which Skinner, 1950, p. 70, describes as "not . . . an actual structure undergoing physiological or biochemical changes, but only . . . a dynamic system with a certain output").

On Skinner's (1950) view, these are all "theories in the sense that they are not expressed in the same terms and could not be confirmed with the same methods of observation as the facts for which they are said to account" (pp. 69–70).

There is a large literature assessing Skinner's basis for skepticism about such theories (see Kitchener, 1996). Much of it begins with the mistaken characterization of Skinner as a logical positivist and concludes that Skinner holds an unwarrantedly restrictive view of what is required to ensure the empirical significance of technical terms in experimental science. Such an interpretation of Skinner misleads more than illuminates.

Three points are germane here. The first is that Skinner's description of the *ory delimitis* by exclusion a class of terms appropriate for discriminating variables that can be experimentally manipulated and measured. This exclusion highlights his view that the technical terms in experimental science should be effective tools for prediction and control of phenomena being investigated in the laboratory. Skinner finds this problem particularly acute in psychology, because everyday language for describing the behavior of humans and nonhumans alike is mentalistic through and through and, as a consequence, is laden with implications that Skinner finds to be obstacles to the precise description of behavior, of antecedent causes or controlling variables that might be experimentally manipulated, and of relations between behavior and its causes. The links to private events provide one example of obstacles of this sort. Skinner claims that there are others. Some of these other obstacles are the subject of discussion in "Selection by Consequences," which is the focus of the next section. This article is usefully introduced by the second and third points that need to be made by way of illuminating the significance of the first.

The second point is that Skinner's conception of theory relativizes theory to domains of experimental inquiry. Thus, the terms used to describe independent and dependent variables in an experimental investigation of spiking potentials of neural cell assemblies are not, in the relevant sense, theoretical with respect to the domain under investigation, but they are, in the relevant sense, theoretical with respect to experimental investigations of the environmental variables controlling the behavior of whole organisms. Skinner maintains that the experimental analysis of behavior is better served by a technical vocabulary shaped and maintained by the contingencies of experimental research than one imported from everyday life or another experimental or theoretical domain. In Skinner's view, the relations between verbal behavior in these different domains remains a matter for scientific investigation and interpretation.

Finally, it needs to be noted that there is a type of theory construction that Skinner explicitly pursues and hence at least implicitly accepts. In "The Generic Nature of Stimulus and Response," Skinner notes that to be scientifically useful, terms for stimulus and response should discriminate features of behavior and its antecedents that are lawfully related. Thus, Skinner (1935) says:

In a reflex preparation the observed correlation is never between all properties of both stimulus and response. Some properties are irrelevant. The relevant properties are accordingly taken to define classes and the reflex is regarded as a correlation of generic terms. (pp. 476–477)

A reflex is accordingly defined as a correlation of a stimulus and a response at a level of restriction marked by the orderliness of changes in the correlation. (p. 477)

What is wanted is the "necessary and sufficient" correlation of a stimulus and a response. The procedure recommended by the present analysis is to [experimentally] discover the defining properties of a stimulus and a response and to express the correlation in terms of classes. (p. 472)

The conception of theory exemplified here is well expressed in the title of Wilfred Sellars's "Concepts as Involving Laws and Inconceivable without Them" (1948). In this sense of theory, virtually all the terms employed in the experimental analysis of behavior are theoretical terms. Skinner's skepticism about theories is not an expression of any radical empiricist or positivist view that science is grounded in what is given in presuppositionless experience. Rather it is an expression of the view that technical scientific terms should usefully discriminate the features of the world that scientific investigation finds to be causally related. Skinner's objection to mentalistic and related terms in psychology is that they present systematic obstacles to that task. I turn now to develop this view.

I highlight an aspect of Skinner's skepticism about theories that is largely overlooked in discussions of mentalism and its relation to the relative merits of radical behaviorism and cognitivism. What I say about this issue should be sufficient to suggest the ways in which the characterization of Skinner as a positivist obscure links between his skepticism about theories and his rejection of mentalism. Specifically, I present reason to conclude that the conventional view of Skinner's skepticism about mentalism has matters almost exactly backward.

On the received view, Skinner's antimentalism is a consequence of his skepticism about theories, and his skepticism about theories is grounded in a radically constrained form of logical behaviorism, an application of a restrictive (radical empiricist) form of logical positivism to psychology (see Kitchener, this volume). I present reason for concluding that, correctly understood, Skinner's skepticism about theories in psychology is grounded in his skepticism about mentalism, and his skepticism about mentalism is, in turn, grounded in his view that the aim of science is the experimental determination of causal relations that enable the prediction and control of behavior. Skinner's basic objection to mentalism is that mentalistic concepts are an obstacle to achieving that aim. Mentalistic concepts fail to meet the test embodied in Skinner's operationalism:

The ultimate criterion of the goodness of a concept is not whether two people are brought into agreement but whether the scientist who uses the concept can operate successfully upon his material—all by himself if need be. . . . What matters. . . . whether he is getting anywhere with his control over nature. (Skinner, 1945, p. 383)

2. Mentalism and Selection by Consequences

"The Operational Analysis of Psychological Terms" provides one of Skinner's case studies of how a scientific analysis of the verbal behavior of psycholo-

gists can illuminate scientific methodology and provide a basis for improving it. Another is provided by "Selection by Consequences" and the earlier work, *Contingencies of Reinforcement*, in which similar points were developed. Here Skinner explores the significance of his (1974) claim that "operant behavior is the . . . field of purpose and intention" (p. 55). His main thesis is that the causal processes producing the behavior traditionally called purposive and intentional are instances of selection by consequences, a causal mode exhibited in the analogous processes of operant conditioning (the contingencies of reinforcement) and natural selection (the contingencies of survival). Skinner argues that operant conditioning stands in the same relation to the adaptiveness of the behavior of organisms traditionally explained by purpose and creative intelligence as natural selection stands to the biological adaptations natural theologians attributed to the purpose and creative intelligence of divinity. He suggests that just as we learned that design could be produced without a designer we are learning that intelligence (and purpose) can be produced without mind. He also suggests that just as we learned that mysteries rather than productive problem solving are the end result of biological research driven by the model of creative intelligence design, so are we learning a similar point about psychological explanations driven by a similar model. Here Skinner's remarks make contact with recent and exciting work in naturalistic philosophy and psychology.

Skinner's point here is essentially that made in philosophers' (e.g., Darden & Cain, 1989) discussions of interfield relations: that phenomena in one field that exhibit characteristics similar to those in another may turn out to be the result of similar processes. In this instance, the similarities between the variation and subsequent adaptiveness of behavior and the variation and adaptiveness of biological structures suggest that the causal patterns that explain the first set of phenomena may be similar to those earlier found to explain the second. Skinner argues that they are. Both processes are selection processes, the common features of which are exhibited in operant conditioning and natural selection. Skinner calls this causal mode "selection by consequences." He argues that this causal mode should displace mentalistic explanation for similar reasons and in the same way that natural selection displaced appeals to divine creation (and various forms of vitalism) in biology (Kitcher, 1993). This is the basis of Skinner's animentalism.

3. Mentalism, Teleology, and Causation

Skinner argues that mentalism constitutes a pattern of explanation that historically has proven to be a scientific dead end. Conceptually, Skinner compares mentalism in psychology with animism in physics and vitalism in biology. He argues that mentalistic explanations mislead. Like animistic and vitalistic explanations, mentalistic explanations suggest that a causal order has been identified when, in fact, none has been found: Instead, teleological or goal-directed propensities are named. The controlling (i.e., causal) variables that produce such

propensities remain unspecified, and it is their specification that is the aim of science. In this way, Skinner maintains that mentalism in psychology, like animism and vitalism, is a scientific dead end. Mentalism does not enable progress in the search for the causal variables that facilitate the prediction and control of behavior.

In contrast, Skinner argues that (as a matter of empirical fact) operant behavior is the field of purpose and intention, and in this manner proposes that study of the causal relations exhibited in the processes of operant behavior and conditioning represent a scientifically more promising approach to understanding behavior than mentalistic analysis can provide. Conceptually, Skinner suggests an analogy between the study of evolution by natural selection and the study of behavior change by operant conditioning: Both involve a causal mode Skinner dubs "selection by consequences." Skinner suggests that historically, natural selection stands in relation to vitalism and intelligent design in biology as operant (instrumental) conditioning stands to mentalism and cognitive theories of rational choice in psychology.

These arguments are mainly heuristic. They suggest that from the perspective of natural science, mentalism appears reactionary and radical behaviorism a progressive extension of the Darwinian achievement—establishing how variation and adaptiveness of behavior fit an explanatory pattern of the same type (selection by consequences) as that which explains variation and adaptiveness in biological characteristics. Skinner here holds out the prospect of the kind of explanatory unification that philosophers (e.g., Kitcher, 1993) identify as a central feature marking Darwin's achievement as an instance of scientific progress.

The preceding arguments, of course, are not conclusive. Proof must include empirical evidence that the ranges of behavior for which mentalistic explanations are characteristically invoked can be explained (predicted, and controlled) by processes of respondent and operant conditioning. Such evidence would support skepticism concerning cognitivist claims that mentalistic explanations are the most promising (and perhaps essential) route to whatever degree of predictability intelligent action exhibits (see, e.g., Dennett, 1978, 1987; Fodor, 1987).

Skinner presents the achievements of radical behaviorist program for the experimental analysis of behavior as evidence sufficient to warrant continued (and more) vigorous pursuit of that program. Cognitivists often contest radical behaviorist interpretations of such evidence. Surveying these debates is beyond the scope of this chapter, and, of course, any such survey would be inconclusive. (For a useful beginning, see Smith, 1994.) For my purposes, however, it suffices to have exhibited the nature of Skinner's criticism of mentalism. (Compare Rachlin, 1992; and Stout, 1996 on the prospects for a "teleological behaviorism.") The main point could be summarized as follows: Mentalism and radical behaviorism embed the behavior of organisms in different kinds of processes, namely teleological, and, exclusively, nonteleological (e.g., mechanistic and se-

lectionistic) processes, respectively. The significance of this contrast emerges sharply in relation to traditional approaches to the epistemology and philosophy of science.

IV. RADICAL BEHAVIORISM AND KNOWLEDGE

According to conventional wisdom:

Science is a way to teach how something gets to be known, what is not known, to what extent things *are* known (for nothing is known absolutely), how to handle doubt and uncertainty, what the rules of evidence are, how to think about things so that judgments can be made, how to distinguish truth from fraud, and from show. (Gleick, 1992, p. 285)

Such a view of science fits comfortably with a traditional view that knowledge is justified true belief. (Knowers are those who either have knowledge or have the capacity to acquire it, e.g., through learning either from experience or from instruction.) Many have argued, however, that this view of knowledge (and knowers) does not fit comfortably with the radical behaviorist conception of psychology as a natural science. The main argument for this conclusion finds tensions between the aims of radical behaviorism and each of the three constituents of knowledge. The arguments suggest that "radical behaviorist epistemology" is an oxymoron.

Belief (like doubt, certainty, and judgment) is a paradigmatic mental state. Radical behaviorism is antimentalistic. Justification is traditionally viewed as a relation between (the contents of propositional attitudes such as) belief and evidence, reasons, and rules of evaluation. Arguably, these relations are not causal relations and rules of evaluation are not lawlike regularities governing the (psychological or sociological) acceptability of beliefs (or propositions) given certain evidence or reasons. As we have seen, radical behaviorism aims to identify the causes and controlling relations that permit the prediction and control of behavior. Finally, truth is traditionally viewed in terms of either coherence (a relation among sentences, propositions, or the contents of belief) or correspondence (a relation between the world and sentences, propositions, or the contents of belief). Both coherence and correspondence are traditionally construed as semantic (or logical/conceptual) relations, and these are arguably not causal or lawlike relations.

Skinner proposes a radical behaviorist (i.e., a nonmentalistic, causal) account of scientific behavior. It is hard to see how such a project could even begin to address the central concerns of a traditional approach to the theory of scientific knowledge.

Critics (e.g., Putnam, 1988) argue that radical behaviorism could not possibly give an account of the justification of claims to true scientific belief. At best, it could suggest how to change the subject. At worst, like full-scale skepticism, it would be self-defeating: It would undermine any possible warrant for its own ac-

ceptance. It should be clear that considerable difficulty attends any attempt to describe how Skinner's radical behaviorism relates to these criticisms. Nevertheless, I will try.

A. "THINKING" "IMPOSSIBLE" "THOUGHTS"?

One unsatisfactory approach is to note that Skinner often distinguishes the technical language of various sciences from everyday language. Thus:

We need a language of feelings and states of mind in our daily lives. It is the language of literature and most of philosophy. Clinical psychologists use it to learn many things about the histories of their clients that they could not discover in any other way. There are two languages in every field of knowledge, and it would be foolish to insist that the technical version always be used. But it must be used in *science* and especially in a science of behavior. (Skinner, 1985, p. 300)

It is a mistake to view this acknowledgment of two languages as the suggestion that in Skinner's view radical behaviorists and traditional epistemologists are engaged in nonoverlapping tasks and hence that their respective ways of describing phenomena can never conflict. That Skinner holds they can is suggested by various already-quoted passages from "The Operational Analysis of Psychological Terms." Here and elsewhere he clearly asserts that the theory of knowledge should be scientifically assessed, and he introduces radical behaviorism as one competitor in this field. Furthermore, in many of his essays, Skinner takes clear aim at cognitive approaches to scientific psychology.

At the core of much recent work in cognitive science is an assumption shared by traditional epistemologists and classical cognitivists: Intelligent human action is guided by contentful cognitive states that to a greater or lesser degree succeed or fail in representing states of affairs in the world in which the actions guided by these states occur. Mental representations cause behavior. Skinner calls this view the copy theory. It is one principal target of radical behaviorist criticism.

Versions of the copy theory (e.g., Cummins, 1996) unite classical cognitivist psychology and much contemporary philosophy of science around two compelling theses: Scientific activity is both a form of intelligent action and an explanatory epistemic activity. Successful scientific activity produces better representations ("copies") of the world, and such representations can be objects of belief and causes of intelligent action. These theses are so much a part of conventional wisdom that it is hard to see how things could be otherwise.

Skinner's radical behaviorist project for a scientific epistemology might well be epitomized by remarks that in fact inspired and shaped it. Bertrand Russell (1927) remarks:

The word "knowledge", like the word "memory", is avoided by the behaviorist. Nevertheless, there is a phenomenon commonly called "knowledge" which is tested behaviorally in examinations. I want to consider this phenomenon . . . with a view to deciding whether there is anything in it that the behaviorist cannot deal with adequately. (p. 88)

Skinner (1979, p. 10) acknowledges reading and being inspired by the book in which this quotation appears. The quotation can serve as a brief characterization of both the promise and the problems of radical behaviorist epistemology as well as the tensions between radical behaviorism and traditional views of knowledge and knowing. These tensions emerge along several dimensions.

One approach to understanding knowing and knowledge is to aspire to a theory of knowledge that is independent of (and, perhaps, presupposed by) any possible science including scientific psychology. Skinner clearly rejects such a non-naturalistic view (e.g., see p. 164). He must be counted among the philosophical naturalists who hold that “every epistemology needs a psychology” (Kitcher 1993, p. 65). Radical behaviorism is problematic in part because the psychology that traditional epistemology appears to require is in conflict with the antimentalism of radical behaviorism. Indeed, an extension of Skinner’s antimentalism suggests that from the radical behaviorist perspective, traditional mentalistic epistemology (even if naturalistic, see James, 1891) instantiates a scientifically problematic form of vitalism.

The issues here are profound and excruciatingly hard to keep straight, but one cannot begin to appreciate Skinner’s radical behaviorism without assessing how his project relates to this issue. The challenge is to provide a coherent alternative to patently commonsensical views about the nature of scientific knowledge, specifically to provide a coherent alternative to mentalism. Meeting this challenge requires “thinking” “impossible” “thoughts” in exactly the way that natural theologians’ challenge to 19th-century biologists did, namely to explain how there can be design in nature without invoking a designer. Here, Skinner’s own comparison of natural selection and operant conditioning, his consistent and telling criticisms of the “copy theory” of the mind, as well as recent developments in cognitive neuroscience provide a framework for articulating a set of alternatives to mentalism, particularly the representational theory of the mind.

1. The Copy Theory of the Mind

Skinner characterizes a variety of cognitivist theories as copy theories. Information-processing theories and symbol-processing theories of cognitive capacity and function are the prime examples, but various theories of perception are characterized as copy theories as well. And, it should be clear that one of the earliest of Skinner’s sustained criticisms of this form of mentalism appears as a principled criticism of introspection as a method for experimental psychology.

The copy theory of the mind and the correspondence theory of truth exhibit interesting relations to one another that exemplify an important theme in contemporary cognitive science. The common theme is Cartesian: Human cognition, at least, involves a capacity for representing states of affairs in nature more or less faithfully, and the representations are constituents of the causal processes that initiate and guide intelligent action. Such a view holds out the prospect of representations that are completely faithful to the states of affairs they represent. A familiar conception of epistemic activity naturally emerges: The aim of basic

science is knowledge, ideally a theory representing *the* truth, the *whole* truth, and *nothing but* the truth about a given domain of inquiry. On this view, such an aim constitutes an intrinsic value of epistemic activity. Wholly, or even partially, realizing this aim is also acknowledged to be of instrumental value in a way that coheres nicely with the representationalist theory of the mind. Assuming that truth is a matter of correspondence, it is argued that accurate representations of the world provide “fuel for success” in attaining any human aims whose achievement is contingent on states of affairs that obtain in nature. True beliefs (or propositions) indicate what states of affairs exist to be negotiated and exploited in attaining human desires. Scientific theories, human beliefs (thoughts, perceptions), and the linguistic expressions of each are construed as more or less faithful copies or representations of states of affairs in nature. The task of science and the theory of knowledge as well as the conceptual framework for human psychology is constituted by these commonsense views. Skinner’s criticism of the copy theory is the argument that these themes present obstacles to the scientific description and understanding of human behavior including human epistemic activities. In this sense the themes are obstacles to scientific and epistemic progress. Radical behaviorism represents a challenge to these themes and a program for describing and explaining intelligent action in radically different ways. It is beyond the scope of this chapter (and the present capacities of the author) to assess or even fully develop the details of this challenge, but some of the dimensions can be made clearer.

2. Copy Theory, Intentionality, and Teleology

Skinner often (e.g., 1969, pp. 265–266) remarks on the similarities between descriptions of our environments and descriptions of our mental states. Thus, knives are described as sharp or dull and so are pains; the etymology of “excruciating” includes “crucifixion”; actions that “miss their mark” still count as rational, if they were appropriate to circumstances the actor mistakenly believed to obtain (and the mistaken belief was rationally held). Cognitivists maintain that descriptions of mental states are descriptions of an “intentional environment” and not descriptions of the “geographical (e.g., physiological, physical, or social) environment.” Items in the intentional environment have content or meaning; beliefs are about states of affairs that may or may not obtain. Faithful representation is a matter of mental entities being copies of or corresponding with what is the case independently of any representation. Skinner and his cognitivist critics agree that descriptions of the intentional environment are theoretical in exactly the sense that Skinner takes them to be in relation to an experimental analysis of behavior. Radical behaviorism embodies principled skepticism about the scientific value of any such descriptions of an intentional environment. Cognitivists argue that they are scientifically indispensable. Here Skinner’s radical behaviorist arguments begin with the thesis that experimental investigation of any domain is facilitated by a technical language devised for that purpose. They are further developed in relation to the analogy between operant conditioning

and natural selection. Both connect with recent work in philosophy of mind and evolutionary epistemology. I turn to develop these connections, briefly.

A main connection between the radical behaviorist attack on the copy theory and intentionality and evolutionary epistemology emerges in relation to concerns with teleology. Teleology is intimately related to the kind of intentionality exemplified in the copy theory. Following Charles Taylor (1964), Jonathan Bennett (1990) provides what remains the most succinct expression of that relation. Bennett gives expression to two neglected themes that have been constitutive of discussions of mind for at least two millennia: The first theme is that "vital" activities seem to be patterned in means-ends relations; specifically, what occurs consistently at earlier times is what is appropriate in the circumstances for bringing about some specific state of affairs (i.e., a goal state) later. Furthermore, within limits, variations in what reaching the goal state requires are matched by activities appropriate for goal attainment in those circumstances. In this sense, vital phenomena exhibit intelligence. Taylor expresses this idea by saying that certain phenomena fit teleological generalizations. This first theme is consistent with a purely behavioral concept of intelligence and teleology. The second theme links mentalism and teleology. Taylor (1964) notes:

In an "intentional system" . . . the condition of an action occurring is that it be believed adequate to the goal, and not simply that it is, in fact, adequate. And, the two may not go together. The situation as it really is may differ from the situation under its intentional description for the agent, that is, the intentional description may not hold of it. . . . The teleological account holds not of the agent in its "geographical" environment, but of the agent in his "intentional" environment, the environment as it is for him. (p. 62)

Some behavior appears to violate teleological generalizations. For example, behavior may deviate from what is appropriate for attaining a specified goal. This deviation may occur for a variety of reasons, but occasionally, in the human case, at least, it seems appropriate to explain such deviations as instances of goal-directed (or intentional) action directed by mistaken beliefs (e.g., as guided by misrepresentations of the circumstances in which the action occurs, and so caused by a misperception of what is required for goal attainment). Here the teleological generalization is preserved by its extension into the "intentional environment." The behavior inappropriate for goal attainment in actual circumstances is exhibited as appropriate for the circumstances represented in the mind (or intentional environment) of the behaving system. In this sense, the intelligence of the behaving system is also preserved, and at this point, the intentionality of mentalism, the copy theory of the mind, and teleology are linked. I suggest (following Bennett, 1983, but contra Bennett, 1993) that this is the framework within which Dennett's (1987) intentional stance finds its most natural and most intelligible home. I doubt that the traditional notion of mental content (intentionality in the sense of "aboutness") can be found outside this teleological framework. It is clear that this framework is the one to which Skinner takes radical behaviorism to provide a clear and scientifically preferable alternative.

There are, however, a considerable number of obstacles to accepting, appreciating, or even fully or coherently describing the implications of a radical behav-

iorist epistemology. Radical behaviorism raises a skein of problems about truth, reference, meaning, and intentionality whose character is best suggested by the past absurdity (but current obvious commonsense facticity) of the proposition that there can be design without a designer. Skinner's radical behaviorism treats this skein of problems as challenges to be met rather than demonstrations of the absurdity of behaviorism. That solutions to these problems appear to require "impossible" "thoughts" for their resolution is an accurate measure both of what is radical about radical behaviorism and of how truly revolutionary it is.

It is hard to imagine what the alternatives to mentalism in epistemology might be. This difficulty has occasioned remarks that at the level of the theory of knowledge (and, perhaps, ethics), radical behaviorism becomes incoherent. The challenge to articulate a coherent alternative to mentalism is, of course, perfectly legitimate, but Skinner's repeated comparisons between the role of natural selection in biology and operant conditioning in psychology suggest a possible way to proceed in responding to the charge; the incoherence is no more than a failure of imagination, rather like that embodied in the nineteenth-century charge of incoherence leveled at those who suggested there could be design in nature without a designer of nature.

Efforts to work out the nature of this view and to meet the challenges it poses can illuminate both radical behaviorism and the traditional alternative to it. In the interest of encouraging such efforts, I conclude with a brief survey of a variety of views in the literature that exhibit one aspect or another of a set of themes united in radical behaviorism, and some remarks on the strengths and weaknesses of the specific combination of these themes that radical behaviorism exemplifies.

B. NATURALISM AND "KNOWLEDGE?"

Skinner advocates a nonmentalistic causal account of knowing and rejects a copy theory of perception and semantic (coherence or correspondence) theories of truth. A variety of recent work in the theory of knowledge embodies aspects of this view, and exhibits affinities with radical behaviorism.

Paul Churchland explicitly entertains the prospects for a "successor concept for truth" (Punnam, 1988, p. 60). In *A Neurocomputational Perspective* he describes a notion of representation as activation vectors in the weight-error space of connectionist systems that illustrates how a set of causal relations might constitute a notion intriguingly like that of true belief or true sentence without introducing a copy theory of the mind (Churchland, 1992, 161ff). Causal (or informational) semantics (e.g., Dretske, 1981) attempts a causal account of intention (or content) of the sort semantic notions require. The causal account of content suggested by the biosemantics of Ruth Millikan (1984, 1993) and others treats representation and content as relations produced by selection processes exemplifying the causal mode Skinner terms "selection by consequences." Panyol Butchvayrov's work (1994) on direct realism articulates a view of perception

that accounts for the perception of and appropriate discriminative responding to diverse properties of the world without appeal to the formation or processing of internal copies of these properties. Karl Popper's (1972) well-known proposal for epistemology without a knowing subject exemplifies conceptions of knowledge without belief. None of these views is uncontroversial, and none constitutes a complete theory of knowledge, much less a coherent radical behaviorist epistemology that would satisfy Skinner. Nevertheless, they each challenge traditional views in ways that a radical behaviorist can appeal to as evidence that various surprising features of radical behaviorism are not only conceivable, but are in fact under discussion. It is beyond the scope of this chapter to attempt any synthesis of these views that might suggest the outlines of a radical behaviorist theory of knowledge and knowers. It suffices to have indicated the dimensions along which such an account is at odds with traditional views.

V. SUMMARY

B. F. Skinner proposes that psychology be pursued as an experimental natural science. His radical behaviorism identifies traditional commonsense mentalistic concepts and modes of explanation as a serious obstacle to that pursuit. Skinner's defense of radical behaviorism consists of arguing that mentalistic concepts constitute a systematic diversion from the task of developing concepts that can serve as effective tools in the experimental search for the causal factors and functional relations that will enable prediction, control, and scientific interpretation of human and nonhuman behavior. Mentalistic concepts embody the copy theory of the mind. As such they encourage the problematic attempt to observe the features of a private mental (or intentional) environment. They also embody the kinds of teleology that have proved to be scientific dead ends. For these reasons, and not because of antecedent commitment to logical positivist dogma, Skinner takes mentalism to be properly identified as the kind of theory that constitutes a distracting and unnecessary speculative diversion from the essential discipline of experimental research.

In the place of mentalism, Skinner recommends a radical behaviorist philosophy of scientific psychology: a scientific interpretation of the epistemic activities of scientific psychologists. This interpretation provides reason for pursuing a kind of experimental program that over the past 60 years has in fact proved productive, and the program avoids the pitfalls of vitalistic and animistic teleology from which modern natural science represents a break. In addition, the program promises coherence with modern biological science, most strikingly in providing the kind of explanatory unification in terms of selection by consequences that has been the hallmark of progress in post-Darwinian evolutionary biology. Realizing this promise remains a daunting challenge, but contemporary developments include encouraging signs. Nominalistic approaches to artificial intelligence have emerged in force. Selectionist approaches to cognition are being

pursued in work on brain development and function as well as in contemporary work in philosophy of mind, philosophy of science, and philosophy of language. Skinner might be pleased to see a radical behaviorist prediction being confirmed:

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, and the current issues which define behaviorism may be wholly resolved. (Skinner, 1969, p. 267)

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