

The Discipline of Behaviorology and the Postulate of Determinism

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Introduction to the Issue

Behaviorology is the name of an organized natural science discipline that is committed to the study of functional relations between behavior and the environment in which that behavior occurs. Determinism is a philosophical doctrine of natural science. It is based upon the postulate that all real events are determined by a functional history that leads inevitably to the manifestation of those events. The scientific study of any event is largely devoted to accounting for the particulars of the natural history that has led to that event—and on that basis, to predict similar events that are yet to occur. These scientific foundations then support the development of the technology by which such events are brought under control. Typical objectives include producing such events, preventing such events, or customizing such events.

Problems arise when the human capacity to trace such a natural history proves inadequate, and a satisfying account cannot be completed. Scholars debate whether, at that point, we should say that the event is wholly or partly indeterminate, or whether we should say that it has a natural history that we are, as yet, unable satisfactorily to trace. At issue is whether nature is inherently unknowable, or whether, in some cases, the human intellect is simply incommensurate with the task of sorting out what are the orderly and theoretically predictable complexities of nature.

Historical Influences on Skinner's Approach

This debate about the nature of nature occasionally arises when people consider the behaviorological scheme of analysis for operant behavior, instances of which are often described in terms of probability. The inherent multiplicity in the antecedent stimulus controls on an operant behavior renders impractical a complete accounting of all of the concurrently effective functional relations between environmental stimuli and an operant behavioral event. That leaves probability statements as the best available way to describe the potential appearance of an operant response. Doing so represents a shift to a different level of analysis at which validity is maintained at the expense of precision. B.F. Skinner led the analyti-

cal way by speaking of the shifting *probability* of an operant response under changing environmental conditions.

It seems to me that Skinner's way of describing operant behavior was heavily influenced by the context in which Skinner struggled to clarify the difference between operant conditioning and the traditional psychological stimulus-response notions that today fit more closely with our contemporary concepts of respondent behavior. In conceptually prying operant behavior apart from that tradition, Skinner had to emphasize what then was the important new role of the consequating stimuli, and in doing so, he seemed to find it necessary to de-emphasize the functional role of the antecedent stimuli (which, in the traditional psychological view, long held center stage as far as function and importance were concerned).

Like most behaviorologists who review Skinner's attempts to present and explain operant behavior and its conditioning to the traditional psychology community, I do not believe that Skinner's de-emphasis of the antecedent stimulus represented any departure from his commitment to determinism. After all, the concept of *functional antecedent* has served as the foundation upon which natural scientists have based their abandonment of mystical causation. It seems to me that when Skinner pointed out that operant conditioning may be described without mentioning any stimulus that acts before the response occurs, he was not thereby implying that the response in question was a spontaneous event that had no functional history leading up to it. That is, Skinner, for strategic reasons pursuant to his departure from traditional psychology, needed to show how operant conditioning could be described by starting with the appearance of a response.

A given response, while it could serve as the starting point for a Skinnerian account of an instance of operant conditioning, did not thereby become divorced from its own functional history. That is, the fact that Skinner began his account of an operant behavior with a single response did not remove that initial response from nature. That response still had its functional history, even though that history was playing no role in Skinner's account of the further operant conditioning of the behavior represented by that response.

Skinner suggested that, given a response, we take note of precisely how it is consequated (perhaps by arranging that consequation), and that we then wait for the subsequent appearances of that behavior, again describing precisely how they too are consequated. We can then point to how those recurring responses are changing in frequency across that sequence of consequations, and, in the case of the variation called shaping, how the recurring responses are also evolving in form—all without having to identify the functional antecedents that share in evoking those responses. Given the traditional stimulus-re-

sponse formulation with which Skinner's main audience was familiar, Skinner's pointed lack of reliance on precisely identified antecedent events exposed most starkly the operant-respondent distinction to which Skinner hoped to sensitize his audience.

However, in proffering such accounts of the operant conditioning process, Skinner was not rejecting antecedent control as the driving force behind operant behavior (if, by *driving force* we mean the functional evocation of a response by an antecedent stimulus). While Skinner's way of accounting for an operant effect was rendered without explanatory reliance on the identity or nature of the functional antecedents, his doing so was not a denial of the necessary existence and evocative function of proximally antecedent events. I would say that any operant behavior is *driven* by its functional antecedents, but in a manner that has been *determined* by the prior consequences of that behavior. I presume that even the most inconsequential little behavioral manifestation has to have its functional antecedents, because I do not believe that any real event, however trivial and small, happens spontaneously (i.e., without a functional history). It is one thing to ignore that history and another to deny it.

In cases where finding those antecedents and exploring their functions goes undone because it is not practical, or is not important, we are left unable to predict accurately the time and characteristics of whatever response those unknown antecedents may evoke. However, based on the entire history of the natural sciences, plus our own personal histories with natural science, we tend to avoid saying that, because we cannot accurately predict an event, its appearance, when it does occur, is mystical, spontaneous, or intrinsically indeterminate.

Instead, we presume that the event *has* functional antecedents and say that we are *ignorant* of them. We would hardly be justified in insisting, on the basis of our personal ignorance of the functional antecedents, that there are none and that an observed behavioral event has instead occurred spontaneously. That would be taking our mere ignorance of the history of that event to mean that the functional order of the universe does not apply to that event. Nor would it seem justified to go mystical when we are merely ignoring the functional history of some event, and doing so because, given the contingencies under which we are operating, no compelling reason exists to bother tracing and describing that history.

Skinner himself noted that if all of the events leading up to an operant response could be taken into analytical account, we could then predict that operant response at least with the accuracy that we now predict an instance of respondent behavior from an occurrence of its eliciting stimulus (see *Science and Human Behavior*, p. 112). It seems to me that Skinner, like all natural scientists who seek out functional relations,

believed that those relations exist to be discovered. Otherwise, why bother with science?

Reinterpreting Our Explanatory Reliance on Probability and Chaos Theory

It has often been noted that a particular stimulus can evoke a number of different operant responses and that a given operant response can be evoked by any of a number of different stimuli. However, two points are relevant to statements of that kind:

First, a typical response occurs as a function of a *set* of stimuli—stimuli that, in some way, share in contributing to the evocative capacity of the environment to produce that response. When we talk about the control exerted by a particular stimulus in which we have an interest, and speak of it as if it were acting alone, we are really inquiring about its contribution to a behavioral effect that is a naturally concerted production. The stimulus of interest is not really acting alone, but shares the evocative function with other events, which, in many cases, we are not taking into analytical account, thus allowing their contributions to be exerted in ways that are going unmeasured. Our usual assumption is that the variable upon which we *are* focusing accounts for most of the functional control even though its exclusivity is problematic.

Second, we must also remain aware that both the environment and the behavior–mediating organism are dynamic systems, and that both of them are always in a state of flux. Any enduring function between environment and behavior upon which we direct our analytical focus thus necessarily manifests as a differential across time. The manifestation of a behavioral response defines a moment of capture by function—a sample pair consisting of the momentary state of the behavior–controlling environment and the corresponding momentary state of the dynamic body. Their functional relation has been established by a particular conditioning history. On the basis of what remains from that conditioning history, the functional relation between them is a deterministic function at that moment. The behavior is theoretically predictable, but to predict it accurately, we would have to be tracing both the flux of the environment and the flux of the body so that we could say that, given the environment as it exists at this instant, and the body as it exists at the same instant, this functional environment,¹ in its

entirety, will evoke precisely this response from this body at this moment.

That kind of predictability is precluded, not because nature is arbitrary (although natural states can change rapidly), but because we lack the capacity to keep pace with those changes. The fluxing mix consists of too many variables that are changing in too many ways, and our measurement technology is not equal to such a challenge. We deal with that problem by jumping to a different level of analysis where we rely on probability theory and chaos theory.

When we talk in terms of probability theory, chaos theory, and other such conceptual devices, those are merely intellectual schemes by which we manage our ignorance of antecedent events in special ways that allow us to tease out the most that validly can be said in spite of that ignorance. However, while those conceptual devices allow us to do that, we would be going too far in our analysis of a kind of behavioral event were we to permit an occasion of recourse to the principles of probability to become an excuse to doubt the *existence* of the functional antecedents that determine that event. That is, what amounts to a neat way of dealing with our ignorance of the functions that account for a behavioral event is not the occasion to start denying the existence of those functions.

The manifestation of that behavioral event can just as rationally be taken as the evidence *for* such functional causation. Recourse to probability theory is just a conceptual way by which we get along without knowing, or having to know, about some antecedent functions that are too costly or too difficult to analyze. In addition to the troublesome complexity of the complete set of evocative antecedents, by the time we undertake our analysis of some behavioral event, the evidence of its functional antecedents may have faded into history beyond the reach of what limited powers of recovery we might have been able to muster. That our residual ignorance compels our explanatory appeal to the concept of probability does not challenge the existence of the functions that define the deterministic kind of reality. Rather, our explanatory reliance on the concept of probability affords us the best kind of answers that are possible without our having to engage in measurement practices that are beyond our capacity, or that we cannot afford to undertake, or that are not worth the effort.

¹ *Environment* can be defined in different ways. It consists of all stimuli that control behavior. Thus, *environment* can be defined in general for all behavior ever exhibited by each member of a population, or by any subset thereof—current, historical, or both. *Environment* can also be defined narrowly in terms of the stimuli that

share in the control of (a) one individual's single response, (b) one individual's single behavior, or (c) the entire behavioral repertoire of an individual. (A response is a single instance of a behavior. Throwing a stone is a response. The throwing of stones is a behavior.)

A Contemporary Casting of the Issue

I have done my teaching in a different era than Skinner did his teaching, and I have ranked the importance of the teaching problems differently because, over time, the problems facing a behaviorology teacher have changed in relative importance. Today it seems less necessary than was true in Skinner's time to go to extremes to try to convince people that respondent conditioning is not the only kind available. Thanks to Skinner's work, the operant-respondent distinction is now seldom doubted even by people who do not fully understand the details of either variety.

During my teaching career, I have found that most students arrive on my doorstep hopelessly superstitious. That would have been true in Skinner's time too. However, it is that corruption of the students' intellect that has posed the greatest teaching challenge to me. In helping my students to overcome their superstitious tendencies, it has been useful for me to stress the functional precursors of *everything*. For that reason, I have found it helpful to emphasize the role and place of the functional antecedents in *any* account of operant behavior, especially their role in the conditioning process.

In that way I deviate from the presentation strategy that Skinner sometimes favored. Whereas Skinner's main problem was how to make his newly delineated operant behavior seem as different as possible from the traditional respondent-like behavior familiar to most of his psychology colleagues and students, my main problem has been to teach the philosophy of naturalism to superstitious people. I have had to find ways to teach the science of behavior-environment relations and its supporting philosophy of naturalism to students who are all too anxious to go mystical given the slightest excuse, especially with respect to human behavior. In the context in which I have worked, I believe that it is best to start an analysis of a behavioral event with its set of functionally evocative antecedents, whether the elements of that set have been identified or not. See Figure 1.

In such a three-term contingency, the set of functional antecedents may be reduced to a single stimulus event that alone contributes enough of the functional

effect to yield a satisfying account if all others are ignored. Alternatively, the set of functional antecedents may consist of multiple events that must combine to generate a net evocative capacity that is minimally sufficient to yield the behavioral effect.

Alternatively, the antecedent set may be a *sequence* of interacting events, the net effect of which comprises the evocative capacity. In such cases, the antecedent circumstances may make little sense unless all of the important elements in a functional sequence are considered. An example is the effect of a function-altering stimulus on an otherwise neutral stimulus. If a stimulus is only evocative in the presence of another stimulus, a satisfying account of the function of the antecedent conditions is possible only if both stimuli and their interactions are incorporated into the analysis.

In any case, as Skinner made clear, the identity of the set of functional antecedents need not be specified to demonstrate an operant effect. We have only to wait for the response and, upon its occurrence, follow it closely with a consequating stimulus, and then repeat that procedure as necessary. Changes, over time, in either the frequency, or the relative frequency, of the behavior then demonstrate the fact of operant conditioning and reveal its kind. However, I think it important that we remain confident that the functional antecedents are extant whether they have been identified or not. As a practical matter, if the wait for an instance of the behavior of interest lasts too long, we have only to evoke the desired behavior by arranging the organism's contact with the appropriate evocative antecedents (assuming that we have bothered to identify them).

With respect to the importance of the consequences of an operant response, I prefer to emphasize the functional role of the consequence *on the relation between the first and second terms*—that is, on the relation between the evocative antecedent stimuli and the behavior in question. For example, a reinforcing consequence has the functional effect of *strengthening that relation*, while an aversive consequence has the functional effect of *weakening that relation*—kinds of changes that are revealed during subsequent iterations of the evocative function. See Figure 2.

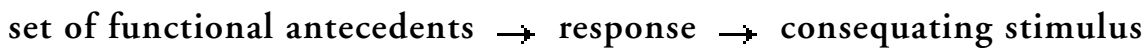


Figure 1

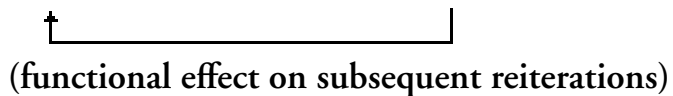
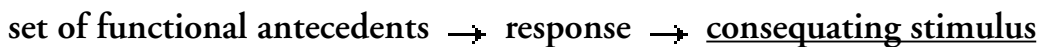


Figure 2

This approach keeps the students focused on a kind of functional causation that involves potentially discoverable real-world (i.e., measurable) antecedent events, a kind of causation that they are all too prepared to compromise to preserve their personal investments in superstition. While a demonstration of the operant effect does not *require* the identification of the set of antecedent stimuli, and we often leave a question mark written in that position, at least the question mark reminds people that some real stimulating events occurred there that are yet to be identified should it become important to do so.

In fact, some potentially important behavior engineering procedures depend upon identifying those antecedents, so that those functional antecedents can be manipulated on future occasions. An example of a practical behavior technology that requires the somewhat precise identification of those functional antecedents is a preclusion or prevention procedure in which a behavior is prevented by intervening to insure that the organism does not contact the stimuli that would evoke that behavior.

In any case, it seems to me that Skinner's way of resorting to the concept of probability to describe the operant conditioning process does not threaten the basic deterministic postulate of the natural sciences. My conclusion is that behaviorology remains as deterministic in its philosophical foundations as any natural science and for the same reasons.

The Nature of the Postulate of Determinism

The deterministic notion that underlies the natural sciences is, of course, a grand inference. The evidence supporting that inference consists of the frequent discovery of function when people have looked for it, coupled with the absence of credibly demonstrated exceptions. Instances of apparent spontaneity seldom withstand unrelenting searches for the measurable kind of functional antecedents that we describe as "real."

The concept of *function* itself is a kind of inference based on observations of certain conditions at one time being reliably followed by certain conditions at a later time. That is, we do not see the function that relates two events; we see the before-and-after conditions. We then infer the function from the reliability of that change.

Yet, without these kinds of deterministic inferences in place, why would we bother trying to analyze events, behavioral or any other kinds. It seems to me that we do so precisely because of our respective histories with the implications of the deterministic view. The assumption is that all events have a natural (i.e., functional) history. That history, when finally understood, affords a valid and reliable accounting for those events of a kind that leads to prediction and ultimately to control. When we have behaved as if such assumptions are true, that kind of behavior has paid off handsomely.

Comparative Philosophy

Once, during a classroom discussion of these issues, an astute and deeply religious graduate student critically noted that a kind of faith underlies the naturalistic philosophy of the natural science community, just as a kind of faith underlies the activities of persons in his devoutly religious community. True, the two communities feature respective faith in different sets of postulates, but, he asked rhetorically, were those differing postulates not both but assumptions that represent extrapolations beyond the hard evidence? He wanted his point to carry to the implication that our respective disciplines, both based on assumptions, were therefore equally worthwhile.

However, the fundamental postulate of naturalism, which can be classified as an assumption, *is inferred from a lifetime of contacts with relations among measurable variables*, whereas the fundamental postulate underlying that student's view of the world comes in the form of prescribed content plus instructions to act as if it were valid.

If the qualitative aspects inhering in the origins of the respective postulates are insufficient to evoke one's commitment to naturalism, then the implications of the kinds of behavior that those incompatible assumptions respectively control should suffice. While the past several centuries have revealed the vagaries associated with both intellectual approaches, the net effects seem to present a clear resolution of the contest. Overall, the human condition is more improved when people act on the implications of naturalism than when they act on the implications of its non-natural alternatives. (Also, see Fraley, 1994, for an elaboration of these issues.) ❧

References

- Fraley, L.E. (1994). Uncertainty about determinism: A critical review of challenges to the determinism of modern science. *Behavior and Philosophy*, 22 (2), 71-83. ❧

