Operants

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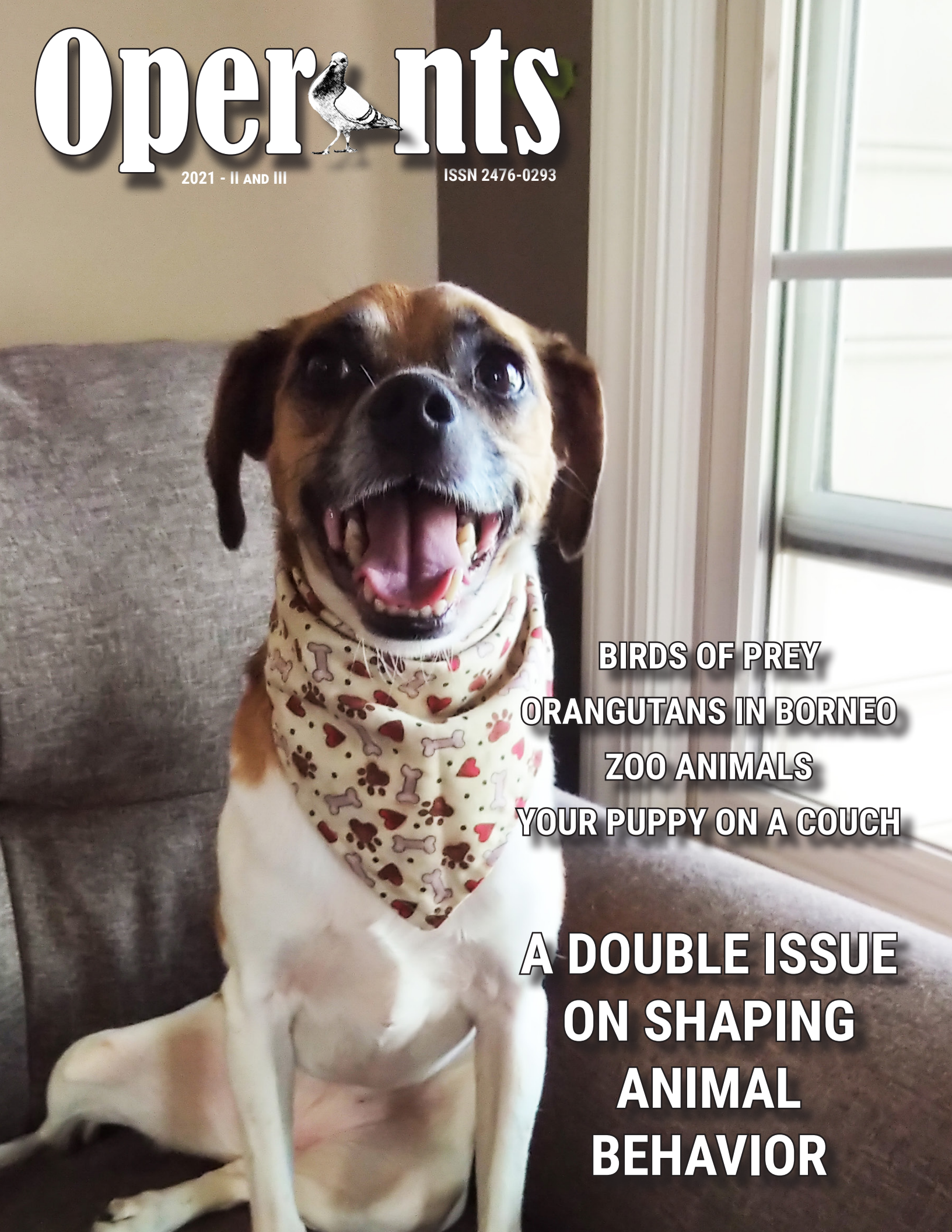


BIRDS OF PREY

ORANGUTANS IN BORNEO

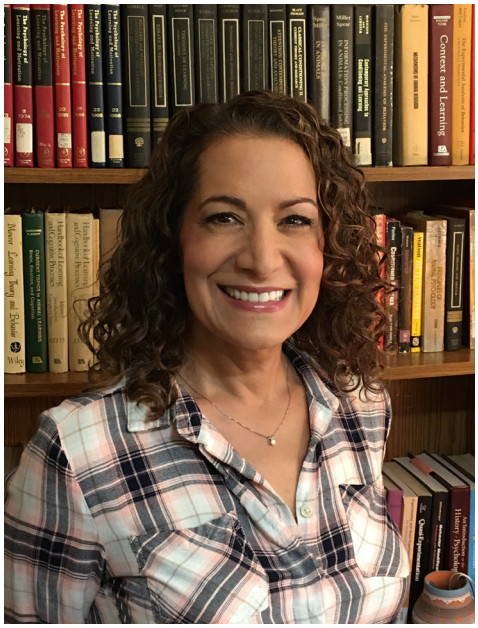
ZOO ANIMALS

YOUR PUPPY ON A COUCH

A DOUBLE ISSUE ON SHAPING ANIMAL BEHAVIOR

ANIMAL TRAINING REVISITED

Parvene Farhoody, PhD



Parvene Farhoody earned her doctorate in learning processes and behavior analysis from the Graduate Center of the City University of New York and her Master's in Psychology, with a concentration in animal behavior and wildlife conservation, from Hunter College in New York City. She started training animals in 1974 and started her own training and behavior business, Behavior Matters,® Inc., in 1992. She has conducted research on the behavioral effects of neutering dogs, acquisition and demonstration of dogs' "guilt" behavior, and maximally effective and minimally restrictive behavioral interventions to reduce interdog aggression. She specializes in teaching people to better understand learning principles and how to apply them to training across species. She shares her passion for experimental and applied behavior analysis through her research, writings, and teaching.

In 1938, B. F. Skinner published *The Behavior of Organisms*, in which he demonstrated that research with nonhuman animals could be used to investigate universal principles that govern the behavior of all organisms. Skinner's research had enormous implications across species, and a new hard science was born: The experimental analysis of behavior (EAB). Scientists interested in gaining a comprehensive understanding of learning processes were required to study and train nonhuman animals as the foundation of their education in this basic science.

Like all basic scientists, Skinner began his investigation of behavior with experiments in the laboratory. Skinner achieved what until then had never been accomplished—he isolated and identified controlling variables of behavior. We say that Skinner discovered operant conditioning the way we say that Newton discovered gravity. Skinner, like Newton, discovered an objective way to measure naturally occurring phenomena. Skinner called this discovery of functional relations between behavior and environment *operant conditioning* because the behavior of an organism operates within an environment: Behavior changes current contingencies of reinforcement and punishment, and *these contingencies shape the behavior of all living things.* Skinner's cause-and-effect, rather than correlational, approach to the study of behavior was consistent with how other hard sciences investigate controlling variables. Today, the experimental analysis of behavior remains the only area of science under the enormous umbrella of "behavior science" that investigates behavior in this way—as a naturally occurring phenomenon in which *prediction and control* validate basic scientific findings.

From the beginning, Skinner's discovery and approach to describing behavior as a basic science has contradicted other explanations of behavior across philosophy, psychology, and theology. This is because the basic tenet of operant conditioning is that the control of all organisms lies *outside* the organism. By the 1940s, Skinner and his students had begun to apply the basic principles identified in the laboratory to many contexts outside the laboratory. Even though many early behaviorists worked in various real-world environments, they were as competent in the laboratory as they were in the field. In this way, the experimental analysis of behavior was increasingly validated as a basic science, and its application demonstrated how it could be used as a technology of behavior.

As would be expected, there were those who disagreed with Skinner's findings. But the scientific method had long established how basic science advances: Those who disagree with evidence compiled by one scientist or group of scientists state their alternative hypothesis and provide evidence to demonstrate why the old theory can no longer be supported. For example, if one disagrees with the theory that $E = mc^2$, one must use the technical language set forth by the basic science called physics to disprove the validity of the previous theory and support the new hypothesis. The new hypothesis is then increasingly validated by replication until the hypothesis becomes the new theory. The more evidence compiled by scientists to support the original theory, the more

difficult it becomes to disprove.

The experimental analysis of behavior is a basic science that requires the same use of scientific method to separate hypothesis from validated theory and opinion from scientific fact. Therefore, it follows that those who have alternative explanations about why behavior occurs must use the same technical language set forth by EAB to demonstrate that previous findings are unsupported. To this day, no such evidence has been brought forward to successfully refute Skinner's basic findings that the behavior of all organisms is caused by contingencies of reinforcement and punishment that exist within environments—not within organisms. In contrast, data continue to be compiled that strengthen the fundamental principles of operant conditioning and advance our understanding of the four fundamental forces that control behavior—positive and negative reinforcement and positive and negative punishment. These forces, like the force of gravity, are neither good nor bad; they are descriptions of naturally occurring phenomena that act upon all organisms.

Basic science often discovers things that individuals and society are not ready to hear. Most know the consequences to Galileo for stating that the earth was not the center of the universe when he lived in a culture steeped in Christian theology. To accept Galileo's measures of the observable universe, people could no longer believe the information they had been taught from childhood. One might say that Skinner's findings were the behavioral equivalent of Galileo's discovery. Skinner stated that organisms are not the center of their own universe and that human and nonhuman animals are therefore not initiating agents of their own actions. This is in direct contrast to what almost every human being is taught to believe and remains in conflict with what is said in all other branches of psychology/behavior science.

In his time, Galileo expressed his frustration that those who condemned him would not even look at his data. How could he argue his own innocence if people would not look at what he had found? The implications of Skinner's findings were as expansive as Galileo's, and this new way of looking at behavior was perhaps even more difficult to accept than altering a perception of the universe outside oneself. Should we be surprised, then, that in a mere blink of time—83 years—scientists and laymen alike continue to fight against Skinner's discovery by ignoring the findings of a science that questions what a person believes about why they do what they do? Should we be surprised that today, most of those claiming expertise in the science of behavior disregard or circumvent Skinner's basic scientific findings?

Skinner recognized in his own lifetime that the hard science he founded was already in danger of slipping away. The first hurdle was to protect the fledgling basic science from the tendency to default to long-reinforced philosophical interpretations of behavior. In 1987, Skinner wrote the article *Whatever Happened to Psychology as the Science of Behavior?*, in which he identified some of the barriers to the advancement of behavior as a basic science and to the development of a technology of behavior. Two of these were the colloquial use of language and the helping professions.

Skinner was concerned that without a technical language comprehensively understood by those using it, it would be impossible to effectively transfer knowledge and build upon that knowledge to create a true technology. As early as the 1970s, students of Skinner, along with others educated in EAB and practicing its application in real-world settings, noticed a dangerous trend: a decrease in emphasis on *why* behavior changed and an increased emphasis on *how* behavior can change. As Hayes and colleagues pointed out in 1980, the education of those interested in applying the basic science was increasingly focused on procedures for changing behavior and not on advancing the scientific principles and conceptual knowledge of EAB.

Skinner singled out the helping professions as a barrier to the study of behavior as a natural phenomenon and basic science. The umbrella of psychology and behavior science encompasses professionals in many areas of interest who use the basic scientific terminology of EAB inaccurately or inappropriately. Those entering most helping professions have minimal contact with primary sources relevant to the history of EAB and its application. This is often true even for those seeking education in applied behavior analysis (ABA), where concentration is placed on "did you successfully change behavior?" and not on "can you use EAB to describe why behavior changed?" Concern over the implications and consequences of this change in educational emphasis were discussed by Critchfield in 2011 and by Guercio in 2018 and 2020.

Skinner warned that those in helping professions often default to colloquial descriptions of why behavior occurs and changes. This shorthand results in inferences, leads to correlation rather than causation as explanations of behavior, and perpetuates circular arguments that compromise advances in behavior as a hard rather than soft science. In his essay, *Why I Am Not a Cognitive Psychologist*, Skinner spoke directly of "cognitive" explanations and warned that explanatory fictions to explain behavior include "mental processes" such as cognition—unseen and unmeasurable mechanisms that exist in the brain.

Today, the colloquial use of scientific terminology and cognitive explanations of behavior proliferate throughout the increasingly popular helping profession called "animal training"—but like all early applications of the basic science, it did not start out that way. In the 1940s, when Skinner's students first began to apply scientific principles to improve the lives of people, two of his students turned their attention to the lives of animals. Marian and Keller Breland, both experimental behavior analysts who were students of B. F. Skinner, demonstrated that animals could learn enormous behavioral repertoires using maximally effective and minimally restrictive training procedures. The Brelands worked with more than 120 species and trained many thousands of

individual animals. They were the first to directly apply behavior analysis to improve husbandry procedures for animals in zoos and other captive environments. These genuine pioneers of the application of behavior analysis to animal training set ethical and performance standards for anyone wanting to elevate animal training to the same level as that being set for human subjects in applied settings; they collected data, increasingly improved their own skills, and, with a precision still unmatched today, they demonstrated how to implement behavior technology to create the most ideal learning environments for the animals in their care. They also taught others to apply these principles and showed that humane animal training could be accomplished when animal trainers understood how to accurately apply basic science (For more information, see https://www.uakron.edu/chp/abe/the-iq-zoo/animal-behavior-enterprises.dot).

Over many decades, the high standards handed down to us by these pioneers has been lost to most animal trainers. Rather than being encouraged to objectively investigate optimal training methods, to use scientific terminology accurately, and to understand basic concepts of data collection, animal trainers today are sold philosophical arguments about "how we should" train animals. Most unfortunately, much of the use of cognitive explanations and the inaccurate uses of scientific terminology is now coming from individuals claiming knowledge and expertise in behavior analysis, many calling themselves "behaviorists." These well-intentioned figures of authority encourage the use of countless overly simplistic explanations of learning and offer personal opinions and recipe-like approaches for changing behavior. Well-intentioned animal trainers and consumers are told that behavior analysts "do no harm" because they use simplistic roadmaps or procedural hierarchies as ethical guidelines to determine which behavior interventions will be the most effective and least restrictive. However, these oversimplifications directly contradict more than half a century of behavior analytic literature that comprehensively explains why such approaches to the application of a complex science are doomed to fail. In 1988, Van Houten and colleagues addressed the growing concern over ethical issues faced by behavior analysts, and, in 1993, Johnston & Sherman explored the origin and meaning of these ethical guidelines. Animal trainers wanting to learn humane procedures to train animals and improve animals' welfare are too often misled because there are so few opportunities for them to learn EAB and its systematic application in a comprehensive way. Instead of coming closer to the noble goal of a more scientific approach to animal training, the outcome has been an expansion of the dangerous trajectory Skinner predicted.

It may be useful to provide a concrete example of how explanatory fictions posing as behavior analytic explanations compromise the education of those who sincerely try to understand operant conditioning as a natural phenomenon and its application as a technology. A fundamental misrepresentation of operant conditioning is found in the colloquial statement "giving the animal choice and control" over its environment. We can forgive the colloquial verbal behavior but not the explanatory fiction being touted as scientific fact—specifically as behavior analytic fact. Animals do not control their environment; animals are controlled *by* their environment. Choice is not a cause of behavior. Control is not a cause of behavior. These are cognitive explanatory fictions that do not explain why an animal exhibits behavior *X* and not behavior *Y* or *Z*.

Colloquial definitions of "choice" and personal "control" are exactly the sort of imprecise use of language that Skinner tried to remove from the discussion of behavior. The technical term *operant* was developed to set the occasion for the would-be behaviorist to think critically and objectively about behavior. An operant or operant class of behavior is an outcome of reinforcement history. Within an environment in which many possible behaviors (concurrent operants) might occur, the probability that one operant will be exhibited and not another is determined by the learning history of that particular organism in that context. Simply stated, animals are conditioned to respond to stimuli within contexts.

The four fundamental forces (i.e., positive and negative reinforcement and positive and negative punishment) shape the behavior of all organisms. Behavior changes *because* force is placed upon it. These fundamental forces continually act on the organism and occur on many levels at the same time, even though we might, as an academic exercise, investigate them separately, just as a chemist might separately investigate elements in a compound. None of these forces is synonymous with coercion or distress but are scientific terms used to describe *why* behavior changes. Behavior does not change because the animal has "made a choice" or "tried to control its environment" or "feels empowered" by "making its own decision." Such colloquial use of language has led to preposterous circular statements such as "control is a primary reinforcer." Such a statement twists Skinner's profound discussion of consequences as feedback from the environment into a circular, reified construct called "control." This leads those uneducated in EAB to infer that organisms act to contact control, rather than act to contact specific reinforcers. In his 1966 essay, *What is the Experimental Analysis of Behavior?*, Skinner stated that such cognitive circular explanations of why behavior occurs results when one "has not been able to relate the behavior to the contingencies." Such circular arguments do not assist students trying to learn about behavior as a science; indeed, one might consider such statements to be evidence that the person making them has only a rudimentary understanding of EAB and its application.

Behavior changes in response to contingencies that exist within an environment; the animal trainer's job is to alter environments to manipulate current contingencies of reinforcement and punishment and bring the animal into contact with contingencies that act upon the animal and control the animal's behavior. The better the animal trainer understands this, the greater that trainer's ability

to use the four fundamental forces in ways that are minimally stressful to the animal at *every moment* of training.

There is a distinct difference between the work conducted by animal caretakers to determine what behavior is to be trained and the work conducted by a trainer to teach the animal to exhibit a behavior when signaled to do so. The first requires the animal's caretakers to carefully consider many factors (e.g., ethology, phylogeny, biology) as well as the particular needs of that specific individual animal. Training can proceed only after preferences are assessed, evaluations are concluded, and behavior(s) to be trained are identified and defined.

When an animal responds appropriately to a cue (a discriminative stimulus), the animal is said to be under *stimulus control*. Use of this term removes the tendency to be subjective and develops a trainer's ability to observe what is actually happening rather than narrating what the trainer wants to believe is happening. When an animal does not respond appropriately to a cue, it is said that the animal is not under stimulus control. If a final behavior has been carefully considered by the animal's caretakers, and training has been deemed necessary for the health and welfare of the animal, then such lack of stimulus control is the result of training failure and not animal "choice." A competent animal trainer alters the training environment such that the most reinforced operant is the behavior that the trainer wants the animal to exhibit when the cue is presented. Today, however, caretakers of companion animals, working animals, and animals in zoos are being led to believe, under the guise of "science-based training," that animals "choose" what they do. Therefore, if an animal does not respond appropriately to a cue, the explanatory fiction is that "the animal has *chosen* not to do what it was asked and therefore the trainer has empowered the animal by giving it *choice and control*." Such verbal misdirection obscures the fact that the trainer's behavior was also reinforced—behavior that failed to establish stimulus control over the targeted behavior. Given explanatory fictions such as "choice and control," it is not difficult to identify reinforcers that maintain trainer incompetence to achieve stimulus control with the animals in their care. Nor is it difficult to understand why those who preach such fictions gain a devout and self-righteous following.

A human training parallel may be of value. When a child does not engage in "math behavior" in the presence of the discriminative stimulus (i.e., cue), "Take out your book and do math," it is inaccurate, inappropriate, and unscientific, from a behavior-analytic standpoint, to state that the child has "chosen" not to do math. The far more difficult scientific reality to accept, especially for the teacher, is that the learning history of this individual child has resulted in more reinforcement value for engaging in any number of behaviors (concurrent operants) other than the target behavior (doing math). Therefore, the teacher has failed to control the environment in the past and in the present and thereby has not effectively set the occasion for a higher probability that the child will engage in math when cued to do so rather than engage in any other behavior. The child's behavior provides the evidence that the child has not contacted sufficient reinforcement for engaging in math behavior (Behavior *X*) over all other possible concurrent operants in the classroom at that time (Behaviors *A*, *B*, *C*, etc.).

Colloquial language can do a great disservice to the genuine student of behavior who wishes to learn about operant conditioning and understand stimulus control. It is a frightening time for those seeking deeper knowledge in the experimental analysis of behavior and its application. When those hailed as experts at teaching operant conditioning misrepresent Skinner's most basic findings while professing to be one of his followers, their teaching more closely resembles religious zealotry than the expansion of an elegant and far-reaching science. Only when one abandons cognitive fictions can one truly begin to learn what stimulus control means and how to teach in ways that are maximally effective and minimally restrictive; only then does one begin an education in the natural phenomenon called operant conditioning.

When personal agendas become more important than scientific discovery, we can predict that those most dedicated to comprehensive scientific analysis will encounter increasing pressures to accept popular opinion. This is found in many areas of the animal-training community: Those who do not accept overly simplistic representations of a complex science encounter consequences deleterious to their professional standing. For example, in recent years, some professional organizations and certifying bodies have altered their language so that in order to become members or be certified, you must literally sign your name in allegiance to some currently popular philosophy about "how you will train an animal." People who refuse to accept philosophy as science are excluded from organizations, not permitted to take certifying examinations, or not permitted to keep certifications. Those who hold firm to more comprehensive scientific fact over popular fictions are "nonbelievers" and are given any number of labels: unethical, inhumane, unenlightened, abusive—and, most ironically, unscientific. There is no place for scientific discussion when the latest animal training gurus disseminate decrees from on high—Facebook, websites, online courses, and television. The excuse of needing to use colloquial language to "talk to the nonscientist" and "spread the word" must no longer be accepted. The field of behavior analysis is experiencing the outcome Skinner warned against in the 1980s. The dedicated animal trainer, behavior analyst, or concerned consumer must take notice. The older hard sciences remain valid today because they have had centuries (arguably millennia) to build their foundation. Today, one is hard-pressed to find a master's or PhD program anywhere in the world that teaches the experimental analysis of behavior as its focus rather than applied behavior analysis as a helping profession. If we value the discoveries of this science, we must return to an emphasis on teaching its basic tenets as the foundation of the technology of behavior.