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Contents

NOTE: Previously *Behaviorology Today* published occasional fully peer–reviewed articles, explicitly so labeled. Beginning with Volume 15, Number 1, *all* articles receive full peer review. See the "Submission Guidelines" for details.

* This issue does not contain any TIBI course syllabi. New syllabi, or updates of previous syllabi, may appear in future issues. (See the *Syllabus Directory* for details.)

Volume 15, Number 1 **Spring 2012**

Editorial

Philip R. Johnson

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Welcome to the next step in the evolution of this behaviorology journal. While I am a relative new–comer to behaviorology (by way of a Ph.D. in the applied behavior field of rehabilitation, informed by this natural science) the contingencies of my work have compelled support for this discipline in whatever capacities I might serve. Along those lines, being appointed journal editor implies a great deal of trust in me, and some serious responsibility for me, and I am pleased to accept the editorship of this ground breaking natural science journal. I am also greatly honored to have been asked to assume this position, one that Stephen Ledoux so brilliantly filled since 1998, for which we owe him many thanks. He began *Behaviorology Today* then as a newsletter under the name *TIBI News Times* for its first four volumes, and he put every issue out on time (or early), a record I mean to maintain. Now, though, he asked to be allowed to step down. His reasons speak for themselves. One was to increase the time available for some serious book writing while the other concerned encouraging more of us to get experience in organizational tasks, like this, to benefit the future of the discipline. I look forward eagerly to the outcomes of both these reasons.

While we fully peer–reviewed the occasional article previously (stating explicitly when this was the case) I am also pleased to announce that, with the current issue (Volume 15, Number 1, Spring 2012) *Behaviorology Today* is now a fully peer–reviewed journal. Peer reviewing legitimizes our journal among science scholars, and enables us to pursue inclusion in scientific databases (e.g., PubMed).

This issue includes two articles. Stephen Ledoux contributed the first article, "Behaviorism at 100 Unabridged." An abridged version of this article appeared in the January–February 2012 issue (Volume 100, Number 1) of *American Scientist,* because both behaviorism and *American Scientist* were celebrating a centenary year. Published here with permission from *American Scientist,* the unabridged version addresses Ledoux's concern both for peer–review and for the last–moment loss of already accepted content from the paper to create space that the *American Scientist* editor wanted so he could include excerpts from an article by B. F. Skinner (1957) with Ledoux's article. The unabridged paper examines 100 years of the philosophy of science, Radical Behaviorism, and the scientific study of human behavior that it informs, with a particular focus on developments that occurred during the last 50 years since Skinner published "Behaviorism at Fifty" (1963). Ledoux also details the establishment of a separate and independent natural science discipline known as behaviorology, provides a review of selected examples of experimental and applied developments in behaviorological science, and examines the many possibilities for the collaboration of behaviorologists with other natural scientists, especially in relation to efforts to solve global problems.

The second article, "The Evolution of a Discipline and Our Next Steps," by Lawrence Fraley, is a version of a presentation that Fraley gave at the May 2000 ABA convention in Washington, D.C. This paper details Fraley's thoughts regarding how the evolution of a natural science of human behavior should proceed. He justifies classifying behaviorology as a basic natural science, and argues that this natural science of behavior should cut all ties with the "social science" community and its commitment to mystical agential accounts. Also, he clarifies why departments of behaviorology should be housed on university campuses with the other basic natural sciences (physics, chemistry, and biology).

It is my desire that this journal serve as a vehicle to expand the academic, applied, and empirical components of behaviorology. I am very much looking forward to receiving the usual range of submissions (e.g., research and conceptual papers, letters, book reviews) from the international community of behaviorologists. More details appear in the submission guidelines that appear in this and future issues.

Finally, I would like to remind everyone of the TIBI 25th *Behaviorology Anniversary Convention* in Columbus OH, 1–3 August 2012. The convention venue is the Drury Inn and Suites South, 4109 Parkway Centre Drive, Grove City OH 43123. See you there. ♣

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Behaviorism at 100 Unabridged

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Abstract

This paper summarizes 100 years of behaviorism and its impact, starting with a description of B. F. Skinner's 1963 article covering the first 50 years (1913–1963) and reviewing the second 50 years with interrelated advances in the philosophical, organizational, scientific, and interdisciplinary domains. This includes not only (a) Skinner's "Radical Behaviorism," the philosophy that extends naturalism to inform the *natural* science of behavior and its emergence organizationally as an *independent* discipline that today we call behaviorology, after its separation from the non–natural, fundamentally mystical discipline of "behavior and the mind," but also (b) organizational developments, (c) some experimental and applied advances of behaviorological science, and (d) the interdisciplinary benefits and relations among all the natural sciences of energy, matter, life forms, and life functions (i.e., behavior) that accrue with the emergence of the natural science of behavior. These continuing advances improve the possibilities for reducing global superstition, extending global science, and solving global problems.

Source and Circumstances

The 2012 centenary year of behaviorism coincided with several interrelated circumstances: Natural scientists have been working to solve problems like global warming within the limited time frame available before we must experience its worst effects. In that process they noted that the solutions require changes in human behavior. Yet they have lacked access to a natural science of behavior. Thus natural scientists in general comprised one of the principal audiences for this paper. Then in 2012 American Scientist, *the journal of one of natural scientists' major organizations (Sigma Xi, the Scientific Research Society) celebrated its centenary as well. This set of circumstances led this article into the hands of the editor of* American Scientist, *David Schoonmaker.*

To emphasize this historical context, the editor arranged for an abridged version of this paper (Ledoux, 2012) to follow some lengthy excerpts from B. F. Skinner's article, "The Experimental Analysis of Behavior," which had appeared in American Scientist *in 1957, with this article then bringing readers up to date on the first 100 years of behaviorism. To make room for the Skinner excerpts, he needed to remove several pages from the paper just prior to publication, pages that comprise crucial content. With permission of* American Scientist, *here is the unabridged version of "Behaviorism at 100," which restores the removed material.*

[1] For helpful comments on earlier drafts of the original article in *American Scientist* and the unabridged peer–reviewed version in *Behaviorology Today,* the author thanks many colleagues from over 15 institutions and agencies, including Barry Berghaus (behaviorologist), Paul Chance (behavior analyst), Walter Conley (biologist), John Ferreira (behaviorologist), Lawrence Fraley (behaviorologist), Michael Hanley (behavior analyst), Feng Hong (physicist), Philip Johnson (*Behaviorology Today* editor), Joseph Kennedy (biologist), Marc Lanovaz (behaviorologist), Jerry Lin (mathematician), Werner Matthijs (behaviorologist), David Schoonmaker (*American Scientist* editor), Catherine Shrady (geologist), Donn Sottolano (behaviorologist), Jeffrey Taylor (biologist), Deborah Thomas (behaviorologist), William Trumble (biologist), and several anonymous reviewers.

Address correspondence to ledoux@canton.edu. Also note that the references still include the original annotations for the initial article (Ledoux, 2012) where, under journal policy, the references mainly constituted a short list for further reading.

Key words: behaviorology, behaviorism, B. F. Skinner, human nature, human behavior, behavior, evolution, neural behavior, consciousness, natural science, education, science education, global warming.

Introduction

As a philosophy of science, behaviorism began with an article by John B. Watson in 1913, and its several varieties inform different behavior–related disciplines or sub–disciplines. During the last 100 years, disciplinary developments have led to a clarified version of behaviorism informing a basic, separate *natural* science of behavior. This recently emerged independent discipline of life functions not only complements traditional natural sciences of energy, matter, and life forms, but also shares in solving local and global problems by showing how to discover and effectively control the variables that unlock solutions to the common behavior–related components of these concerns.

In 1963, B. F. Skinner published "Behaviorism at Fifty," reviewing the varieties of behaviorism and the directions of natural behavior science. By the 1960s common wisdom held that the experimentally discovered laws of behavior were largely irrelevant to normal humans, as researchers were then applying these laws mostly to treatments for psychotic individuals and to training for other animals. Skinner challenged that notion on scientific as well as philosophical grounds, and data accumulating over the next 50 years has validated his position that the natural laws governing behavior are relevant to *all* behavior of humans and other animals.

The 1960s were also a time when natural scientists of behavior were continuing their attempts to change the discipline under which many of them worked, psychology, into a natural science. Over the next 50 years, as recognition increased that resistance to those efforts was adamant, natural scientists of behavior gradually took their discipline outside psychology, establishing a separate independence for their natural science that some recognized formally in 1987 using the name *behaviorology.* That name is synonymous with "the natural science of behavior" and is conveniently shorter. While at present quite a number of possible natural scientists of behavior still use an older label for this discipline, only this name definitively indicates the discipline completely separated from disciplines accepting or espousing superstitious or mystical accounts for behavior.

Actually, several different disciplines claim behavior as a subject matter, including theology, psychology, and behaviorology. They are not equal. While the distinction between theology and science is already well established, some confusion lingers over the other two, so we should start by clearing that up: *Behaviorology, and Skinner's behaviorism, are not psychology of any kind!*

While the history that behaviorology and psychology shared some decades ago is not unlike the history physics shared with philosophy some centuries ago, the relation between behaviorology and psychology more closely approximates the relation between biology and creationism. Both psychology and creationism claim to be sciences because they use scientific methods, but neither qualifies as *natural* science because they both appeal to entities or events outside of nature (i.e., to mystical, supernatural, anatural, or otherwise non–natural events). And natural scientists fail to see the *secular* mystical accounts of psychology as any sort of improvement over *theological* mystical accounts.

With behaviorism celebrating its one–hundredth year in 2012, a review of those developments, and their ramifications for other natural sciences and for today's world, seems appropriate. If the implications of this review precipitate appropriate action, the results can elevate the status of naturalism and the natural sciences, lead to solving more human problems, reduce susceptibility to superstition and mysticism (both theological and secular), and improve human intellectuality, rationality, and emotionality.

Naturalism, the general philosophy of science in the natural sciences, has among its characteristics one that particularly helps achieve those outcomes, which is that natural scientists maintain a mutual respect for the natural functional history of events. This enables their analyses to be more complete and to track well across their disciplinary lines. In contrast, ignoring that natural functional history of events often leads to unnecessary compromises between some natural sciences and non–scientific disciplines that make claims of mystical origination of events. An example is the early, ultimately unhelpful, and yet still extant, give–away to theology of human nature and human behavior considerations.

Conversely, here is an example of the cross–discipline tracking that respects the natural functional history of events: While behaviorology accounts for a stimulus evoking a behavior, such as a fast and close moving object that evokes ducking the object, biology can provide details at the physiological level about how an energy change at receptor cells, such as light from a close moving object striking the retina, sets off a cascade of changes through the nervous system that mediates—*not* originates—a behavior, like ducking. In addition, chemistry works on details at the cellular and sub–cellular level about those physiological events, while physics strives for atomic and sub–atomic details about those chemical events.

All four disciplines together provide a comprehensive account of the events. But if natural scientists instead allow claims that behavior in general—or ducking in this particular case—results from the spontaneous, willful act of some putative inner agent, then they lose the whole subject matter of human behavior to purveyors of non–science, a subject matter whose application is perhaps vital for human survival. This loss occurs because an untraceable, untestable mystical account replaces critical

links in the natural functional history of the events, links that already trace more parsimonious, and more detailed, paths at those several different natural science levels of analysis. When such compromises give undeserved status to mystical accounts, natural science loses ground, reducing its benefits. Maintaining respect for the natural functional history of events thus enables a more complete and consistent account of any phenomena including behavior phenomena.

To avoid unnecessary and harmful compromises, a greater availability of even introductory–level coverage of the natural–science of behavior, in science degree curricula, would have been helpful to traditional natural scientists. Instead, many—perhaps most—have experienced exposure mainly to popular cultural and academic perspectives on human nature and human behavior of the kind that fundamentally mystical disciplines espouse, including some disciplines that use scientific methods to support claims of mystical origins of events.

Some traditional natural scientists try to rescue the human nature and human behavior topics from theological and secular mysticisms by trying inappropriately to shoehorn them into strictly evolutionary, genetic, or physiological accounts. Exposure to popular mysticisms can lure others into accepting and repeating mystical accounts when they venture beyond the limits of their disciplinary training and specializations. Instead, as traditional natural scientists become more aware of the progress that other *natural* scientists have made on behavioral fronts, the accuracy of their work expands and the risk of resorting to mystical accounts shrinks. The point here is to provide some highlights of that progress.

Foundations in the First 50 Years

Skinner's 1963 treatment of behaviorism began by describing the primitive origins of mentalistic or psychic explanations of human behavior. His concern, however, was not the primitive origins of these explanations, but their continued use in a discipline, psychology, that began in the 1800s when its original philosopher members wanted to be "scientific." If one restricts the term *scientific* to the use of scientific methods, as they did, then much of the psychology discipline could be construed as scientific. But *scientific,* more broadly and typically construed, also includes adhering to the fundamental philosophy of naturalism, a basic facet being that science deals solely with natural—real, measurable—events as independent and dependent variables, with no abiding place for non–natural—mystical, fictitious—events. Natural philosophy ties the natural sciences together, and distinguishes them from other disciplines.

However, as a discipline, psychology maintains a range of non–natural, even anti–natural, alternatives among its disciplinary schools; this alone is enough to maintain its exclusion from the natural sciences. In addition, psychological explanations, deriving from and so reflecting common, traditional cultural biases, ultimately trace to some type of mystical inner being or entity, sometimes little more than secular versions of the theological soul, like a behavior–originating mind or a behavior–initiating self–agent, which spontaneously considers various factors, decides what to do, and tells the body to do it. With these processes, or sub–parts like id, ego, motive, choice, or trait, we cannot trace the behaviorological, physiological, chemical, or physical links of a natural functional history chain; we can only trace the causal chain back to the putative spontaneous wilful act of the self–agent. This breaks the chain of events in the natural functional history, and further excludes psychological analyses from natural science. However, the competition that these psychological analyses represent absorbs resources that could otherwise expand natural science functional analyses and their related beneficial behaviorological engineering applications. Such were some of the ongoing problems from the first 50 years.

Also in his 1963 paper, Skinner dealt explicitly with the question of "mind" (the quintessential self–agent). His answer began with Charles Darwin's continuity of species. With humans and other animals qualitatively similar, some researchers looked for, and claimed to have found, human characteristics in other animals including consciousness and reasoning. Lloyd Morgan, however, pointed out that more parsimonious accounts than claiming an animal "mind" could explain such findings. And if that was so with other animals, then more parsimonious accounts could explain such characteristics for humans also. Trying to discover parsimonious accounts prompted the natural, experimental science of behavior that began with Skinner in the 1930s. The point was not merely to discover the naturalistic explanations of human behaviors, including complex behaviors such as consciousness, language, reasoning, imaging, and thinking (both verbal or visual) but to discover these naturalistic explanations initially as alternatives to, and ultimately as replacements for, superstitiously grounded explanations, and then to apply these explanations for humanity's benefit.

Behavior, a natural phenomenon, happens—and changes—because independent variables affect the particular body structures that mediate it. No mysterious inner self–agent *does* the behaving or instructs the body to behave. Instead the experimental literature describes two basic and continuously operating conditioning processes that we call respondent (i.e., Pavlovian) conditioning and operant (i.e., Skinnerian) conditioning. Both involve energy transfers between the environment (internal and

external) and the body in ways that, as our physiology colleagues can show, trigger cascades of neural firings that variously induce both the greater energy expenditures involved in bodily movements, and the altered neural structures that constitute a different body that mediates (not initiates) behavior differently on future occasions (in a process popularly called learning, although no inner agent—no "learner"—is present to "do" the learning).

Early in the 1900s, Ivan Pavlov discovered respondent conditioning, which involves the "pairing" (i.e., the overlapping or successive occurrence) of neutral stimulus events with stimulus events that already elicit responses (due to genetically determined neural structures). These pairings transfer energy to the body resulting in nervous system change that alters the way in which the neutral stimulus events function; they come to elicit the responses also. Emotion and feelings and other reflexes and reactions involve respondent processes.

Some years after Pavlov's discovery, and acknowledging Edward Thorndike's work, B. F. Skinner discovered operant conditioning, which involves stimulus–evoked responses affecting—as in "operating on"—the environment in ways that produce, as consequences of behavior, environmental changes that transfer energy back to the nervous system thereby producing structural changes that establish the relative functionality of similar future evocative antecedent stimuli. A wide range of such antecedent stimuli are usually present at any given time. Due to past conditioning, and either in a kind of competition, or sometimes singly but more often in combination, some among these stimuli evoke further behavior based on current neural structure derived from species and personal conditioning history. Additional stimuli may then consequate this behavior, altering the neural structures that mediate it and thereby changing how readily future similar situations will evoke it. Walking, talking, singing, dancing, loving, thinking, studying, working, fighting, planning, partying, publishing, and problem solving—including engineering and scientific research and writing—are all among the typical and ongoing results of operant processes.

The kinds of consequences occurring in operant processes appear to have little effect on the behaviors produced through respondent processes. Thus, respondent behaviors tend to remain consistently reliable, and we can describe their elicitation as automatic.

The physiology that mediates behavior, and the genetic basis of that physiology are also important, but while both are real, access to them is generally unnecessary or unavailable when practical engineering interventions are altering environments at the behaviorological level of analysis thereby producing differences in behavior, as when teachers change the instructional environment with the result that student behavior expands. This is similar to chemists being able to account for changes in the properties of matter using the principles of physics while not needing that level of knowledge to engineer chemical reactions. Also, in the same way that nothing in the nature of chemicals requires involving phlogiston in accounting for a chemical reaction, nothing in the nature of behavior requires involving a homunculus, mind, or will in accounting for any behavior. Indeed, the spontaneous production of responses by self–agents not only violates the conservation of energy principle but also mimics the spontaneous generation hypothesis in biology that Pasteur put to rest.

In expanding naturalistic explanations toward a more complete scientific account of behavior, Skinner discerned that the question of consciousness not only holds a central challenge but also attracts substantial attention and must be taken into account. This science begins its account of consciousness in terms of *neural* behaviors such as awareness, recognition, observation, thinking, and comprehension. While muscle behavior (actually, neuro–muscular behavior) is more familiar to us as it intertwines both neural process components and the more obvious innervated muscle contraction components, the behaviors of consciousness manifest as *pure neural processes* lacking muscle contraction components, with possible exceptions like sub–vocal speech (see Fraley, 2008, 2012, for more detail about neural behavior).

To help grasp consciousness as pure neural responses, consider describing conscious behavior on several increasingly elaborate levels. We could first speak in traditional (i.e., agential, non–natural) terms, noting that people can observe and report to themselves or others the occurrence of some of their behaviors. To *restate* this point with simple behaviorological phrasing (i.e., naturalistically, without implying self agents) certain of peoples' behaviors *evoke* subsequent behaviors of observing and reporting the earlier behaviors. To *embellish* this point behaviorologically, the external and internal environments of peoples' daily existence feature the occurrence of energy exchanges that condition people such that some behaviors, including neural behaviors, function as real, independent variables evoking further behaviors, including more neural behaviors, as real, dependent variables that others describe, also due to past conditioning, as observing and reporting.

Actually many, perhaps most, moment to moment human behaviors play little or no part in evoking any conscious behaviors that way, which may make the occurrence of conscious behaviors even more discriminable (i.e., more evocative of further behavior). And if one's past conditioning history has made putative agential accounts reinforcing, then the occurrence of otherwise ordinary, natural conscious behavior can seem

particularly impressive as supposedly being, or showing, the activity of one or another inner agent. Cultural preferences and lore may build through such processes, affecting large numbers of individuals, to yield the organized forces of theological or secular superstition and mysticism that oppose so much natural science today in spite of their thorough reliance on the vast array of products—from these same natural sciences—to live quality lives while rendering that opposition. Elaborating the natural science analysis of behavior, including of consciousness, helps counter these trends.

The elaboration of the conscious behavior of observing/reporting some *other* behavior can also accommodate the physiological and genetic levels of analysis. While genes originally produce nervous system structure, ongoing respondent and operant conditioning processes that occur throughout life continually change that structure as the internal and external environments exchange energies with the body on a moment by moment basis. Some of those changes to nervous system structure are such that some structures now react in ways naturally mediating neural, conscious behaviors that we describe as observing and reporting, and that differ from the observed and reported behaviors.

When happening, all these intertwined environmental/neural/behavioral processes move along at such a rapid pace that they may seem undetermined, particularly when we try to encompass behavior in general across a time frame beyond a few moments, because events can quickly outpace our measurement technology. That, however, is a problem not with nature but with our residual ignorance (see Fraley, 1994) which we then manage with a variety of techniques including probability and chaos theories. Meanwhile, consistent with Skinner's behaviorism and as Fraley relates repeatedly through increasingly more detailed and complex examples in his 2008 textbook, these processes are *still all entirely natural!* Including self–agents in accounts for behavior is not only redundant and misleading but also dangerous and irresponsible because the resulting reduced effectiveness in problem solving can cause harm.

In his paper Skinner emphasized a range of concerns surrounding the question of consciousness, as this topic seems to focus attention on the difference between science and non–science with respect to behavior. While Freud had assisted the behavioristic perspective by showing that consciousness was not required for other behavior to occur, the nature and occurrence of the consciousness itself presented a more difficult problem, namely the reduced access to real but private events (i.e., events that can function as stimuli only for the body in which they occur).

Some early behaviorists simply denied the existence of private events. For example, Skinner (1963) reports that Watson "tangled with introspective psychologists by denying the existence of images" (p. 952). Others accepted the public/private distinction but disallowed the inclusion of private events in scientific deliberations, because "science is public." Still others, while also accepting the public/private distinction, allowed such events in scientific discourse but only after defining out the private aspect. As examples, some might simply deny that hunger exists; others, accepting that hunger was private, disallowed its study due to its privateness; and still others, while also accepting that hunger was private, studied it only after defining away its privateness by defining it as some number of hours of food deprivation. Respectively, we allude to these three approaches to the privacy problem as Watson's *original* radical behaviorism, methodological behaviorism, and operational behaviorism. All are unsatisfactory because they sidestep the reality of private events, and thereby fail to deal with those events, particularly the events called consciousness.

Calling his 1963 article a "restatement of radical behaviorism" (p. 951), which contributed to calling his philosophy of science "Radical Behaviorism," Skinner resolved the privacy problem by pointing out that, with the skin as a scientifically unimportant boundary, the physical dimensions of public and private events are the same; a natural science of behavior makes no assumptions that events inside the skin are of any special nature, or need to be known in any special way, different from the rest of nature. Instead, an adequate natural behavior science deals with private events as part of behavior itself. In the bulk of his article, Skinner went on to discuss the results of experimental science that had already accumulated in support of this privacy–problem solution, and many of its implications and ramifications.

That experimental science, however, was largely a natural science of the behavior of non–human animals; in the subsequent 50 years, it became both a natural science and an applied engineering technology emphasizing human behavior. During these years developments expanded in the organizational realm while also continuing in both the philosophical and experimental realms.

Developments in the Second 50 Years

The privacy–problem solution that capped the first 50 years prompted one of the major developments bearing on the question of consciousness in the years since 1963, namely a greater appreciation of the reciprocally valuable overlap between the separate yet complementary natural sciences of physiology and behaviorology. For example, to deal scientifically with emotion requires the different analytical levels of these two disciplines. *Emotion* refers to a release of chemicals into the bloodstream (an area of physiology) that external or internal stimuli elicit (an

area of behaviorology). That changed body chemistry produces the reactions called *feelings*. Perhaps more importantly, that changed body chemistry produces effects on other responses. When a bear startles you, you run faster than you run under more ordinary circumstances (or, excising the fictitious inner agent that the word "you" can mistakenly imply, the sudden appearance of a big brown bear from behind a boulder only a meter away evokes faster running—due to the elicited emotional body chemistry change—than the running that more ordinary circumstances evoke, such as a clock showing the time that a jogging session begins).

While behaviorology accounts for specific functional relations between real independent variables on both sides of the skin, and real dependent variables of behavior changes on both sides of the skin, brain physiology accounts for the structural changes that are occurring as those behaviorological–level independent and dependent variables interact. That is, brains mediate behavior that occurs as a function of other real variables; brains neither originate nor initiate behavior. Thus, the more brain physiologists work to account for *the mediation of behavior,* particularly *the mediation of neural behavior,* rather than for *mind* or *mystical mental operations,* the more valid their work becomes.

Essentially then, behaviorology is not a natural science *of how* a body mediates a behavior (e.g., of how striated muscle contractions are a function of neural processes) which is a part of physiology; rather behaviorology is a natural science *of why* a body mediates a behavior (i.e., of the functional relations between independent variables, such as a boulder blocking a forest path, and the dependent variables of body–mediated *behavior,* such as the muscle contractions that the obstacle evokes thereby taking the body around the boulder). All the events at both levels of analysis are entirely natural; no mystical inner agent is considering options and then willing the body/physiology to do the action that it has decided to take. "Considering" and "decision–making" are naturally occurring neural behaviors that happen as a function of real independent variables.

Also naturalistically, behaviorology has addressed some ancient and fundamental questions, leading to some exciting outcomes. This followed the enhanced accounting for complex human behavior, including consciousness, made possible by incorporating Skinner's analysis of verbal behavior (1957a) into the mix of more typical physiological and behaviorological variables: Since what scientists and philosophers and other knowers "do" *is* behavior—often verbal and stripped of residual agential implications—behaviorology, as the natural science of behavior, is providing scientific analyses of science, of philosophy, and of epistemology. By the 1990s such natural–science analyses also covered attitudes, values, rights, ethics, morals, and beliefs (see Fraley, 2008, Chapters 25 and 30) with important implications for a range of engineering concerns including robotics. These kinds of scientific extensions of behaviorology led Lawrence Fraley, in Chapter 29 of his *General Behaviorology* (2008) to conclusions about reality that parallel those Stephen Hawking reached in his *The Grand Design* (2010) through the logic of naturalism in physics, that our neurally behaving reality is the sole source of knowledge (i.e., conscious/neural responding) about reality, because we can get no closer to reality than the responses evoked by the firings of sensory neurons.

A related question arises, both on its own merits and due to its relevance to accounting for consciousness: How can events that seem to be in the past or future affect our behavior? The basic answer is that past or future stimulus events *cannot* directly evoke or consequate responses. Both responses and stimuli occur only in the present, an important implication being that all behavior is *new* behavior (with responses grouping into response classes for experimental analysis). Every behavior occurs under the functional control of *current* evocative stimuli regardless of the complexity, multiplicity, or interactivity of those stimuli or responses. Even memories are not stored responses. They are new responses that current stimuli evoke and that current neural structures mediate, neural structures that have their current structure because conditioning processes changed them both at and since the time of the original instance.

With our now more fully informed perspective, we return to address consciousness more completely. Using the vision modality for convenience, Skinner had described consciousness as *"seeing* that we are seeing*"* (known as "conscious *seeing*"). But he excised any mysterious implied inner agent who "does" the seeing by pointing out two general kinds of contingencies (i.e., functional relations between behavior and antecedent and postcedent variables). Our physical environment supplies the kinds of contingencies that condition seeing in the first place (called "unconscious seeing") while our verbal community supplies the kinds that condition both our conscious seeing and our reporting of what is seen. The thing seen evokes our initial unconscious seeing responses which in turn evoke the seeing/reporting conscious responses. Actually, the thing seen need not be present because other real variables, often as part of processes that some call imaging or picturing, can evoke the unconscious seeing response, which can then evoke conscious seeing/reporting responses. Equally pertinent, when current independent variables are insufficient to compel the conscious part to occur, it does not happen.

The verbal community conditions such seeing and reporting because benefits accrue to it when those events occur. In common terms (i.e., using the linguistic

economy which the agential perspective sometimes provides) more effective social organization and discourse arise when the verbal responses (reports) of what we did, are doing, and are about to do, provide stimuli that share in evoking the responses of verbal community members. As members of that same verbal community, we also benefit when our own seeing and reporting share in evoking our own subsequent responding, for such reporting also evokes our own hearing responses which then naturally supplement the controls on subsequent responses. Often those reporting and hearing responses occur covertly as one type of the conscious neural behavior called thinking, a common and vital addition to the controls on subsequent behavior (since single stimuli seldom control responses). As with all neural behavior, this thinking behavior can be difficult to separate from the neural physiology that mediates it. Still, as with all behavior, independent variables must evoke the occurrence of neural behavior, including thinking. While all these events may be complex and occur so rapidly that they strain our measurement technology, they are nevertheless occurring entirely naturally. No inner agent of any sort is "doing" the seeing, observing, thinking, measuring, evaluating, reporting, or mediating.

While we sometimes benefit from its occasional economy (e.g., the "what we did, are doing, and are about to do" in the previous example) common language usually dampens or curtails scientific sensitivity to the natural status of human behavior. Having developed under primitive conditions that seemed to support the superstitions of personal agency, the common language *per se* unsurprisingly contains explicit and implicit references to inner agents (e.g., personal pronouns). Thus, avoiding common language in scientific discourse is often best, even though it seems comfortably familiar to most audiences. However, the technical language of natural behavior science, which works to exclude agential implications, can still sound overly complicated to new audiences even as these audiences experience an improving scientific sensitivity to the natural status of behavioral phenomena, including consciousness.

Some examples relating to the central concern about consciousness may help. While these use the seeing sense modality, other examples could use other sense modalities (e.g., hearing, taste, smell, touch). As an example of unconscious seeing, a hiker, engaged in a focused conversation with a companion, will step over an unconsciously seen football–size rock on the trail but later cannot describe that rock as it was not consciously seen. Conscious seeing examples are necessarily more complicated as they usually begin with unconscious seeing. For instance, under some current, relatively simple contingencies involving functional chains of external and internal (neural) stimuli and responses, a favorite kind of car is seen (i.e., physical stimulation in the form of light energy reflected onto the retina from a favorite car, perhaps on a dealer's lot, evokes an initially unconscious neural visual car response); it is a "favorite" kind of car due to the past variables with which it was paired. Later, unconsciously and consciously seeing the favorite car occurs again under other contingencies, often with that car absent, as when, unable to get to work, seeing our old, broken down, rusty wreck in the front yard evokes seeing the favorite car replacing the wreck. Still other variables can evoke such conscious seeing. When we see an acquaintance at the grocery who sells cars, that person not only evokes consciously seeing both our wreck and our favorite kind of car (neither of which is present) but also evokes the responses of describing the favorite car, asking where to buy one, how much it will cost, and so on. Still other contingencies may evoke consciously seeing the favored car type, as when the clerk at an airport car rental counter asks us, "What type of car would you like to rent?" The question may evoke only the verbal name of the favorite car, but often the question evokes consciously seeing the favored car which then evokes observing and reporting its type to the clerk.

These responses—unconscious seeing then conscious seeing, and thinking, and sometimes reporting—are typical examples of the natural phenomena of responses chaining into response sequences (i.e., responses, as real events, evoking other responses; see Hayes & Brownstein, 1986) usually including neural responses, all in the present, all new, and not requiring the thing seen to be the current source of evocative stimulation. The same holds for other sense modalities. A physically present object transferring energy to neural receptors of any sense modality can be an evocative stimulus for either muscular responses or neural responses or both. And an evoked neural response can function evocatively for further responses either when *a directly genetically produced* neural structure mediates it or when a neural structure *that various continuously operating conditioning processes have changed* mediates it. If the necessary conditioning (i.e. neural restructuring) has occurred, then once some stimulation evokes a response, that response—as a real event—can evoke a further response, which can evoke yet another response, and so on, chaining according to the current set of operating functional relations.

Those cascading chains of sequential relations, though at times obscure, are not mystical. They merely involve two kinds of behaviors, covert and overt, each serving evocative stimulus functions for subsequent responses of either type. And, especially when contemplating interventions, behaviorologists quickly trace back the links in any causal chain to search in the *accessible* environment for the functional public antecedents of the covert events. By tracing the functional relations

back to events in an accessible part of the environment, they locate potentially changeable independent variables. This affords control over the subsequent internal and otherwise inaccessible parts of the sequence as well as over the external parts. In this way the difficult problems of private events become quite manageable.

As those events unfold, no capricious inner agent makes these chained responses occur; any responses that occur are the only responses that can occur under the present functional independent variables. As natural scientists, we respect the natural functional history even of extremely complex and multiply–controlled response chains such as the text composition responses that the physiology of this complex carbon unit (i.e., of the author) mediated under the then current conditions during the original moments (hours, weeks, months) of writing this article. While it would be quite economically wasteful to bother with the detailed analysis to identify and describe the range of variables compelling the present wording, B. F. Skinner (1957a) as well as Norman Peterson (1978) and Lawrence Fraley (2008, pp. 949–1094) have provided, in their textbooks, the foundations for making such an analysis, and it will occur under appropriate contingencies.

All this complexity in behavioral events can seem amazing, wondrous, awesome, even overwhelming, *but it is all entirely natural.* Perhaps summarizing the origin of such emergent complexity in the context of *all* the natural sciences as a law will help. If it rates the status, call it the Law of Cumulative Complexity: *The natural physical/chemical interactions of matter and energy sometimes result in more complex structures and functions that endure and naturally interact further resulting in an accumulating complexity.* An origin of life is an outcome of the Law of Cumulative Complexity. On this planet other examples of this law include the vast range of life forms available for study, and the interrelations of physiology and behaviorology. *All these are cumulatively complex; all are entirely natural!*

All these considerations involve extensions of the philosophy of science that Skinner called "Radical Behaviorism." It is radical in the sense of comprehensive or fundamental, and it informs both the natural science that experimentally studies human nature and human behavior, and the derivative engineering technologies of that science for effectively addressing accessible independent variables in ways that bring about improvements in behavior at home and work, in education and diplomacy, in interpersonal relationships, and indeed in all applied behavior fields from advertising to zoo keeping. This philosophy, and the science and technology that it supports, first arose among a thoroughly naturalistic group of researchers and academics, working in early twentieth century psychology, that Skinner and his colleagues and their students best represent. However, this natural philosophy, science, and technology ultimately proved to be fully incommensurable with the more commonly available, non–natural, fundamentally mystical, agential perspectives of certain fields that popular culture currently supports, including psychology. As a result, a separation of disciplines had to occur.

Organizational Developments

Such full incommensurability with natural science begins when any discipline studying any phenomenon eschews the assumptions of naturalism that provide the foundation for all natural sciences. This is because *all* real aspects of the universe—including energy, matter, life forms, *and life functions* (e.g., human behavior)—are potentially within the reach of objective scientific accounts and applications. To qualify as *natural* science though, natural philosophy, rather than any sort of mystical assumptions, must inform the framing of research questions and the interpretation of experimental results.

That is basic to natural science, but difficult to maintain in a culture steeped in superstition, where some insist instead that accounts based on mystical assumptions are adequate. Of course, with much scientific activity being methodological, anyone using scientific procedures, even mystical people, can objectively collect data on any real phenomenon. But this is not enough; the inherently contradictory biases in any variety of mystical assumptions informing such data collection usually leads both to misdirected research questions and to misinterpreted experimental results either or both often aimed mainly at proving the mystical assumptions.

However, no one can prove or disprove assumptions. The supporters of mystical assumptions only induce them off–the–cuff or, with allusions to tradition or common lore, from various kinds of faith beliefs that also result from researchable natural processes. In contrast, supporters of the assumptions of natural philosophy mainly induce them from the results and developments of several hundred years of accumulating experimental evidence and effective engineering practices with the wide range of phenomena that the various natural–science and engineering disciplines cover. Thus, these two types of assumptions, naturalistic/scientific and mystical/superstitious, are *not* equal in any meaningful way. They are incommensurable.

That kind of incommensurability, and the growing pressure of expanding experimental and applied research, provided the principal driving forces behind reorganizing the natural science of behavior as a separate and independent discipline. The general result of this development is a foundation natural science related to all other natural sciences, not at the discredited level of

body–directing self–agents, but at the level of a body's physics–based interactions with the external and internal environments. Working in this natural–science tradition, Skinner's treatment of behaviorism in his 1963 article was well rounded but necessarily minimal. A decade later his book *About Behaviorism* (Skinner, 1974) provided details and helped pave the way for the sometimes controversial steps in this reorganization. Lawrence Fraley and Stephen Ledoux (2002) thoroughly discussed the issues and history of this transition, some highlights of which are relevant here.

The movement to disengage from psychology began with several small independence steps. In *A Matter of Consequences* (1983, pp. 23–24, 44) Skinner reported that, around 1950, many of the Harvard psychology faculty considered his early course at Harvard, Psych 7, as too divergent, so he renamed it and transferred it to the general education area as "Natural Science 114: Human Behavior" where it proved very successful with a wider range of students. He subsequently used his notes for that course as the basis for his still highly regarded 1953 textbook, *Science and Human Behavior,* upon which Lawrence Fraley built when writing the first text (Fraley, 2008) explicitly delineating the natural science of behavior as the independent discipline of behaviorology.

Around the same time as his course transfer, Skinner and his behavioral colleagues were moving away from the label "operant psychology" by which they had been known in the 1940s and 1950s. The new label, "The Experimental Analysis of Behavior" (see Skinner, 1957b) implied their more independent direction. In the late 1950s, they founded a new *natural* science journal, *Journal of the Experimental Analysis of Behavior (JEAB),* to publish the growing body of their experimental work. For decades papers in this journal have emphasized single–subject designs and eschewed inner–agent analyses.

By the 1960s, the growing number of researchers reporting experimental analyses in *JEAB* had begun to branch out into an increasingly wide range of application areas. Partially in recognition of the experimental *and applied* nature of their natural science work, they began calling themselves "behavior analysts" and their work "behavior analysis" and, later, "applied behavior analysis." Given their ever growing amount of research, in the late 1960s they founded another journal, the *Journal of Applied Behavior Analysis (JABA).* In time, as research interests expanded further, they founded organizations as well as several additional journals.

With a core philosophy of science—Skinner's radical behaviorism—as a focus, the founding of several new organizations and their journals marked the expanding disciplinary independence of the natural science of behavior. During eight years of increasingly formal meetings started in 1966 (only three years after Skinner published "Behaviorism at Fifty") some natural scientists of behavior moved away from the Midwestern Psychological Association (MPA) which was not filling their professional disciplinary needs. In 1974 they formally established the Midwestern Association of Behavior Analysis (MABA) and began holding conventions separate from the MPA conventions. Margaret Peterson (1978) reported the importance of these events in a quote from an early MABA president, Nate Azrin: "What we are witnessing with MABA may be not only a distinctive type of regional convention organization, but also the birth of a new discipline… separate from Psychology, Psychiatry, Education, and other related areas" (p. 15). After four conventions, MABA was drawing members from the national, and even international, pool of behavior scientists, and it had also become concerned with professional certification issues. So in 1978 it began publishing *The Behavior Analyst* and changed its name first to the Association for Behavior Analysis, and later to the Association for Behavior Analysis International (ABAI).

A possible majority of those who remain natural scientists of behavior maintain membership in ABAI, whose activities have continued vibrantly. On its web site (www.abainternational.org) ABAI reported that in 2008 it had over 5,300 members, with 60 affiliated chapters worldwide reporting around 13,000 members. Over 4,000 members from about 40 countries attended the annual convention which featured over 1,500 presentations by more than 3,000 contributors and a convention bookstore of over 1,000 titles.

However, organizationally, ABAI members had, from the beginning, increasingly emphasized political action on professional, social, and cultural fronts. The enthusiasm for political clout made a large membership seem more important than philosophical clarity and natural science consistency. After decades of pursuing that path, the ABAI membership now comprises a variety of philosophical and disciplinary perspectives. The commonality of its members currently inheres predominantly in efforts to produce good behavioral outcomes within their respective specializations, a circumstance that renders ABAI less of a basic science organization and more of a behavior engineering society.

Furthermore, as important as the political activities were, they distracted the organization from wholeheartedly pursuing its independence. As a result members lost touch with their independence origins, leaving the credibility problems that inhere in gradually separating from another discipline, while still being seen as part of it, to remain and grow.

Exacerbating the controversy, behavior analysts took those and other independence–oriented steps while still closely associated with psychology. This allowed the psychology discipline to claim behavior analysis as part

of itself, a claim that behavior analysts initially validated when, apparently as part of a reasonable attempt to move psychology toward giving up mysticism in favor of natural science, they used the behavior analysis label as the name for the journal of an official division of the American Psychological Association. The attempt failed, and later that same division took "behavior analysis" as its own name, with no clamor of objections occurring!

The valid psychology claim to behavior analysis and its label leaves others, including natural scientists in general, with the clear understanding that behavior analysis can no longer be trusted to be a natural science. The collegial relationships that some natural scientists of behavior have with some traditional natural scientists may buffer that mistrust a bit. But beyond such relationships, those natural scientists of behavior who remain "Behavior Analysts" invite avoidance, and even scorn, from traditional natural scientists. They see these behavior analysts as refusing to go independent and leave mystical psychology behind, as refusing to become behaviorologists and use the appropriate label to name their basic natural science.

On the other hand, the benefits of being part of psychology can include, among other things, an increase in job security and some safety from accountability. While the current poor state of the US economy can increase the value of such factors, a wide variety of contingencies may drive being part of psychology for different behavior analysts, including some—perhaps much—personal success in psychological work units. Even for those behavior analysts well trained in radical behaviorism and the natural science of behavior, these pro–psychology contingencies compelling primary support for behavior analytic organizations too often override the evocative and reinforcing potency of contingencies driving independence for natural behavior science. Could that include contingencies involving intellectual honesty and disciplinary integrity, and even the potentially greater benefits for humanity that could accrue from being able to work, with mutual respect, alongside traditional natural scientists to help solve global problems? (See Fraley & Ledoux, 2002, for details on the contingencies driving independence for natural behavior science.)

All that not only raises severe credibility issues for behavior analysts, issues that continue to haunt their efforts to collaborate with traditional natural science colleagues, especially in efforts to solve global problems, but it also affects naming a separate natural science of behavior discipline. The emphasis on political power drove ABAI to maintain a very liberal policy on member qualifications, such that many members qualified for membership without the benefits that derive from full training or even interest in or agreement with the natural science of behavior (under *any* name), which is why multiple philosophical and disciplinary perspectives pervade ABAI, and why most members mainly emphasize the engineering of good behavioral outcomes without much concern for the basic science—or its disciplinary integrity or name—behind those engineering efforts. Some behavior analysts, however, *are* well–trained natural scientists of behavior, accepting naturalism over mysticism and agentialism. Yet so many them, who could have objected, evidence so little concern over the status of the behavior analysis label, and of being under psychology's wing, that they have let the past status of behavior analysis as a natural science slip permanently away, thereby destroying any possibility of using the behavior analysis label as the name for a completely *independent* natural science of behavior. For such reasons formal separation of the natural science of behavior from psychology required adopting a new disciplinary name, one free of connections with non–natural disciplines.

In the years 1984–1987, an extensive debate (see Fraley & Ledoux, 2002) filled the published behavioral literature regarding, pro and con, the question of fully and officially separating the natural science and philosophy of behavior from psychology. Many discussants acknowledged numerous types of recognizable separation already present in varying degrees, including courses, journals, organizations, conventions, certification, accreditation, and even some academic departments and programs; but prior to 1987, none of these early types of separation occurred under full and formal declarations of independence, although some departments came close. For example, the "Department of Behavior Analysis"—named before the behaviorology label came into use—was fully separate from and independent of the Department of Psychology on the North Texas State University campus in Denton.

The 1984–1987 debates culminated, in 1987, in a group of behavior analysts meeting, as natural scientists of behavior, to reassess the situation and take action. They came to several conclusions. (a) If data from a half century of continuously attempting to change psychology into a natural science "from within"—by invoking standard, evidence–based methods that might take centuries and even then not work—showed failure to produce even slight movement in that direction, then changing psychology was not going to happen within a meaningful time span (e.g., before the opportunity passes in which to help humanity reduce global warming and so avoid its worst effects, a time frame of about 150 years as they rather optimistically understood it then). (b) Their natural science of behavior was not, and never actually had been, any kind of psychology as it had never accepted the basic psychological core of mystical agential origination of behavior. And (c) instead, their already well–established natural science would continue, at least

in part, as a fully separate and independent discipline called behaviorology, a term first proposed in the late 1970s specifically to describe a natural science of behavior discipline completely separate from and independent of psychology, and the only one, from among all proposed names, to have survived and grown in use.

Based on those conclusions, these behaviorologists took several organizational steps establishing the independence of their natural science discipline separate from all disciplines that espouse non–natural accounts for behavior. They founded The International Behaviorology Association (TIBA) and the journals *Behaviorology* and *Behaviorological Commentaries.* Ten years later, in 1997, they separated the research and convention functions from the education and training mission respectively by changing the name to the International Society for Behaviorology (ISB) and founding The International Behaviorology Institute (TIBI) and its journal *Behaviorology Today (BT)*.

From the start, they also held annual behaviorology conventions, with the first one in August 1988 at Clarkson University in Potsdam, NY. The photograph in Figure 1 shows the attendees at that first convention. Most behaviorologists have also continued supporting the beneficial behavior engineering efforts that ABAI disseminates, and in recent years, TIBI has expanded the convention offerings.

However, those disciplinary developments constrained other possibilities. For example, the behaviorology label usually elicits strong negative emotional reactions from some behavior analysts, especially those who forfeit claims to natural science status—even if they adhere to natural science themselves—due to the formal connection that they support and maintain with non–natural disciplines like psychology. These or other behavior analysts have pointed out that the PsycInfo database yields only a handful of hits for the term behaviorology, while yielding thousands of hits for the term behavior analysis. Yet since that database is published by the same American Psychological Association that has a division named Behavior Analysis, while Behaviorology is instead a young natural science completely unconnected to psychology, such findings are quite appropriate. Similarly, some behavior analysts might claim that the lack of a Special Interest Group (SIG) in ABAI implies that behaviorology lacks any importance. But behaviorology lacks a SIG in ABAI because such SIGs are for various *parts of behavior analysis,* and a non–natural discipline fully owns behavior analysis and its label. On the other hand, behaviorology is the label, not for a part of something else but for the independently organized natural science of behavior. Participating as a SIG in that organization, or *any* organization that affiliates with psychology, is simply not appropriate for behaviorology.

Those concerns may occur because behaviorology, now an independently organized natural science, arose historically from roots in the early behavior analysis movement, itself originally an expansion of *The Experimental Analysis of Behavior.* Ever since the 1980s, the behavior analytic literature has featured a broad spectrum of views not only on the emergence of behaviorology but also on other topics as behaviorologists view them (e.g., see Cheney, 1991; Eshleman & Vargas, 1988; Fraley, 1983, 1987, 1994a, 1994b). As some in organized behavior analysis turned increasingly *back* toward psychology, the behaviorologists instead moved to declare disciplinary independence. The author suspects that other behavior analysts still adhere to naturalism and natural science, and reject any connection with psychology. These and some others may even now be under contingencies to move away officially from psychology, with its mystical agentialism, and move slowly toward re–committing to Skinner's natural science of behavior. This would begin to qualify them as behaviorologists while they clearly and publicly re–declare their independence and adopt the behaviorology label as the name for their basic science. In this way they would regain recognized status as natural scientists of behavior; they might even join a behaviorology professional organization. Humanity might benefit more if they took that stand quickly, enabling more success in efforts to solve local and global problems, and faculty jobs for credible behaviorologists would become easier to fill.

One must wonder, for example, what path professional contingencies will induce with Board Certified Behavior Analysts (BCBAs). So long as BCBAs are natural scientists of behavior without independence, and use psychology's behavior analysis label, they cannot justify their separate credentials and so always face the threat of legal requirements for supervision by licensed traditional—and often anti–scientific—psychologists (a function that any local minister can just as inappropriately but perhaps more honestly serve). They also even face the threat of legal requirements to replace one half to two thirds of their natural science and behaviorological engineering training with training in traditional psychology so that they can be both less effective and licensed as psychologists themselves. If enough qualified natural science BCBAs re–declare their independence and adopt the behaviorology label as the name for their basic science, which need not otherwise change (beyond the self–correction inherent in science), then using the "Applied Behavior Analysis" (ABA) label for at least some of the engineering side of the independent discipline may succeed. "ABA" carries an engineering connotation, while behaviorology is a name for the basic science that can inform that engineering.

Photo by Stephen F. Ledoux

Douglas Greer	Ernest Vargas	Jack Michael		John Stone	Scott Beach	
		Lawrence Fraley		Laura Dorow		
Jerome Ulman	Al Kearney		Robert Spangler		Carl Cheney	
Sigrid Glenn	Guy Bruce				Julie Vargas	Juan Robinson
Stephen Ledoux		Jeffrey Kupfer		John Eshleman	Linda Armendariz	

Figure 1: Most participants at the first TIBA convention, Potsdam, NY, USA, August 1988.

Meanwhile, behaviorologists are quite satisfied with the name of their discipline. That some who would not be strategically qualified to identify themselves as behaviorologists dislike that term is perhaps advantageous to all parties.

A related and more serious concern that some might express regards the current relative numbers of behavior analysts and behaviorologists. As this is written, behavior analysts are much more numerous than behaviorologists, and that may continue for some time. After all, engineers tend to outnumber basic scientists. However, and more importantly, the emergence of behaviorology has broken the monopolistic grip of the cultural forces of organized mysticism on behavioral phenomena. By its independence behaviorology definitively shifts that sphere of inquiry into the realm of the natural sciences. The widening disciplinary rift likely leaves many students of natural behavior science trapped on the non–natural side where mentors who wish to retain their allegiance may, unable to argue against natural science, resort to disingenuous tactics of distraction or career threats. To those students we can only shout back across the rift: "Examine the evidence; the contingencies therein may ensure that your maturing career investment remains inside the natural science community."

Furthermore, the relative numbers carry little importance, because to natural scientists numbers fail to trump scientific and disciplinary integrity. Behaviorologists need not be numerous; they need only be independent natural scientists addressing the relations of their discipline to the culture that it serves. Even if the number of behaviorologists were to fall to a mere dozen, those 12 would still represent the only independent natural science of behavior named using an established term uncompromised by any connections with fundamentally mystical disciplines.

However, connections with non–natural disciplines reduce the credibility of behavior analysts in the eyes of traditional natural scientists, making the behavior analysts' contributions to humanity's future more difficult to provide, contributions like helping with the behavior components of reducing global warming, within the limited time frame available before enduring its worst effects. And the clock is ticking. Behavior analysts who prefer both credibly helping their traditional natural science colleagues make such contributions, and clearly increasing their distance from fundamentally mystical disciplines, can regain their credibility by adhering to naturalism and natural science while re–declaring their independence and, if qualified, using behaviorology as the name for their basic science. But if those steps are to help, they need to take them soon, as humanity is running out of time.

Scientific Developments

During the decades of gradual emergence as an independent discipline, natural scientists of behavior have reported a still growing range of experimental research and engineering applications. Consider, for example, this sample of behaviorological science articles from that period: William Baum (1995) further analyzed radical behaviorism and the concept of agency. Joseph Cautela (1994) elaborated on the importance of the concept of the General Level of Reinforcement (GLR). Carl Cheney (1991) summarized the controlling relations and sources of behavior. John Eshleman and Ernest Vargas (1988) promoted application technologies for verbal behavior analysis. Philip Johnson (2011), and John Ferreira, each analyzed aspects of clinical successes from Progressive Neural Emotional Therapy (PNET). Lawrence Fraley discussed the cultural mission of behaviorology (1987), naturalistic consideration of uncertainties about determinism (1994a), behaviorological thanatology and medical ethics (2006), naturalistic analysis of the legal doctrine of *Mens Rea* (1983), and behaviorological penal corrections (1994b). Stephen Ledoux (2010) reported results on an experimental procedure to control simultaneously evocable and simultaneously occurring, human behaviors with multiple, even simultaneous, selectors, like reinforcers. Jack Michael (1982) separated discriminative and motivational functions of stimuli.

Also, consider this sample of behaviorological science books. Charles Ferster and B. F. Skinner (1957) published the data from their extensive laboratory research on schedules of reinforcement. Robert Epstein (1996) and B. F. Skinner, through their *Columban Simulation Project,* reported the phenomena called recombination of repertoires. Murray Sidman provided works (a) on research methods (1960/1988), (b) on stimulus equivalence relations (1994)—a work with considerable implications for the nature of research *as behavior,* and (c) on the unhelpful effects of coercion and punishment at all levels of social interaction including families, classrooms, workplaces, and international relations (2001). Glenn Latham contributed works on positive practices for raising (1994, 1999) and educating (1998, 2002) children. Cathy Watkins (1997) clarified the value of *Project Follow Through* for improving regular education. Catherine Maurice, Gina Green, and Stephen Luce (1996) detailed best practices for work with autistic children. Aubrey Daniels (1989) addressed performance management in business and industry. Lawrence Fraley (2008) published his graduate level behaviorology course materials from which he had been teaching for 25 years thereby providing the first extensive and systematic book explicitly establishing the separate and independent natural–science discipline of human behavior. Fraley also provided a book–length work on behaviorological

thanatology and dignified dying (2012) and another on behaviorological rehabilitation and the criminal justice system (available in late 2012 but with a date of 2013). The philosophy and science discussed here even prompted two popular and educational works of fiction, one each by B. F. Skinner (1948) and W. Joseph Wyatt (1997).

Those sample lists could have included a far larger number of available books and articles; the particular selections they include are attributable as much to the writer's familiarity with them as to various opinions regarding their relative importance. The same applies to the selections, next, for detailed research and application examples.

Highlighting three of the many areas of experimental research can sample the range of important findings discovered in the last 50 years. These three areas are schedules of reinforcement (Ferster & Skinner, 1957), recombination of repertoires (Epstein, 1996), and equivalence relations (Sidman, 1994).

Basically, reinforcers are postcedent stimuli whose occurrence produces increases in the frequency of the behaviors that they follow, and schedules of reinforcement are the patterns of intermittently occurring reinforcers. These schedules are defined in terms of either the number of responses since the last reinforcer occurred (called *ratio* schedules) or the amount of time—plus a contingent response—since the last reinforcer occurred (called *interval* schedules). The values of either type can be fixed or variable, thereby defining the four fundamental intermittent schedules of reinforcement: fixed ratio (FR), variable ratio (VR), fixed interval (FI), and variable interval (VI). For example, on an "FI–30 second" schedule, a reinforcer would follow the first response to occur after each 30–second interval since the last reinforcer, while on a "VI–30 second" schedule, a reinforcer would follow the first response after each interval, with intervals averaging 30 seconds; on a "VR–30" schedule, a reinforcer would occur, not after *every* thirtieth response—which would be an "FR–30" schedule—but after every set of responses, with each set *averaging* 30 responses; using one of several available methods to arrange this VR schedule, ten reinforcers would occur in 300 responses with between one and 60 responses occurring between reinforcers. Researchers often combine or otherwise rearrange the elements of these basic schedules to conduct studies with a range of more complex schedules (e.g., mixed, multiple, chained, tandem, and concurrent schedules).

Outside the laboratory VR schedules are common. They produce relatively rapid and steady response patterns, which we can characterize as "persistence." For centuries before science discovered and analyzed this schedule, these response patterns compelled purveyors of games of chance intuitively to arrange VR schedules for control of the behavior of their players. And still today VR schedule effects (not the "gambling habits" of fictitious inner agents) are responsible not only for much individual citizen wealth reduction but also for swelling government treasury coffers from lotteries and gambling taxes.

Overall, schedule research has repeatedly led to several general conclusions, including these three: Many features of behavior emerge as the effects of particular reinforcement schedules. Schedules with only subtle differences often produce distinctly different response patterns. And, the direct effects of schedules of reinforcement reduce a wide range of putative inner–agent emotional and motivational causes of behavior to misleading redundancies.

Next we consider two examples of the experimental research concerning recombination of repertoires, with important implications particularly for scientific, engineering, and educational problem–solving behavior. In the 1980s Robert Epstein, with B. F. Skinner, coordinated some studies at Harvard called the *Columban Simulation Project* in which pigeon behaviors that were functionally related to explicit variables simulated complex human behaviors. Some of these complex behaviors concerned novel behavior, symbolic communication, and the use of memoranda and tools. Others were traditionally thought to arise from various mentalistic notions such as "insight" or "self–concept." The result of this research was a more objective explication of complex human behaviors. The same kinds of common contingencies known to be producing the pigeon–simulated behaviors were at work with the human behaviors.

The pigeon simulations began with analysis of the complex human behavior of concern to surmise the minimum repertoire components likely needed for that complex behavior to occur when a challenge situation confronts the organism. Then, for each pigeon subject, after conditioning each required repertoire component (in isolation from other components, to avoid confounded results) the experimenters placed each pigeon in the challenge situation. The researchers found that, for different problematic tasks, if the conditioning of all necessary component behaviors had occurred, then (and only then) the challenge situations evoked successful responses appropriately combining the trained repertoire components.

The first of our two recombination of repertoire examples concerns the test for a supposed "self concept." In this test a young child faces a mirror with a rouge spot on his or her forehead, a location that makes the spot visible only in a mirror. If the image of the child–*cum*–spot in a mirror only evokes responses typical of the presence of another child, we are supposed to accept that the child lacks a concept of self. However, if the image of the child–*cum*–spot in a mirror evokes responses of

touching the spot, then we are supposed to accept that the child's having a "self concept" caused those responses.

In experimenting to discover the actual variables involved in the mirror test, the researchers came upon two classes of responses that they needed to condition in their pigeon experimental subjects. They began by conditioning the birds *with no mirror present* to peck blue stick–on dots placed on virtually every part of the bird's body that it could reach. Separately, they also conditioned effective responding in a mirrored space, with no blue dots on the bird's body, by reinforcing each bird's pecking at each of the varying, correct locations on the unmirrored wall of the chamber upon which a blue light had briefly flashed while the bird faced a mirror and could only see the flash locations in the mirror image. Finally they placed a blue stick–on dot on the bird's breast along with a bib around the bird's neck that prevented the bird from seeing the dot directly, because *any* lowering of the head moved the bib downward covering the dot. When in the chamber with the mirror covered, none of the birds tried to peck the dot, which was possible and likely if they could detect it in any way. With the mirror uncovered, however, every bird began bobbing its head as the dot, repeatedly visible in the mirror whenever standing erect, evoked repeated attempts to peck the dot, which each time disappeared from view due to downward bib movement. Does this mean that these birds had a self concept? Parsimony requires accepting that spot images in mirrors evoke spot–touching not as a function of self concepts, for pigeons or humans, but rather as a function of a relevant conditioning history and current evocative circumstances, a history and circumstances that, for these birds, is an explicit matter of record.

The other recombination of repertoire example concerns testing the "insight" account of some complex human behaviors. Consider that many proud parents have watched as their child, too short to get a cookie from a jar atop a table and having never faced this situation before, looks around and, spotting a chair, moves it over to the table, climbs on it, and retrieves a cookie from the jar, putatively due to something called *insight.* In experimenting to discover the variables involved in this situation, the researchers came upon three pigeon response classes using boxes and toy bananas. They conditioned the birds *with no banana present* to push a box around the chamber toward a target spot and, separately, to climb on a stationary box and, still separately, *with no box or target spot present,* to peck a toy banana within normal reach. These response classes approximated the components of the child's cookie retrieval behavior. Finally, they placed each bird in a chamber with a box to one side and a toy banana *suspended from the ceiling,* a challenge situation that had never confronted the birds before. With some apparent confusion and sighting, like the child's behavior, the birds pushed the box under the banana, climbed on the box, and pecked the banana. Does this mean these birds showed "insight?" Was the child's behavior due to "insight," or was the child's behavior also an example of previously conditioned repertoires combining under novel circumstances? We seldom observe children closely enough to track the conditioning of various repertoire components. Still, parsimony requires accepting that the occurrence of the challenge–meeting responses is not a function of supposed higher mental processes like insight, for pigeons or humans, but rather is a function both of the organism's history having included the conditioning of all relevant repertoire parts and of the current evocative control in the new pattern of related multiple stimuli in the challenge situation. (For organisms with the necessary brain structures, evoked neural responses of consciousness, like thinking, may also naturally be supplementing the more obvious sources of control; more research may clarify this situation.)

The recombination of repertoires line of research benefits the analysis of problem solving as well as enhances the justifications for multi–disciplinary education in scientist/engineer training curricula. As the range of an individual's conditioned repertoire of behavior expands, so does the likelihood that needed parts will be available to combine successfully in new problem circumstances for which no previous conditioning has provided explicit solution responses. While welcome physiological research will show how nervous systems mediate the combining of behavioral elements, the recombination of repertoire contingency accounts replace the unnecessary and counter productive traditional mentalistic accounts of these complex behaviors.

Apparently related to recombination of repertoires in ways still being explored, *stimulus equivalence* is the remaining experimental research area highlighted here. Under some circumstances, after explicitly conditioning some functional relations between environmental antecedent or postcedent stimuli and responses, the number of related behavior–controlling functional relations that we can successfully detect is greater than the number originally involved in the explicit conditioning. Agentially stated, subjects seem to "learn" more than they are "taught," although explaining these phenomena requires no inner agents. Researchers in this area have come to call these explicitly and implicitly (i.e., emergent) conditioned relations *equivalence relations.*

Equivalence relations can transpire in fairly simple circumstances. For example, to train a cloakroom attendant, we might first reinforce (i.e., condition) a new employee such that when shown a regular customer, Ms. Minkowner, and then shown a group of coats, including her pink mink coat, the Ms. Minkowner stimulus reliably evokes the trainee's response of picking up her mink coat.

Then, we reinforce the trainee such that when shown the pink mink coat and several different coat–hanging cubicles, this mink coat reliably evokes the trainee's depositing it in a particular cubicle, say, number seven. *With no further training,* we find that Ms. Minkowner's appearance at the counter reliably evokes the trainee's movement to cubicle number seven from which the trainee retrieves the pink mink coat for her.

Beyond such simplistic examples (which actually pertain mostly to the part of equivalence relations that researchers call transitivity), researchers in this area have demonstrated the phenomena occurring in far more complex circumstances. Using, for example, six sets of three stimuli each, explicit conditioning of a particular 15 environment–behavior functional relations turns out implicitly to condition an additional 75 behavior–evoking functional relations. In this instance, conditioning 15 particular relations can produce a total of 90 testable relations! (For many readers the simple summary here will likely suffice; to peruse the fascinating details, however, see Sidman, 1994; also see Fraley, 2008, Chapter 16.)

The implications of equivalence phenomena for a science–based revolution in, say, education can be substantial. More careful arrangements of curricular components—what we would scientifically call educational conditioning programs—in, for example, history, language, math, and science, can economize by explicitly conditioning only certain evocative functional relations, relevant to the subject matter, in ways that virtually guarantee the implicit conditioning of many other possible and relevant relations evocable by the same broad set of stimuli, an outcome that harbors profound implications for teacher training.

Although physiological research gradually continues to elucidate at the cellular and molecular levels *how* respondent and operant conditioning processes work, and contribute to equivalence relations, natural selection has produced the kind of bodies that these processes can change in varying degrees. For example, if their genes happened to include variations that produced neural structures enabling the mediation of even a small extension of equivalence relations through these processes, then proto–species members could benefit from any likely survival/reproductive advantages that these emergent equivalence–relation extensions confer. Over millions of years, the accumulation of such selected variations would result in genetically produced nervous system structures of increasingly sophisticated potential. As a result, humans today genetically inherit neural structures that generally mediate a relatively extensive range of equivalence relation phenomena.

With biological selection as the foundation of the physiology through which conditioning processes work, including equivalence relations, untestable mystical constructs—from autonomous behavior–initiating self agents to cognition and the secularized soul called the mind—remain scientifically unparsimonious and redundant. Behaviorological science accounts for why these relations happen, and is bringing them under practical control. Still, an even more complete description of the nature of these phenomena must await the physiological research of neural scientists that will eventually show how, in stimulus equivalence, the conditioning of a subset of relations actually changes the nervous system such that the sub–set conditioning turns out to produce the remaining relations as well. While all these behavior related processes have substantive societal implications, society has only begun to notice the potential benefits of applying all the processes and phenomena that basic behaviorological research has discovered in the last 100 years.

Nevertheless, beyond *experimental* research, the last 50 years have seen an explosion of studies applying natural philosophy and science to practical concerns. Touching on two applied research areas, *Project Follow Through* in regular education (Watkins, 1997) and the refining of best practices for work with autistic children (Maurice, Green, & Luce, 1996), minimally samples the extensive range of behaviorological engineering applications.

Project Follow Through was the most extensive and expensive federally funded educational experiment in U.S. history. It looked at how the outcomes, on a variety of standard measures from children taught with a range of distinct instructional models that whole districts voluntarily sponsored, compared with the outcome measures from children whose school districts across the country had not adopted any particular model.

The results led to a major observation: While some models produced a range of poorer outcomes than those of the comparison group, others models produced consistently better outcomes, particularly the Direct Instruction and Behavior Analysis models. Importantly, these successful models explicitly derived from the application of the principles and concepts of the natural science of behavior. This research had predictably revealed some science–based instructional approaches that work in education.

However, leaders in the education field little disseminate that revelation of some best practices for regular education to the very teachers who, along with their students, would benefit from implementing its findings, leading to the wide ignoring of those findings. When giving a workshop a decade ago to about 100 teachers and staff at a public K–12 school, the author asked who had ever heard of *Project Follow Through;* only two answered affirmatively. Also, while the results of *Project Follow Through* focused mainly on student outcomes from the first several years of the project, the

funding of various of its models continued for many years. Unfortunately, this funding was *not* limited to the models that produced improved student outcomes. Objecting to wasting funds on models that hurt children, Cathy Watkins (1997) concludes that suggestions to solve the problems of education include attempts to "change just about every structural and functional aspect of education except *how children are taught*" (p. 88). Ignoring *Project Follow Through* data not only indicates some blind respect for ineffective, agentially–focused methods that comport with popular mysticism but also indicates some persistence of the discredited notion that behaviorological laws are largely irrelevant to normal humans. Perhaps more fundamentally, the dismissal of *Project Follow Through* results reveals that better teaching is not actually a part of the contingencies that drive formal education.

In contrast, the other applied research example, on best practices for work with autistic children, has achieved greater recognition than best practices for regular education. Much of the research initially applying core behaviorological principles and concepts to a wide range of practical concerns, including interventions for autistic children, occurred before the name *behaviorology* emerged to denote the separate and independent status of the natural science of behavior. Consequently, many people refer to such behaviorological practices with the older terms *Applied Behavior Analysis* or ABA, even though today these terms may also cover some less well–grounded practices. Nevertheless, the extensive successes of the behaviorologically supported autism–related practices have made them the preferred intervention, especially for children diagnosed at a young age. For example, in 1999 the New York State Department of Health completed a multi–year project to evaluate the research literature on the numerous types of available autism treatments so as to make intervention recommendations based on scientific evidence of safety and efficacy. Its final report (NYS Department of Health, 1999) stated, for most evaluated interventions, either that the intervention was "not recommended as an intervention" or was "not to be used as an intervention" for young children with autism. The *only* fully recommended intervention was ABA: "It is recommended that principles of applied behavior analysis (ABA) and behavior intervention strategies be included as important elements in any intervention program of young children with autism" (*Quick Reference Guide,* pp. 33–51).

Interdisciplinary Developments

Based on its informing philosophy of radical behaviorism, and beyond experimental and practical contributions in general, behaviorology makes other important contributions to the capabilities of traditional natural scientists. One major current area involves behaviorological green engineering, including overpopulation concerns as a foundation for achieving sustainable lifestyles. Behaviorological scientists and practitioners already work in this area, because so many of the seemingly intractable problems facing humanity today are problems of human behavior as much as they are problems of physics or chemistry or biology. Typical of this interest, a special section in the fall 2010 issue of *The Behavior Analyst* features ten articles devoted to "The Human Response to Climate Change" (see the Supplemental References). With introductory and closing remarks (Heward & Chance, 2010; Chance & Heward, 2010), the topics of these articles include recycling (Keller, 2010), buying green (Layng, 2010), procrastination management (Malott, 2010), increasing success by helping others (Neuringer & Oleson, 2010), driving green (Pritchard, 2010), cooperation (Nevin, 2010), and web–based children's environmental education (Twyman, 2010).

After the introductory remarks, paleo–climatologist Lonnie Thompson (2010) sets the stage for the special section with his article titled "Climate change: The evidence and our options." After reviewing the evidence and discussing the relative merits of mitigation, adaptation, and suffering, Thompson concludes that, "There are currently no technological quick fixes for global warming. *Our only hope is to change our behavior* in ways that significantly slow the rate of global warming, thereby giving the engineers time to devise, develop, and deploy technological solutions *where possible"* (p. 168, emphases added).

Others have made that same crucial point, in some cases even before Thompson. For example, in a 2007 speech, Frederick A. O. Schwarz Jr., the 17–year leader of the Natural Resources Defense Council, said, "Global warming is the greatest threat we face, but it is not the only threat… Too many wild places are disappearing, too many species are being snuffed out, and too many babies are being born with bodies and brains damaged by man–made chemicals and pollution… To win [these battles]… *we must change how people think—and how they act"* (p. 60, emphasis added). In acknowledging the importance of changing peoples' behavior as part of solving world problems, Schwarz was implicitly encouraging the traditional natural sciences to coordinate with an effective natural science of human behavior in green engineering efforts and the movement toward sustainable lifestyles.

Completing such tasks must be a team effort. The players are the natural sciences of energy, matter, life forms, and life functions, because the complex problems facing humanity, and hence the complex solutions, involve aspects of *all* these science and engineering disciplines. Will we cooperate in time? In his paper Lonnie Thompson also pointed out, "… our future may

not be a steady, gradual change in the world's climate, but an abrupt and devastating deterioration from which we cannot recover" (p. 165). As Thompson describes, we must mitigate the problems while that is still an option, or we will be stuck with adaptation and suffering. The message is clear; we are running out of time for efforts to solve world problems, including developing programs to train more people in *all* the relevant natural sciences, including behaviorology, so that they can work more effectively on solutions.

Those solutions require all natural scientists to work together. In part behaviorologists moved decisively for formal independence when they did, so that their science could contribute its share to the expertise and coordinated efforts needed to solve such problems within the necessary time–frame; under these circumstances, they considered that their *not* declaring independence, and instead spending much energy over many more likely fruitless years trying to change psychology, would be essentially a mistake. In agreement, other natural scientists are welcoming behaviorologists in the coordinated efforts that solving major problems requires.

The behaviorology discipline makes additional contributions to the capabilities of other natural scientists. After becoming basically familiar with behaviorology, scientists in many disciplines are more able to remain naturalistic in dealing with subject matters at the edge of, and beyond, their particular specializations rather than slipping into the compromising use of culturally conditioned, superstitious agential accounts. They may also add desirable details to accounts within their specializations. For example, when natural scientists (e.g., Sam Harris or Michael Shermer) say that science accounts for morals and values, their mentioning the controlling relations that behaviorology describes for these topics strengthens their point. Also, behaviorology provides the students of natural scientists with a natural–science alternative to the non–natural disciplines that most of these students currently study when covering behavior–related subject matters.

For their part, other natural scientists can also help themselves by contributing to behaviorology not only through increasing their own familiarity with it—which may be particularly valuable in the efforts to solve world problems, as recombination of repertoires research indicates—but also, and especially, through support for the wider availability of academic behaviorology programs and departments. More of these are needed now to increase people's contact with behaviorology so as to reduce or avoid the increased difficulty in solving problems that stems from culturally conditioned susceptibilities to behavior–related superstition and mysticism. This need is difficult to meet because, as a result of the historical circumstances of the origins of their discipline, many academic behaviorological scientists and engineers remain scattered among academic departments of non–natural disciplines. Traditional natural scientists can help solve this problem by promoting the addition of behaviorology courses and programs in their own larger academic units.

For most people a meaningful amount of contact with behaviorology will occur when behaviorology is a requirement in high school science curricula along with the other foundation natural sciences of physics, chemistry, and biology. To achieve that, science teachers must have behaviorology courses available in their college training programs. To make those courses available, faculty to teach them must be trained in this discipline. And for *that* to happen, programs and departments of behaviorology need to become widely established at colleges and universities. This would also generate increased development of basic research and behaviorological engineering applications, including those contributing to solving personal, local, and global problems on which natural scientists in general are working together.

While Ledoux (2009) reported the consensus among behaviorologists regarding some departmental curricula for various academic levels, one of the obvious places from which to grow behaviorology programs and departments is from within departments of biology, especially within strictly natural science schools. Skinner recognized early in his "Behaviorism at Fifty" article that the *natural* science of behavior was an offshoot of biology. As he elaborated the connection in *The Shaping of a Behaviorist* (1979, pp. 16–76) even though he was earning his doctorate through the psychology department at Harvard University in the 1930s, much of Skinner's work occurred under W. J. Crozier who headed the physiology section of Harvard's biology department and who had been associated with biologist Jacques Loeb. Both Crozier and Loeb not only emphasized studying the whole organism, including its movement (behavior), but they also emphasized studying the causal mechanism of selection which Skinner subsequently adapted from biology and applied to behavior. While that process essentially started this natural–science discipline, modern behaviorology now features its own level of analysis and can stand alone on its own disciplinary merits. These disciplines complement each other, but are not logically dependent. Consequently, a biology department would be only a good temporary home for behaviorology.

In its second 50 years, the value and legacy of behaviorism broadened substantially. The natural science that Skinner's radical behaviorism supports and informs has emerged as an extensive, multi–faceted discipline, although its independence as behaviorology began only about a quarter–century ago. Its academic homes will continue

to expand due to the well–documented effectiveness of approaching human behavior naturalistically. Other disciplines also faced similarly difficult circumstances in their early histories and prevailed. The astronomical discoveries of Galileo 400 years ago helped move our human home, the Earth, beyond superstitious, mystical accounts. The biological discoveries of Darwin 150 years ago helped move the human body beyond superstitious, mystical accounts. And, based on the naturalism of Skinner's radical behaviorism, the current discoveries of behaviorological science help move human nature and human behavior beyond superstitious, mystical accounts. On that basis, our continuing efforts not only improve effective scientific thinking about all subject matters including human nature and human behavior, but also reduce reliance on superstition across the worldwide culture, expand reliance on naturalism, science, and engineering, and increase success in solving personal, local, and world problems.❧

Endnotes

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The Evolution of a Discipline and Our Next Steps

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Context

Shortly before withdrawing from The Association for Behavior Analysis to devote myself exclusively to the establishment of an independently organized behaviorology, I was invited to participate in a two–person discussion at the May 2000 ABA convention in Washington, D.C. The topical issue pertained to how the evolution of a natural science of behavior should proceed. The other participant was well known for his strong conviction that "behavior analysis" should be developed as a facet of organized psychology, while I advocated a divorce of our science and its philosophical foundations from all "social science" affiliations. I argued that our natural science of human behavior should be classified as the fourth basic natural science along with physics, chemistry, and biology, and that our science should be housed with them on university campuses. This paper is a recently edited version of my presentation on that occasion.

The "behavior analysts" have conducted a generation–long experiment, and the question was this: Can the organized natural science discipline of behavior–environment relations thrive while operating under the organizational umbrella of an alternative antithetical discipline that is founded largely on mystical postulates about the nature of human beings and their behavior? Psychology is a science of self–agency with selves functioning much like secular versions of both mystical souls and the much more powerful deity to which souls answer. Putatively a deity can move a mountain easily, but a self, much weaker in its mystical powers, can move little more than an arm or a leg. The fifty–year attempt to operate as a natural science under the organizational umbrella of psychology stands as a well–failed campaign and represents a predictable outcome. Furthermore that comprehensive experiment has failed in an insidious way that renders its advocates progressively incapable of appreciating the symptoms and the magnitude of that progressive failure. That is because the attempt to change psychology is conducted at the expense of the disciplinary integrity of our training programs. Each successive class of newly trained behavior analysts is less critically astute in taking stock of the accumulating results of this misguided campaign and is more comfortably adjusted to its adverse implications.

This intra–psychology movement could have succeeded only by displacing the antithetical discipline of the host psychology community. But that relatively intractable community represents a cultural majority, one that admires the benefits of science but rejects the naturalistic philosophy that must inform worthwhile versions of scientific practice. Organized psychology has incorporated "behavior analysis"—co–opting it so as to control it, even applying that name to a division of the American Psychological Association. But to remain compatible with religion and thus enjoy the socio–political influence that is attached to affiliation with the cultural majority, psychology has preserved the concepts of secular mysticism around which it developed—namely, the idea of an autonomous or semiautonomous "mind." (In some versions a mind is synonymous with the agential self; in others it is the matrix in which that self operates.)

People who spend their lives attempting rather intensely to render themselves mystical thereby damage their own intellectual capacity, progressively eroding their susceptibility to logical argument. Outwardly such people may appear as normal human beings, but they tend to be largely immune to the persuasiveness of scientific logic upon which members of the natural science community rely when advancing their respective scientific views to one another. A point is reached in the development of a mystical person beyond which the kinds of persuasion common among natural scientists are ineffective. Aside from the improbability of successfully advancing scientific arguments to mystics, the compromises that are necessary to disguise and deflect attention from that long term strategy, erode the honesty of our people and degrade the integrity of our own discipline, and do so to a far greater extent than change is wrought in the discipline of that host community. Defying the principles of their own behavior analytic discipline, behavior analysts have relied on objective evidence to alter superstition as if they do not know that faith is impervious to reason. The majority of behavior analysts have spent their careers waving their scientific evidence under the noses of sophisticated mystics putatively in an effort to convert those strongly conditioned people to a philosophy of naturalism, complete with a respect for the scientific and technological implications of the naturalistic perspective. For decades behaviorists, operating from a philosophy

of naturalism, have been proffering their data and appealing to logic in an effort to persuade fundamentally superstitious people to abandon their mystically basic assumptions. Commitment to such a quixotic strategy implies that behavior analysts are too inept at analyzing behavior to have known better than to waste their lives on such a futile quest.

We live in a mystical culture, and it follows that the cultural resources are mainly controlled by the forces of organized mysticism in all facets of the culture. It seems obvious that the vast and seductive resources of organized psychology, and the political power that follows those resources, have deterred behavior analysts from the difficult but important development of their own discipline. Many behavior analysts have conveniently dismissed as impractical the more appropriate but also more challenging course of independent disciplinary development that characterizes the other organized natural sciences. While snuggling up to the copious resources of organized psychology, behavior analysts have found it easy to engage in self–appeasing rhetoric, often sincerely, about their noble service as missionaries for science.

The scholars and practitioners in behavior related fields typically operate on the basis of differing respective philosophies. The philosophy that is neurally behaved by an individual is important precisely because all else that the person does with respect to behavioral phenomena tends to depend on the underlying basic assumptions or postulates that the person brings to the study of behavior. Many philosophical variations have been identified among those who study behavior, but we can divide the philosophical foundations into two major divisions and, using only those two classes, categorize each person's professional behavior either as comporting with naturalism or comporting with a non–natural paradigm.

From the natural perspective, a human being is a product of natural history, and human behavior is just another natural process. The human body is the product of biological evolution. Behaviors per se are functional bodily–mediated reactions to environmental events.[1] Both biological and behavioral complexities are natural outcomes of the causal mechanism of selection. The natural selection process selects for survival organisms along with their genetic endowments, but genes produce only bodily structure. However, that structure, in turn, determines the kinds of behavior that that structure can subsequently mediate (it takes genes to make a tail, but it takes an environment to make that tail wag).

[1] The "environment" of a behaving body part includes both the exterior of the behaving body and the interior of its skin that lies beyond the behaving part. An example of the latter occurs when a part of the brain neurally behaves an awareness response to a pain in a swollen ankle joint.

In contrast the non–natural paradigms rely on an expedient kind of intellectual shortcut. Manifestations of biological and behavioral phenomena—bodies and the behaviors that they exhibit—are attributed to mystical forces. According to some versions, bodies originated through the creative exercise of a powerful external deity. The behaviors that bodies exhibit are regarded as the willful products of a less powerful internal spirit that in secular circles is called a *self* and in religious circles is called a *soul* (the phrase *human spirit* encompasses both). Scientific studies of how those pre–supposed internal agents operate tend to focus on the physiological workings of the nervous system. But the interpretation of the physiological data comports with cognitive and emotive models *brought to* the data, not implicit within them, and those miraculous constructs of mind and personal agency, brought as basic assumptions *to* the physiological data, above all else, implicitly preserve critically important roles for those mystical body–driving agents. Those putative agents are products of faith. Their adherents engage in scientific inquires that probe the real–world half of the link through which an ethereal body–driving agent putatively extends its communications across the gap from the spirit world of the agential mind into the real world of the physical body.

Such an easy superstitious substitute for a lot of complex evolutionary biology and contemporary behaviorology may be gussied with elaborate intellectual trappings in an effort to lend respectability to that way of thinking. But superstition leads ultimately to adverse practical effects. I will provide an example from my own field. Professionally I am an educator—in particular, a teacher. I specialize, from the perspective of a strict natural science, in behavior–environment relations. My specialization, independently defined and organized, is called *behaviorology*. That independent natural science discipline is distinguishable from behavior analysis, which once held the promise of an emergent natural science discipline having an independent integrity that most of its followers, as it turns out, have not wanted.

In 1969, as I began my career, I found that the university that hired me, like others, included among its natural science units no department or even a program devoted to the natural perspective on behavior at the level of analysis that characterizes behaviorology. Instead I have had to work throughout my career in a so called "social science" department in which the methods of science were being applied to scientistic confirmations of mystical assumptions about human beings and their behavior, and to the pursuit of the practical implications of those essentially mystical postulates. In the educational psychology department to which I was long ago assigned, I soon recognized that my emerging conceptual framework as a scholar of natural science differed from that which

guided members of the psychological majority. One aspect of that difference pertained to how faculty members related to the graduate students enrolled in the training programs of the Educational Psychology Department.

To appreciate this issue, consider that the integrity of the traditional psychology discipline is not constructed around a core of functional relations as is true of any natural science. Instead psychology is a discipline represented by its cognitive, developmental, humanistic, and other traditional branches, and is constructed of metaphorical models and of experimentally bolstered theories about the workings of those metaphorical constructs. From that perspective behavior science consists of a set of experimental methods, and its products emerge mainly as an ever–changing collection of the theories about the workings of a body–driving inner agent of whatever origin and nature. Much attention is focused on theories that relate physiological mechanisms to the presumed operations of that mystical self–agent. The self can be trait–guided, but it remains characterized by a practical omnipotence that, while allowing probes of its nature, retains immunity to direct intervention, although it may yield, of its own volition (of course), to subtle seduction. Thus, the disciplinary integrity of organized psychology does not inhere in an appreciated core of logically related functional relations and the pursuit of their implications as is true of a natural science. Rather, the integrity of psychology is political—a career–facilitating coalition of theorists in which survival is more a matter of contemporary popularity than of logical consistency rooted in strict objectivity.

Therefore, training programs designed by traditional educational psychologists tend to feature theory sampling courses commonly offered under titles such as theories of learning, theories of instruction, or theories of human development. A theory or model must only comport with the subset of evidence from which it is derived. It need not comport with other theories or models. Therefore mutual compatibility among theories or models is not a requirement. The strict requirement of prerequisite courses that necessarily characterizes student progress through a natural science curriculum remains much less pronounced in traditional psychology curricula. Each student is left to select an appealing subset of the extant theories with which to interpret his or her personal experiences in dealing with behavior. Within a psychology community, a traditional psychologist may not favor a particular theory, but because organized psychology itself is dedicated to the production of a changing body of such theories, a strong ethic of tolerance for theories, or anything that can be called a theory, has always been essential to the integrity of the psychology community.

Each student is to be presented with the menu of currently popular theories or models from which to choose, and a strong ethic among academic psychologists requires that they then help the student mature as a scholar practitioner in whatever direction the student's intellectual propensities lead, including a direction that may be far afield of that faculty member's own predilection. To the extent that an autonomous or semi–autonomous, and largely sacrosanct, self–agent is believed to do such choosing of theories, that kind of self has to be given that kind of leeway. In the traditional psychological view, the seeds or rudimentary constructs of the maturing person, that is, the individual's traits or the internal causal mechanisms that underlie them, the intellect, and other aspects of the student's character, are all deemed to be intrinsic and largely unassailable personal properties that at least to some degree transcend experience. The intellect can be exercised, and in that sense it can be strengthened, but its fundamental nature remains a facet of the self–agent per se.

The psychology faculty members with whom I have worked were always explicit about their role. They were there to facilitate the growth of the student's intellect. But what typically went unsaid was that "facilitate" implies accepting, almost uncritically, the student's intrinsic intellectual proclivities, and then helping the student to mature accordingly. The faculty member is presumably working with a sacrosanct ghost known as a "self." Therefore, such a faculty member is limited essentially to persuasion. Even if, in spite of the faculty member's presentations, a student commits to theories or models that the faculty member does not respect, or even to fundamental ontological and epistemological ideas that differ from those of the faculty member, that kind of teacher construes that it is a professional obligation to accept the students fundamental way of thinking, as well as decisions derived logically through its exercise. Only intrinsic consistency may be demanded. That is because the essence of each student presumably inheres in a sacrosanct self that ethically may be subjected only to "influences" but not to more intrusive attempts to alter its fundamental nature.

As my psychology colleagues idealize their duty as teachers, to the extent that a student's essential and largely predetermined intellectual traits can be inferred, a psychology professor is required to teach anything that would contribute to the student's further development. To the extent that intellectual integrity is worthwhile, it does not pertain to the discipline; it pertains to the individual student. My psychological colleagues regarded causal traits as essential characteristics of the implicitly inviolate mystical self–agent and construed it their professorial duty to *influence* student selves to adopt good traits. The integrity of their theory–based psychology discipline was not centered in a commonly shared global repertoire of philosophy and science. Therefore, their

teaching mission, unlike training in a natural science of behavior, could not be focused on student mastery of a common core of scientific principles and the functional relationships implicit in those principles. Instead, their teaching mission was devoted to the nourishment and growth of each individual's idiosyncratic, theory–laced, intellectual paradigm. In accordance with the concept of training entertained by my psychological colleagues, they were trying to produce gurus, and with respect to any particular student, ideally, the stripe should matter less than the scholarly fame that ultimately would accrue to that student. In actual practice, however, the typical psychological faculty member favored students who adhered to that faculty member's particular variety of religious and secular mysticism about human beings and their behavior.

From the perspective of my natural science philosophy, I had a very different view of my professional role. I saw my role as that of behavior engineer, including the prescriptive conditioning of the behaviors that defined the student's intellect in the first place. From my perspective there is nothing of importance about an intellect beyond the behavior said to reflect it, and while those behaviors are bodily mediated, they are environmentally controlled, not agentially controlled. My professorial duty was not to accept the student's intellectual proclivities as if they represented some expression of a sacrosanct self–identity that can only be affected through persuasion. I was there to intervene in the on–going production of the student's intellect, doing so through processes of behavioral conditioning. A teacher's job is to organize the student's environment to produce more efficient and effective behavior than is already occurring—that is, to control and arrange the kinds of processes that had previously been conditioning the student, perhaps in a somewhat less organized and informal way. Because the body–directing self–agent is not really in there, extending that agent some kind of free ranging latitude is a fictional option. The choice is always to neglect or attend to the ever–present controls on behavior, and the resultant person amounts to what the prevailing controls condition.

The development of an organized natural science community cannot proceed efficiently through a strategy that disperses its people through the home communities of its antithetical counterparts. For fundamentally economic reasons, those host communities cannot be changed; they can only be circumvented and eclipsed. Geology departments do not commingle hydrologists and dowsers. Physics departments do not commingle astronomers and astrologers. Chemistry departments do not commingle chemists with concocters of magic elixirs. Biology departments do not commingle evolutionists with religious creationists. And for all of the well–understood reasons why doing so would be a bad idea, it makes no sense when an academic department devoted to the study of behavioral phenomena commingles natural scientists of behavior with those who respect and teach mystical mentalism.

The psychological majority has long attempted do deal with the occasional arousal of natural science among its ranks by treating natural science in the usual way of organized psychology—namely, as just another theoretical school, which at the same time encrusts the natural science faction with the traditional limitations and expectations that prevail in psychology departments whenever the next psychological theory blooms forth. The problem is that the integrity of a natural science differs extremely from that of a mere psychological theory and is quite unsuited to the typical handling procedures long established within psychology departments. The natural science of behavior should not be treated as a part of psychology for the same kind of reason that astronomy should not be housed within a Divinity School. The fact that studies in both of those units pertain to the "heavens" does not render them methodologically compatible. In academia the appropriate compartmentalization of any given faculty member is both by subject matter studied and prevailing philosophy respected, the former into a department and the latter into a school or college.

In a philosophically motley psychology department, the behavioral training curriculum must be negotiated with a block of people, usually a large block, who do not believe in what a behavioral curriculum teaches, and who often find its implications abhorrent. The political compromises that the naturalists must accept, with respect to the kinds and amounts of behavioral training that can be offered, erode the integrity of their discipline. Mentalists, while resisting the idea that behaviorism is relevant to the central stream of psychological studies, may be compelled to concede that behavioral techniques seem to work in some extreme individual cases, especially when the results of the interventions seem to pose little threat to the secularly mystical mainstream of psychology. Therefore, a behavioral training curriculum, developed under the umbrella of organized psychology, often enjoys a bit more leeway if it remains focused on such clinical extremes. Thus, the focus of the behavioral minority tends to be diverted toward clinical applications that all too often remain isolated in the curricular periphery of a large psychology department. The isolated behaviorists remain somewhat disassociated from their own conceptual foundations, which typically they are granted few opportunities to teach. It amounts to a management technique whereby the psychological majority keeps natural scientists stifled and out of its curricular mainstream.

On the other hand, training in the science of neural behavior, verbal and otherwise, which provides students with a somewhat complete, natural alternative to the essential core of mentalistic superstition, is rigorously and comprehensively taught in so few places that what arguably should be the central subject matter of a behavior analysis discipline now, in many places, represents only an irrelevant and esoteric curricular indulgence. The more academic facet of behavior analysis is on a long–term down trend, because what is required to sustain the training for its maintenance is precisely what is the first to be lost in the necessary compromises with the mystical majorities that prevail in psychology communities. And increasingly, the kind of new behavior analysts that are trained under the cloud of such accommodations do not care. The folly of trying to change sophisticated mystics should stop. The effort is changing the behavior analysts more than it is changing them. A genuine natural scientist of behavior should go where natural scientists belong. They should join the natural science community, moving to make themselves part of the organizational union of the natural sciences.

As the natural sciences have evolved over the last few centuries, they have focused on various classes of phenomena, but little on behavior. Today, no university department of behavior–environment functional relations is explicitly recognized as a department of natural science affiliated with the academic community of the natural sciences. In nearly all cases behavior–related studies are permitted to occur only under an enforced confinement within what are euphemistically called the social sciences. Within the milieu of academic politics, the traditional forces of organized mysticism have tenaciously maintained their claim on the exclusive privilege to oversee behavior–related training. The organized natural science community needs to embrace a real natural science of behavioral phenomena, a science of behavior–environment relations that can provide the natural science alternative to the mystically based social sciences. There is no good reason why the study of social phenomena must be approached from mystical perspectives, but natural science foundations for the study of social phenomena cannot be developed with sufficient integrity for such a mission from within the traditionally organized social sciences.

As a first step, natural scientists of behavior should go to the organized natural science communities and educate their people. Many respected natural scientists are themselves little more than babbling mystics with respect to behavioral phenomena. We must begin by introducing, to the natural science community, the concept of a natural science of behavioral–environment relations. We must introduce the nature of such a science, beginning with its philosophy of naturalism, which represents the common intellectual matrix for all natural sciences. We cannot expect to be welcome in the natural science community until the members of that community understand us. But at least the natural science community will *be able* to understand us, whereas the social science community cannot *afford* to understand us.

After the second participant had spoken in reaction to my remarks and had defended the continued development of "behavior analysis" from within organized psychology, I proceeded with the following concluding remarks.

Gee, I guess we do disagree a little bit here and there. Behaviorology is a little broader, I think, in its basic conception than my colleague would allow, and certainly its conventions are a lot of fun. The next five conventions have been planned; the next one will be in New York, and they are very science–focused. Being part of one is a very rich experience, and I would recommend those meetings to my professional friends and colleagues.

I really don't know quite how to deal with the argument about the supposed value of a basic philosophical mix within a discipline. I think that my colleague would have a difficult time if he took his argument for philosophical diversity to the physicists, the chemists, the geologists, or the biologists, and tried to explain to them that their departments should be more like the philosophically mixed departments in which behavior analysts tend to work. There is a natural science of behavior. It does have a basic philosophical position, generally called naturalism. There are basic postulates that bind the natural sciences together, and faculty members in the natural science departments respect those. So when I consider the kind of department that I think would serve our interests best, I think of a natural science department of behavior–environment relations in the same sense that you have physics, chemistry, and biology departments. I think that would be in our best interests, because we too represent a basic natural science.

Certainly, in terms of our training, right now to get training in behavior analysis, you have to go to some university and in most cases waste a couple of years taking irrelevant courses in various aspects of psychology in order to get some behavior analytic training under one or two mentors. There are a few exceptions, of course. We all know where those departments can be found. But for the most part, as a student, you go to some university where you work with your behavior analytic mentor, and you waste most of your formal education taking a broad spectrum of required courses in psychological nonsense. You get only about one quarter of the education from the perspective of your discipline that you could get if it were independently organized at your university.

With respect to the issue of the quality of paradigms, yes, I guess I do think that there are inferior and superior ways to think, and they are to be distinguished in terms of the practical effects that follow from them. I don't think that superstition is a good way to think. That's why I identify with the *natural* sciences. Either superstitious mysticism about behavior or the natural science of behavior can serve as the basis upon which to develop a culture, but demonstrably the respective cultural products do not work equally well.

I think that my colleague is absolutely right when he insists that you do not recruit people to your point of views by calling them "superstitious." But I don't think you build a natural science discipline through such recruitment in the first place. The last thing I would recommend trying to do when building a natural science discipline is to attempt the conversion of mystical or superstitious people to the naturalistic perspective. I don't think that, in general, that can be done. Perhaps it can be done occasionally here and there with individuals, but most fundamentally mystical people are so invested in that perspective that they cannot afford to know better. What greater folly is there than devoting one's career to persuasive appeals that your audience members cannot afford to pursue. The analysis of persuasive potential is, in that sense, always an exercise in economics.

The way to produce natural scientists of behavior–environmental relations is to train them. It is much more economical, and much easier, to produce new people of that kind than to convert people who have been conditioned for most of their lifetimes in some other basic philosophy. So it would not be my objective to approach disciplinary development in that way. As my colleague suggests, I may be indelicate in how I talk about the distinctions that I have been discussing here today. And if I thought that the only way we could build a natural science discipline was to go forth and convert a bunch of people to naturalism who had spent most of their lives going in the opposite direction, I would revise the style of my remarks to reflect the familiar circumspection that is affected by colleagues who entertain that assumption about how the organized natural science of behavior must grow. To the extent that I am concerned, former mystics who have come to appreciate and adopt the natural science discipline are always welcome, but we behaviorologists have no intention of building our natural science community exclusively, or even largely, out of intensely persuaded recruits from mysticism. Today, many natural scientists work around the periphery of our behaviorological concerns and need only the encouragement of our clear emergence as a valid basic natural science to bring their own work into our province.❧

Submission Guidelines

***Behaviorology Today* is the peer–reviewed Journal of TIBI *(The International Behaviorology Institute)* and is published in the spring and fall of each year.**

***To submit items,* contact the Editor, Dr. Philip E. Johnson (University of Arizona, Tucson) at:**
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Considerations. The Journal entertains experimental or applied research papers and theoretical or conceptual or literature review articles (all of which will have at least three reviewers) as well as book reviews, on terms, in response, and program descriptions (two reviewers) plus letters, memorials, etc. The members of the TIBI Board of Directors constitute the basic Editorial Review Board (ERB) on which others can serve as members or guests. Authors will not be identified to reviewers and reviewers will not be identified to authors, except when they opt to sign their reviews. (Some reviewers prefer to sign, usually in acknowledgement of the additional help they are prepared to offer the author.) Each reviewer will provide constructive feedback as well as a recommendation: accept, or accept with revisions, or revise and resubmit, or reject.

Based on the set of reviewer recommendations and comments, the Editor will convey the feedback and summary decision to the author(s). With assistance from members of the ERB, the Editor will also provide authors with guidance to shape the best manuscripts possible in a reasonable time frame.

All accepted pieces must contribute to the behaviorology discipline (e.g., by relating to or clarifying or expanding some part of the discipline such as the philosophical, conceptual, theoretical, experimental, applied, or interdisciplinary aspects). Accepted pieces must also be crafted in ways that convey as much consistency as possible with the principles, concepts, practices, philosophy, and terminology of the discipline.

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Volume 7, Number 2 (Fall 2004): BEHG 101: *Introduction to Behaviorology I.**
Volume 7, Number 2 (Fall 2004): BEHG 102: *Introduction to Behaviorology II.**
Volume 7, Number 2 (Fall 2004): BEHG 201: *Non–Coercive Child Rearing Principles and Practices.**
Volume 7, Number 2 (Fall 2004): BEHG 355: *Verbal Behavior I.**
Volume 8, Number 1 (Spring 2005): BEHG 400: *Behaviorological Rehabilitation.*
Volume 8, Number 1 (Spring 2005): BEHG 415: *Basic Autism Intervention Methods.**
Volume 8, Number 1 (Spring 2005): BEHG 420: *Performance Management and Preventing Workplace Violence.**
Volume 8, Number 1 (Spring 2005): BEHG 425: *Non–Coercive Classroom Management and Preventing School Violence.**
Volume 8, Number 1 (Spring 2005): BEHG 475: *Verbal Behavior II.**
Volume 8, Number 2 (Fall 2005): BEHG 410: *Behaviorological Thanatology and Dignified Dying.*
Volume 9, Number 1 (Spring 2006): BEHG 365: *Advanced Behaviorology I.*
Volume 9, Number 2 (Fall 2006): BEHG 470: *Advanced Behaviorology II.*
Volume 10, Number 1 (Spring 2007): BEHG 120: *Non–Coercive Companion Animal Behavior Training.*

Current Syllabi by Course Number

BEHG 101: *Introduction to Behaviorology I:*
Volume 7, Number 2 (Fall 2004).*
BEHG 102: *Introduction to Behaviorology II:*
Volume 7, Number 2 (Fall 2004).*
BEHG 120: *Non–Coercive Companion Animal Behavior Training:*
Volume 10, Number 1 (Spring 2007).
BEHG 201: *Non–Coercive Child Rearing Principles and Practices:*
Volume 7, Number 2 (Fall 2004).*
BEHG 355: *Verbal Behavior I:*
Volume 7, Number 2 (Fall 2004).*
BEHG 365: *Advanced Behaviorology I:*
Volume 9, Number 1 (Spring 2006).
BEHG 400: *Behaviorological Rehabilitation:*
Volume 8, Number 1 (Spring 2005).
BEHG 410: *Behaviorological Thanatology and Dignified Dying:*
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BEHG 415: *Basic Autism Intervention Methods:*
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BEHG 420: *Performance Management and Preventing Workplace Violence:*
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BEHG 425: *Non–Coercive Classroom Management and Preventing School Violence:*
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BEHG 470: *Advanced Behaviorology II:*
Volume 9, Number 2 (Fall 2006).
BEHG 475: *Verbal Behavior II:*
Volume 8, Number 1 (Spring 2005).* ☙

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*TIBI / TIBIA Purposes**

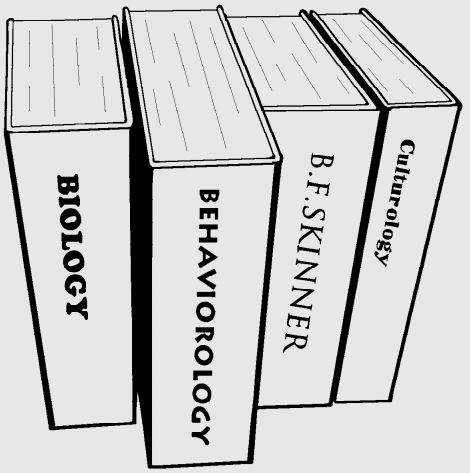
TIBI, as a non–profit educational corporation, is dedicated to many concerns. TIBI is dedicated to teaching behaviorology, especially to those who do not have university behaviorology departments or programs available to them; TIBI is a professional organization also dedicated to expanding the behaviorological literature at least through the magazine/newsletter *Behaviorology Today* (originally called *TIBI News Time*) and the *Behaviorology and Radical Behaviorism* journal;** TIBI is a professional organization also dedicated to organizing behaviorological scientists and practitioners into an association (The International Behaviorology Institute Association—TIBIA) so they can engage in coordinated activities that carry out their shared purposes. These activities include (a) encouraging and assisting members to host visiting scholars who are studying behaviorology; (b) enabling TIBI faculty to arrange or provide training for behaviorology students; and (c) providing TIBI certificates to students who successfully complete specified behaviorology curriculum requirements. And TIBI is a professional organization dedicated to representing and developing the philosophical, conceptual, analytical, experimental, and technological components of the separate, independent discipline of behaviorology, the comprehensive natural science discipline of the functional relations between behavior and independent variables including determinants from the environment, both socio–cultural and physical, as well as determinants from the biological history of the species. Therefore, recognizing that behaviorology's principles and contributions are generally relevant to all cultures and species, the purposes of TIBI are:

A. to foster the philosophy of science known as radical behaviorism;
B. to nurture experimental and applied research analyzing the effects of physical, biological, behavioral, and cultural variables on the behavior of organisms, with selection by consequences being an important causal mode relating these variables at the different levels of organization in the life sciences;
C. to extend technological application of behaviorological research results to areas of human concern;
D. to interpret, consistent with scientific foundations, complex behavioral relations;
E. to support methodologies relevant to the scientific analysis, interpretation, and change of both behavior and its relations with other events;
F. to sustain scientific study in diverse specialized areas of behaviorological phenomena;
G. to integrate the concepts, data, and technologies of the discipline's various sub–fields;
H. to develop a verbal community of behaviorologists;
I. to assist programs and departments of behaviorology to teach the philosophical foundations, scientific analyses and methodologies, and technological extensions of the discipline;
J. to promote a scientific "Behavior Literacy" graduation requirement of appropriate content and depth at all levels of educational institutions from kindergarten through university;
K. to encourage the full use of behaviorology as the essential scientific foundation for behavior related work within all fields of human affairs;
L. to cooperate on mutually important concerns with other humanistic and scientific disciplines and technological fields where their members pursue interests overlapping those of behaviorologists; and
M. to communicate to the general public the importance of the behaviorological perspective for the development, well–being, and survival of humankind.

*This statement of the TIBI / TIBIA purposes has been adapted from the TIBI by–laws.

**This journal (BARB) is under development at this time and will appear only when its implementation can be fully and properly supported.—Ed.

About Behaviorology, TIBI, and *Behaviorology Today*



Behaviorology is an independently organized discipline featuring the natural science of behavior. Behaviorologists study the functional relations between behavior and its independent variables in the behavior–determining environment. Behaviorological accounts are based on the behavioral capacity of the species, the personal history of the behaving organism, and the current physical and social environment in which behavior occurs. Behaviorologists discover the natural laws governing behavior. They then develop beneficial behaviorological–engineering technologies applicable to behavior related concerns in all fields including child rearing, education, employment, entertainment, government, law, marketing, medicine, and self–management.

Behaviorology features strictly natural accounts for behavioral events. In this way behaviorology differs from disciplines that entertain fundamentally superstitious assumptions about humans and their behavior. Behaviorology excludes the mystical notion of a rather spontaneous origination of behavior by the willful action of ethereal, body–dwelling agents connoted by such terms as *mind, psyche, self, muse,* or even pronouns like *I, me,* and *you.*

As part of the organizational structure of the independent natural science of behavior, *The International Behaviorology Institute* (TIBI), a non–profit organization, exists (a) to arrange professional activities for behaviorologists and supportive others, and (b) to focus behaviorological philosophy and science on a broad range of cultural concerns. And *Behaviorology Today* is the referred journal of the Institute. Journal authors write on the full range of disciplinary topics including history, philosophy, concepts, principles, and experimental and applied research. Join us and support bringing the benefits of behaviorology to humanity. (Contributions to TIBI or TIBIA—the professional organization arm of TIBI—are tax–deductible.)

Behaviorology Today

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