



Journal of Behaviorology

ISSN 2331-0774

A journal of TIBI: The International Behaviorology Institute

Behaviorology

Conductologia

Xingwei Xue

Gedragologie

Behaviourology

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NOTE: Prior to Volume 16, Number 1 (Spring 2013) the *Journal of Behaviorology* went by the name of *Behaviorology Today*, which occasionally published fully peer-reviewed articles, explicitly so labeled. Beginning with Volume 15, Number 1, in January 2012, *all* material receives full peer review. See the "Submission Guidelines" for details.

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

Editorial

James O’Heare

(Action Editor for this dual issue)

This issue of the *Journal of Behaviorology* consists of two parts, a separate article and a Special Section. Through some natural–science rules, the article emphasize the philosophical underpinnings of natural sciences, including behaviorology, which may tend to get less attention than some behaviorologists believe is beneficial. The *Special Section* relates more explicitly to the philosophy of science underpinning behaviorology and the naming of this philosophy, with the older term, radical behaviorism, and the newer term “behavioral materialism,” under consideration.

The separate article, *Ten Commandments of Natural Science* by Stephen F. Ledoux, adapts the long, multi–cultural history behind the concept of “ten commandments”—which behaviorologists are more familiar with under the rubric of rule–governed behavior—to expose a gradual decline in the consideration of the assumptions, tenets, and constraints of natural science as a foundation of natural–science disciplines including behaviorology. This article functions to reinstate sets of contingencies that can revoke the inclusion of basic philosophical considerations in natural–science education. The article evokes interest–related behaviors in myself (i.e., this particular biological unit exhibiting this verbal behavior) because it is not just another restatement of the tenets of radical behaviorism / behavioral materialism (e.g., recognizing only natural events), which would also have been a worthy endeavor, but rather it provides a set of rules for operating more broadly within any natural–science discipline. For example the inclusion of respecting the perspectives of others who may operate under different disciplinary contingencies is laudable. This article also folds the relatively newer Law of Cumulative Complexity tenet into the mix, making it a more complete and current contribution to our disciplinary literature.

The *Ten Commandments of Natural Science* article evokes some discipline–wide considerations from which we might benefit by highlighting them here. This is not to say that the opinions expressed in this article necessarily differ from those of other behaviorologists, but the issues have appeared, and further consideration might be reinforcing for other behavior efforts.

First, behaviorology is often framed as the “natural science of human behavior.” Though this may indeed constitute the vast majority of the current emphasis

of behaviorological efforts, behaviorology might also be thought of more broadly as “the natural science of behavior.” This would include all species of animal, including humans, but would exclude the “behavior” of rocks and plants and so on. Implying that behaviorology is the natural science of “human behavior” limits the scope of consideration unnecessarily.

Second, the way behaviorologists sometimes talk can seem to express or imply that behaviorology is or ought to be constituted of only the *basic* natural science of behavior, while the contingency–engineering efforts should be left to “Applied Behavior Analysts.” Some might misconstrue this article that way, which could establish a potentially dangerous precedent. I see behaviorology as the comprehensive “science and technology of environment–behavior functional relations” where “technology” relates broadly to include the contingency–engineering practices of applications and interventions. Misconstruing the contingency–engineering branch of behaviorology as a field still tied to *psychology* (at least by *its* claim) could set a precedent that may seem of minor importance now, but could be used to the detriment of behaviorology, and even natural science, at some point in the future. For the same reasons that behaviorologists retain their disciplinary separateness to protect it as a comprehensive and completely independent discipline, the *applications* of basic science should be encompassed in that protection.

The other articles in this issue constitute a *Special Section* on the relative benefits of the terms radical behaviorism and *behavioral materialism*, with commentaries. The first article in this Special Section, “A rose by another name: behavioral materialism,” by Joseph E. Morrow, provides the foundation for the commentaries. In his paper Morrow establishes a case for considering the term, Behavioral Materialism, as a replacement for the current name of the philosophy of science of behaviorology, Radical Behaviorism. Several articles commenting on Morrow’s paper follow. Their titles and authors appear on the previous page, in the *Table of Contents*. Additional commentaries on this topic, as *In Response* articles, will be published in the next issues of the *Journal of Behaviorology*. Readers are urged to submit articles, brief or in–depth, for inclusion in the next issues, along with articles on other topics; see the Submission Guidelines in this issue. ☺

Ten Commandments of Natural Science

Stephen F. Ledoux*

Abstract: Under various names, the natural science of behavior expanded during the twentieth century and beyond, *albeit under the radar of most natural scientists and the public*. Its more visible contingency–engineering applications and interventions also expanded in this time frame. Still, the need for its potential contributions to solving humanity’s growing global problems, as part of the team with other natural sciences, prompted calls from other natural scientists for a “natural science of human behavior,” for they were unaware of its 100–year–old existence. Some currently pertinent practices (e.g., polluting, and sustainability) affect human survival, but human understanding of these practices suffers from misunderstanding the human–behavior components of the practices. Extending education in this natural science reduces this misunderstanding and supports solving global problems. Some natural scientists, however, also worry about negative effects from the reduced familiarity that newer graduates have with the philosophy of natural science and the contributions of this philosophy to successful scientific endeavors, a cultural contingency also affecting human survival. To address such concerns, ten commandments of natural science provide a brief prompt for increasing—in education and practice—coverage, understanding, and appreciation of naturalism, the philosophy of natural science.

The concept of “commandments,” including “ten commandments,” has a long, multi–cultural history. It arose as an example of the many codes of laws that appeared in documented form in the history of humanity soon after the appearance of writing. A complex contingency, one that induces writing and law codes, involves the improvement in social relations among individuals that occurred as human groups grew ever larger and more dependent on “rules” to govern their interactions (i.e., “rules” as statements of contingencies, and described in Chapter 21 of Ledoux, 2017). Written records and law codes produced greater improvement in social–relation management than did oral records and law codes.

Adapting the long–standing cultural format of “ten commandments” eases the overall challenge of stating helpful rules with respect to behavior that responds to a range of complex contingencies (i.e., sets of functional relations in which the occurrence of some variables are contingent, or dependent, on the occurrence of other

variables, such as stimuli, including verbal stimuli, inducing behaviors that produce consequences that affect the function of various stimuli). Some sets of contingencies concern broad areas of independent and dependent variables such as the area that includes (a) the basic natural science that covers human nature and human behavior, (b) the documented stringent need for this current but generally invisible natural science, and (c) some constraints from philosophy of natural science.

Other sets of contingencies concern more narrowly focused areas of functional relations, such as investing or motorcycle maintenance. For many such areas, broad or narrow, specifying “ten commandments” takes advantage of the potent and long–standing (i.e., thousands of years old) verbal cultural contingency—embodied in the term “commandments”—that widely prompts various behaviors through generalization of ancient and contemporary versions of the *rule of law* with implied if not specified consequences. One can readily find a range of topics already subjected to the

*The author, Emeritus Professor of Behaviorology at SUNY–Canton, thanks not only the anonymous peer reviewers but also the peer reviewers (John Ferreira, Lawrence Fraley, Werner Matthijs, James O’Heare, and William Trumble) whose signed comments enabled interactions that particularly helped improve earlier versions of this work. The BOOKS and JOURNAL pages at www.behaviorology.org provide details or access to many of the cited references plus many other related resources. Address correspondence regarding this paper to ledoux@canton.edu.

Key words: Philosophy of science, naturalism, behaviorism, radical behaviorism, behavioral materialism, behaviorology, The Experimental Analysis of Behavior (TEAB), Applied Behavior Analysis (ABA), natural–science education

common notion of “ten commandments.” These topics can extend widely from “ten commandments of investing” to “ten commandments of motorcycle maintenance” and even, as here, to “ten commandments of natural science.” This usage of “ten commandments” with respect to natural science shares only the age-old, world-wide and multi-cultural, secular rule-of-law tradition, not the superstition or mysticism of any religious usages of “ten commandments.”

Those considerations also occur in the context of discussing *both* what many people see as the most serious circumstances confronting humanity today—solving global problems in the available time frame before their effects overtake us—and some supporting activities that help make solving global problems possible. Here, description of the foundations of these supporting activities takes the form of *Ten Commandments of Natural Science* and the educational efforts that enable these Ten Commandments to make a difference. After presenting these Ten Commandments, some provided elaboration on a few of them shows their direct relationship with this overall challenge.

Philosophy of Natural Science and Ten Commandments

In the USA one can say “science” and “scientist” and be fairly assured that these terms are understood as “natural science” and “natural scientist.” For example, asking audiences in the USA to list some sciences nearly always results in a list of traditional natural sciences (e.g., physics, chemistry, biology, astronomy, geology). Elsewhere, however, this is not always the case. For example, the theology faculty at the university in Leuven, Belgium, officially goes by the name, “Faculty of Theological Sciences” (Werner Matthijs, personal communication). To avoid misunderstanding or confusion, the phrases “natural science” and “natural scientist” *always appear here in full*, rather than in the abbreviated forms “science” and “scientist,” because the Ten Commandments discussed here apply more broadly than just in the USA.

These Ten Commandments reflect components of the *philosophy of natural science*, which is the verbal behavior, arising from the long-term and repeated successes of natural-science research and applications, that describes the foundations that guide the natural sciences. Such successes depend on adherence to the rules stated or implied in the contingencies that compel these verbal-behavior commandments. The commandments prompt adherence, because they improve the quality of natural science practice. By exerting such quality-control, these commandment rules lead successfully to more beneficial natural-science products and services.

Some of these quality-controlling commandments occur as part of naturalism (the philosophy of science of natural sciences in general) and others occur as part of “radical behaviorism” (the more specific philosophy of science of the natural science of behavior, behaviorology). It is not radical in the sense of extremist; it is radical in the sense of comprehensive, compared with earlier behaviorisms (Ledoux, 2017, p. 15; alternative labels to “radical behaviorism” are again under discussion, as other articles in this issue—the combined Spring/Fall 2019, Volume 22 issue of *Journal of Behaviorology*—and subsequent issues show).

Then again, some of these quality-controlling commandments consist of fairly standard philosophy of natural science components while others consist of components made particularly valuable due to the current problems confronting humanity. When such commandments appropriately affect behavior, then the value of natural sciences, especially behaviorology, to humanity can, and predictably will, noticeably increase, helping solve global problems and so helping to save humanity from the disasters that otherwise currently threaten to overtake the global culture. Studies of basic behaviorology, especially if occurring before studies of behaviorology’s contingency-engineering practices (e.g., in Applied Behavior Analysis: ABA) prepare people well for the future.

Some natural scientists express concern, however, about what seems to be a trend over the last several decades in the education—both undergraduate and especially graduate—of natural scientists and engineers. The trend of concern is the reduced coverage of, and so reduced familiarity with, philosophy of natural science and its contribution to successful scientific activity. Meanwhile contingencies across society drive scientific endeavors to solve global as well as individual and local problems, virtually all of which involve human behavior components in the problems or the solutions, or both (Ledoux, 2012, 2014, 2017, 2018a). So, some alarm at the trend for less philosophy of natural science seems justified, especially in light of current knowledge concerning the substantive, quality-controlling, stimulus-control role exerted by the components of the philosophy of natural science in the contingencies controlling the behaviors that constitute natural science.

That knowledge about the value of philosophy of natural science comes from interpretive extensions of the discoveries and findings of the natural science of behavior that B. F. Skinner called The Experimental Analysis of Behavior (TEAB; see Skinner, 1957, 2012). Many now know this discipline as behaviorology, the label in use for the last 30 or more years to name the natural science of behavior. When some practitioners of this science formally separated, in 1987, from a shared history with

psychology, they adopted this name for the science. The separation produced an independence from psychology that was necessary because, as a discipline, psychology requires allegiance to various mystical or spontaneously occurring inner agential causes for behavior, and focuses not on the independent variables of which behavior is a function, but on these inner agents as its subject matter (for the history and details of this separation, see Fraley & Ledoux, 1992/2015). Behaviorology then is not a part, nor any kind, of psychology. Instead behaviorology focuses on the independent variables of behavior and provides the principles, methods, and concepts that support the contingency–engineering practices of professionals in ABA and its wide range of areas (e.g., parenting, regular and special education, behavioral medicine, green contingency engineering, dignified dying, companion animal training, behavioral safety, business and organizational management, penal rehabilitation, and autism and developmental disabilities interventions, among others).

Sadly, however, the natural science of behavior has not become well known to other current natural scientists. Nevertheless, for decades—ever since Rachel Carson’s 1962 book, *Silent Spring*, and the 1972 MIT book, *Limits to Growth* (Meadows et al, 1972; see Hayes, 2012, for an update)—other natural scientists have recognized that global problems are caused as much by human behavior as by other physical, chemical, or biological variables, and the solutions involve changes in human behavior as much as changes in other natural variables. Readers of this periodical have made or reported this observation themselves. As a result various authors in other natural sciences have issued calls, some of book length (e.g., see McIntyre, 2006) for developing a natural science of human behavior. They have, however, remained relatively unaware that such a discipline has existed for over a hundred years (see Ledoux, 2012). This circumstance prevents much of the cooperation that could otherwise occur between traditional natural scientists (e.g., physicists, chemists, biologists) and natural scientists of behavior (e.g., behaviorologists) even though such cooperation is needed to solve behavior–component–laden global problems. Such circumstances hurt everyone (see Ledoux, 2018b, and the last chapter of Ledoux, 2017, for some further information addressing these circumstances).

Discussions regarding aspects of philosophy of natural science in general (i.e., naturalism), and the extensions of philosophy of natural science behind behaviorology and ABA in particular (i.e., radical behaviorism) provide some appropriate background. See, for example, Fraley, 2008, Chapters 1–7; Ledoux, 2014, Chapters 1–4, 7, and 23–24; Ledoux, 2015, Papers 2 and especially 3 (i.e., Fraley & Ledoux, 1992/2015); Ledoux, 2017, Chapters 1–6, and 26–27; Ledoux, 2018a, Papers 3, 8, and 9; Morrow, 2017;

and Skinner, 1953, 1974. The BOOKS and JOURNAL pages at www.behaviorology.org provide details or access to many of these resources.

Another trend, perhaps of greater import, concerns the reduction—compared to requirements several decades ago—in current requirements about how much familiarity natural–science graduates have with the basic elements of each of the other natural sciences outside the graduate’s own major. Indeed, the reduction in familiarity with the broad areas of their *own* basic natural science, occurring from the current, heavy graduate–school emphasis on narrow specialization, also raises alarms, especially for those familiar with the phenomena of *recombination of repertoires* (Epstein, 1996), because repertoire parts that problem solving needs, and that should get conditioned as part of professional education programs, get left out of the programs.

That may even happen to Applied Behavior Analysis graduates when their educational programs leave out a thorough grounding in the full extent of the basic natural science of behavior (i.e., a grounding, such as in Fraley, 2008, or Ledoux, 2014, that includes the extensions, interpretations, and implications of their basic science, as well as its principles, method, concepts, and applications); programs may instead only include a survey of commonly applied principles and concepts, because only that part of basic science coverage is required for certification to practice.

A similar conundrum confronts some related natural scientists and engineers concerned with behavior in the separation of their own basic natural–science degree programs from their contingency–engineering degree programs. Few students can study The Experimental Analysis of Behavior thoroughly (under any name) due to the current relative scarcity of programs, while *many* program opportunities exist for students thoroughly to study Applied Behavior Analysis or, perhaps currently more likely, just some one narrowly focused area of it.

While clearly deserving of more attention, the effects of such contingencies on the ongoing, and future, success of the natural science of behavior, and its contingency–engineering arms, remain unclear, and barely addressed here. Instead, the focus here remains an attempt to manage the philosophy of science concern by elaborating Ten Commandments of Natural Science. The commandments provided here summarize some of the necessary components of the philosophy of natural science that participate, in quality–controlling ways, in the current contingencies involving the behaviors that constitute successful natural science.

Actually, natural science rests on many more than ten commandments, and ongoing changes in related contingencies will certainly vary the relative importance of each of these and other commandments. Thus, the

commandments presented here are *not* written in stone—although most have been extant for centuries—and other contingencies on other authors would produce other commandments. The “ten commandments” format serves an evocative stimulus function for ongoing intellectual, academic and scientific activities. So, as part of prompting increased coverage, understanding, and appreciation of the philosophy of natural science and its contributions, here are ten of the commandments of natural science (with commentary on some of the commandments appearing after all ten).

Ten Commandments of Natural Science

Commandment I. Thou shalt respect perspectives, even ones based on assumptions other than those upon which natural science rests. [See the commentary.]

Commandment II. Thou shalt point out, based on scientific evidence, the dangerous—for people—short-term or long-term consequences to which activities grounded in superstitious or mystical assumptions—either theological or secular—can lead or are leading. [See the commentary.]

Commandment III. Thou shalt research—using the principles and methods of natural science in all natural-science disciplines—the human activities and products that lead to, and support, a sustainable and civilized future for humanity, and disseminate the resulting information.

Commandment IV. Thou shalt recognize that natural scientists and engineers are, like all humans, behaving organisms, and that all their behavior, related to science or not, is behavior under the contingency control of the same kinds of real, measurable variables that control all behavior of all organisms (with recognized adjustments for genetic differences such as “birds fly but pigs don’t”).

Commandment V. Thou shalt take into account the many ways in which the *Law of Cumulative Complexity* [See the commentary.] applies in scientific and liberal arts disciplines and engineering fields, with these ways providing a scientifically sound and humanely meaningful, and parsimonious, alternative to superstitious and mystical (secular or theological) descriptions and explanations of events.

Commandment VI. Thou shalt work with the *simplest yet adequate* (i.e., parsimonious) accounts for any phenomena before ever invoking more complex—and thus more difficult to test—accounts.

Commandment VII. Thou shalt follow all data wherever they lead, although some contingencies make some data mislead, with more data often being corrective (i.e., the ongoing self correction of natural science).

Commandment VIII. Thou shalt, whenever and wherever possible, engage *experimental* methods, and freely share experimental results, conclusions, interpretations, implications, and applications for the benefit of humanity and its web of existence and survival.

Commandment IX. Thou shalt work only with natural—real, measurable—events as independent variables and dependent variables, while respecting the natural functional history of all functional relations across time in all phenomena in all disciplines (e.g., natural sciences, liberal arts) and their related, applied engineering fields.

Commandment X. Thou shalt neither engage research to answer magic/superstition/mysticism-based questions, nor interpret data or research results from perspectives informed by magic, superstition, or mysticism (theological or secular), nor ever fake data.

Commentary on Commandments I, II, and V

Some legitimate natural-science phenomena (e.g., “dark matter”) might appear to stand outside these commandments, due to what at first looks like an “invented” status of such phenomena. The invention, however, was not of the phenomena, but of the labels *naming* the phenomena, which legitimately facilitates talking about them. As long as researchers do not prematurely, and unparsimoniously, extend causal status to these labels, and instead continue probing the phenomena for full accounts, then such phenomena do not stand outside these commandments. The interrelations among several of the Commandments (e.g., VI, VII, and IX) cover this kind of concern.

A role for coercion. Some of the points made herein might possibly elicit negative emotional responses and even evoke unnecessary and unhelpful but overt verbal or physical attacks, due to some readers’ contingency history. After all, recall that scientists are, like everyone else, behaving organisms (i.e., Commandment IV) and some stimuli produce such behaviors. Occasionally, cussing at each other, or fist fights, occur even at scientific conventions. In reply to such attacks, also recall that talking with others rather than fighting with them should have been conditioned at least by elementary school. Problems with parts of this paper probably exist, and can

be improved. When noted by others, such parts can be addressed. But coercive tactics like cussing and fighting have no place either in the noting or in the addressing. Coercion breeds countercoercion, which is a long recognized principle in the natural science of behavior. An example of a place for coercion in science involves the coercion of probable disasters from global problems evoking coordinated, scientific and culture-wide solution responses. Many principles like this will be broadly appreciated, not as cultural guesses, but as scientific realities, when the whole natural science of behavior becomes generally available to the culture through its addition at least to the high school curriculum along with physics, chemistry, and biology (and to elementary and university curricula as well).

Commentaries. All of the ten commandments herein, which contingencies first generated in this form in July 2018, reflect components of the philosophy of natural science, some as part of naturalism and others as part of radical behaviorism. While some repeat fairly standard philosophy of natural science components, others consist of components made particularly valuable in relation to the current problems confronting humanity. While some remain fairly obvious, others—Commandments I, II, and V—can seem ambiguous and so benefit from some unpacking through additional commentary.

About Commandment I

Thou shalt respect perspectives, even ones based on assumptions other than those upon which natural science rests. Perhaps this should say "... respect perspectives contingently and mutually..." not in the sense of agreeing with or admiring all perspectives, but in the sense of treating other perspectives civilly the way adherents of other perspectives should also treat our natural science perspective. Perspectives form not from spontaneous activities of supposed mystical, inner causal agents (e.g., so-called minds, psyches, selves, souls, personalities, and so on) but from contingencies involving conditioned verbal behaviors grounded in earlier verbal behaviors called assumptions. These assumptions have their own natural history.

The current iteration of the natural-science perspective began about 400 years ago. The incremental buildup of consistent and interrelated experimental results, plus the regular successes of the engineering applications of these experimental results, gradually induced the assumptions that form the basis, the philosophy, of natural science, and continue to support that induction. Several of these assumptions, all remaining related to reality, appear in these Ten Commandments.

Meanwhile the assumptions of non-scientific, or pre-scientific, perspectives often remain at odds with reality, and occur due to a range of contingencies, some historical

or social in context and others even more physical. These contingencies include, for example, the varieties of *traditional cultural conditioning* that, for thousands of years, have induced part of the extensive behavior repertoire that accumulates during virtually every human body's childhood. This repertoire forms the generally unquestioned basis upon which later contingencies expand the behavior repertoire on into adulthood and throughout adulthood. This excessive influence, which is difficult to escape, is a pervasive influence that regularly and systematically undermines and compromises both emotional and intellectual behavior, including both consciousness and other thinking behavior. This *traditional cultural conditioning*, with its full range of pre-scientific, superstitious and mystical notions that still are real behavior controls, regularly misleads people into dangerous activities so subtly that many never notice (see Ledoux, 2014). One simple example involves trying to get people to stop polluting by merely believing that just telling them not to—that is, telling their supposed inner self or whatever not to pollute—will be enough. Another example involves constantly, glibly, unquestioningly, invoking pre-scientific labels that support and encourage misdirection, such as "mind," "soul," or "self" as if these were real causal events, rather than recognizing their status as pre-scientific labels for supposed spontaneously acting superstitious or mystical inner causal agents. Other sources discuss these concerns fully (e.g., Ledoux, 2014, 2017). Usually only education in natural science succeeds in displacing—or at least competing with—these superstitious or mystical foundations. Such success supports focusing on educational changes, through widespread, basic knowledge of the natural science of behavior as well as the Ten Commandments of Natural Science.

In addition, assumptions cannot really be proved or disproved. Assumptions are just taken-for-granted starting points. Some assumptions can have discoverable supports, but supports are not proof. Other perspectives can neither disprove the assumptions of natural science nor prove their own assumptions. Of course any religious perspective, being based on faith, actually has no need either to prove its own assumptions or disprove others' assumptions. Curiously, should anyone ask, natural science provides the contingency answers to why, down through history, religions have, sometimes violently, insisted on trying to prove their own assumptions and disprove not only the assumptions of others but also, more recently, the assumptions of natural science. On the other hand, yet similarly, natural science can neither disprove the assumptions of other perspectives nor prove its own assumptions. These realities generate the appropriateness of basic mutual, civil respect. However, assumptions, like perspectives in general, appear as behavioral products of contingencies. And many, perhaps

most, contingencies that produce perspectives and assumptions remain available for scientific examination, analysis, interpretation, and disseminated description (hence the Second Commandment...).

Actually, the point that “assumptions cannot really be proved or disproved” remains debatable, with readers lining up on one side or the other as a function of their contingency history. This situation prevails due to the contingency nature of the behavior of “knowing” (e.g., see Ledoux, 2014, Chapter 21; or see Ledoux, 2017, Chapter 23). This situation also prevails due to the nature of reality, which involves the firings of sensory neurons being the sole source of input for any behavior, whether or not those sensory neuron firings are enhanced by various technologies. Behaviorological analysis, based on summarizing the natural laws governing behavior, leads to the same conclusion about reality that Stephen Hawking and Leonard Mlodinow reached, through the logic of naturalism in physics, in their book *The Grand Design* (2010). That conclusion about reality is this: *Our neurally behaving reality is the sole source of knowing about reality, because we can get no closer to reality than the neural behaviors that the firings of sensory neurons evoke.* Under contingency control, humans behave the reality that they experience, which is a topic discussed elsewhere (e.g., see Ledoux, 2014, Chapter 23; or see Ledoux, 2017, Chapter 26) but otherwise remains beyond the scope of discussing Ten Commandments of Natural Science.

The contingency origin of perspectives such as religion, and natural science itself, and their assumptions, opens all these to consideration by, and explanations from, natural science. For example some *secular* mystical assumptions got conditioned due to relatively recent contingencies inducing the removal of theological verbal behavior from long-standing theologically informed philosophies; this removal introduced the secular inner-agent causes in psychology. Again, and in contrast, the assumptions behind natural science (such as “work only with real, measurable events as independent and dependent variables”) get conditioned from the contingency effects occurring as a result of developments over several hundred years of accumulating experimental evidence and effective engineering practices and products with the wide range of phenomena that the various natural-science and engineering disciplines cover. As an example, carefully inspecting one’s immediate surroundings will show how so much of what one sees came about as a product of scientific and engineering behavior. The increasing amount of such experience that accrues across generations becomes part of the contingencies that induce operating under the “work only with real, measurable events as independent and dependent variables” assumption (hence the Ninth Commandment...; all these commandments are indeed interrelated).

Contingencies inducing scientific assumptions, and related scientific behaviors, inevitably compete, however, with other often conflicting contingencies operating at the same time. Thus opportunities for contradictions abound. For example, some contingencies on the behavior of some people compel “fight against natural science” responses, while other contingencies on the behavior of *those same people* compel determined resistance responses to giving up the products of natural science.

The mechanisms to address fight-against-science responses might fruitfully begin with more thorough natural-science education, especially in the natural science of behavior, which deserves recognition as a needed part of “STEM” discussions. This raises the issue, however, that not enough programs exist, across the world’s colleges and universities, to educate all the professors of the basic natural science of behavior that a society needs not only to educate all the students of society (because arguably this is one natural science that everyone needs, if only to help counter the insidious effects of traditional cultural conditioning) but also to research and apply this natural science’s contributions to solving the behavior components of global problems before the effects of these problems become unmanageable (like global warming; see Ledoux, 2014, or 2017, which also cover some contributions that the natural science of behavior makes to other natural sciences). Thus a major focus of practitioners of the natural science of behavior needs to put far more stress than is currently evident on developing such programs. (For resources that assist program development, see Ledoux, 2018b.)

A kind of parallel danger for natural science, at least as a currently *minority* perspective on this planet, involves reciprocal disrespect—and attendant damage from anti-natural-science activities—from those involved with any *majority* perspective, like religion, that some folks in natural science might publicly disrespect. So, “*Thou shalt respect perspectives, even ones based on assumptions other than those upon which natural science rests,*” lest ye be similarly disrespected, and possibly attacked or, perhaps worse, unfunded.

About Commandment II

Thou shalt point out, based on scientific evidence, the dangerous—for people—short-term or long-term consequences to which activities grounded in superstitious or mystical assumptions—either theological or secular—can lead or are leading. With the potential for scientific consideration and explanation, and some actual scientific consideration and explanation in hand in various cases (e.g., see the chapters on some scientific answers for some ancient human questions in Fraley, 2008, or Ledoux, 2014, or 2017), natural scientists can better appreciate the appropriateness of respecting—while not supporting—the perspectives of others. (Some topics of those answered ancient human questions include values,

rights, ethics, morals, language, consciousness, personhood, life, death, and reality.)

Both natural science and non-science perspectives involve *behavior* occurring under natural contingencies. These contingencies operate even if the scientific consideration and explanation, in particular cases, suggest inherent dangers for humanity that require appropriate address. As an example of such dangers, the pervasive control by the theological mystical perspective (i.e., religious authorities) in Europe around 400 years ago, around the time of Galileo's trial, forced a compromise on the proto-scientists of the time—then called natural philosophers—that prevented for over 300 years the careful kind of inclusion, that other phenomena enjoyed, of human nature and human behavior in scientific investigations. Then, just as a natural-science treatment of human nature and human behavior began in the early twentieth century, excessive controls in the academic sphere by the secular mystical perspective (e.g., psychology and most other social sciences; see Ledoux, 2002) also interfered with the widespread dissemination and broad application of the natural science of behavior (i.e., into *all* of the identifiable application areas beyond the current emphasis on developmental disabilities and autism interventions). Both of these restraints have reduced the availability of the natural science of behavior for application to the behavior-related components of global problems and solutions, which helps explain the repeated calls for this natural science. To the extent that the solutions to global problems *require* such behaviorological input, these restraints endanger human survival. Humanity can no longer afford these restraints, if we ever could. Hence the commandment to *point out, based on scientific evidence, the dangerous—for people—short-term or long-term consequences to which activities grounded in superstitious or mystical assumptions—either theological or secular—can lead or are leading.*

Natural scientists—and behaviorologists in particular—can promote, support, and engage the necessary activities to help solve individual, local, and global problems. The needed efforts of natural behavior science practitioners must occur, for example, in discovering and sharing information on contingencies that induce the denial of climate-science results and conclusions, as voiced in some perspectives, as well as in discovering and sharing information on contingency changes that induce reduction of such denial behavior. Will current contingencies on behaviorologists and other natural scientists induce effective action in a timely manner? Will that action also include establishing and institutionalizing the educational programs in behaviorology that can provide the bulk of the needed societal effects in terms of appropriately knowledgeable and skilled personnel?

About Commandment V

Thou shalt take into account the many ways in which the Law of Cumulative Complexity applies in many scientific and liberal arts disciplines and engineering fields, with these ways providing a scientifically sound and humanely meaningful, and parsimonious, alternative to superstitious and mystical (secular or theological) descriptions and explanations of events. The *Law of Cumulative Complexity* (Ledoux, 2012, 2014, 2017) states: “*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.*” Note that this law says “sometimes result,” not “always result.” Some enduring interactions can reduce complexity. After taking the time to unpack the elements of this law (i.e., ponder the implications of ... *physical / chemical interactions ... sometimes ... more complex structures ... functions ... endure ... interact further, ... accumulating complexity*) one finds that this law helps us make sense of numerous past, growing, and current complexities, starting with the origin of this universe in which we live. In reviewing the results of all the experimental work on the natural events of, and after, the “big bang,” one traces the complexities that naturally accumulate from the “big bang” events and on through the natural development of stars and galaxies and so many more elements, and so on. Then in later generations of stars, after the end of many massive stars has provided additional amounts of so many elements, accumulating complexities usually and naturally produced and produce planets. All of this happens with no need for contributions from magical or mysterious or spontaneous events.

Reviews of what we know—what research has shown us—about the origins of life, show similar outcomes. We should not be surprised that on some—perhaps many or even most—planets, further developments naturally produce an ever expanding and increasingly complex range of minerals and compounds, both organic and inorganic, in a kind of compound or mineral evolution that likely differs on each planet both due to the varying conditions present on, and developing on, each planet, and due to the varying conditions of each planet's location with respect to its local star (see Hazen, 2005, 2012). And on at least one planet that we know of so far (i.e., ours) such naturally produced developments accumulated further mineral and compound complexities that we now call or, more accurately, tact (see Skinner, 1957; Peterson & Ledoux, 2014) as *life*. Indeed, *any* origin of life anywhere—on this planet or others, outside or even inside a laboratory—can be broadly understood in terms of the *Law of Cumulative Complexity*, and again without requiring contributions from magical or mysterious or spontaneous events.

As complexity accumulates, continuing developmental interactions of living matter and energy produced and produces the natural (but not necessarily repeatable) evolution of life's physiology and forms, and behavior-related processes and functions. The broad availability of the natural science of biology has enabled the general population to gain some relatively widespread understanding and appreciation of the evolution of life's physiology and forms. However, at only about 100 years old (see Ledoux, 2012) the relative youth of the natural science of behaviorology has contributed to the general population having relatively little exposure to, and thus little understanding and appreciation of, life's behavior-related processes and functions. Yet all these life functions and processes occur through the developments of natural interactions of energy traces with various sensory *and motor* forms of neural physiology, and these interactions, in all their complexity, produce behavior, in all its complexity. On this planet examples of this *Law of Cumulative Complexity* include not only the vast range of DNA-based life forms available for study (and on some other planets, perhaps the complexities of life originate and accumulate on some other chemical basis) but also the intricacies of global problems and solutions, the joys and sorrows of life in the interconnected web of existence of which we are a part, and the interrelations and interactions of energy exchanges, between internal and external environmental events and the body, as described by physiology and behaviorology, that produce all behavior, including all human behavior, all without needing contributions from magical or mysterious or spontaneous events. This knowledge helps people deal effectively not only with behavior but also with the place of humans in the universe, and with the place of the basic natural science of behavior, behaviorology, among the rest of the natural sciences. *All of these phenomena are cumulatively complex; all are entirely natural.*

No one can yet say for sure what else will naturally develop in the future. This *Law of Cumulative Complexity*, however, *fundamentally* describes—but not with details or formulas—all these developments. While many details still await scientific elaboration, this law operates always and only as a sequence of purely natural-event interactions spreading out repeatedly as multiple, additional, purely natural, usually increasingly complex, outcomes. *With enough time* the operation of this law builds the accumulation of the complexities visible with many diverse phenomena, in many areas, disciplines, and applied fields, again with no contribution from magical or mysterious or spontaneous events. Reviewing the extent and diverse variety of such applicable phenomena both induces the “law” status of cumulative complexity, and adds to our confidence about it. So, we should *take into account the many ways in which the*

Law of Cumulative Complexity applies in many scientific and liberal arts disciplines and engineering fields, with these ways providing a scientifically sound and humanely meaningful, and parsimonious, alternative to superstitious and mystical (secular or theological) descriptions and explanations of events.

Summary

In summary, all of those commandments reflect components of the philosophy of natural science, which is the verbal behavior arising from the long-term repeated successes of natural science. These successes depend on adherence to the rules stated or implied in the contingencies that compel these verbal-behavior commandments. They prompt adherence, because they improve the quality of natural-science practice. By exerting such quality-control, these commandment rules lead successfully to more beneficial natural-science discoveries, developments, products, and services.

Some of these quality-controlling commandments occur as part of naturalism and others as part of radical behaviorism. Some consist of fairly standard components of the philosophy of natural science while others consist of components made particularly valuable due to the current problems—the current contingencies—confronting humanity. When these commandments appropriately affect human behavior, then the value of natural science to humanity—traditional natural sciences as well as behaviorology—can noticeably increase. This helps solve global problems, thus reducing the risks from the disasters that otherwise currently threaten to overtake humanity. Education, especially today in behaviorology, enhances understanding of these commandments and adherence to them. Studying this basic natural science, *and then* its contingency-engineering practices (e.g., ABA) improves effectiveness in contributing to making a better future. Make the most of it!

Endnotes

On 2018 July 13, contingencies first compelled the writing down of the Ten Commandments listed herein. Also, ever since formulating the “law” of cumulative complexity (in 2010–2011, across a dozen earlier versions that got ever more succinct until the contingencies controlling this verbal behavior could not wring anything better out of it, leaving the present version to persist ever since then) the question of calling it a “law” has remained. But continuous incursions into this question—alone and with other natural scientists, including other behaviorologists—have raised confidence about, and

continued to compel, the “law” descriptor. Again, every scientific review of any phenomena, including those that have been traditionally explained through magical or mysterious or spontaneous events, has turned up natural explanations that also followed the pattern of accumulating complexity. *All this* further induces scientific confidence in the appropriateness of tacking cumulative complexity, as here described, as a “law.” ❀

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THE ADDENDUM COMPLETES THIS ARTICLE:

**Addendum: A single page (without commentary*) with the
Ten Commandments of Natural Science
(by Stephen F. Ledoux, 2018 July 13)**

- I. Thou shalt respect perspectives, even ones based on assumptions other than those upon which natural science rests. [See commentary.*]
- II. Thou shalt point out, based on scientific evidence, the dangerous—for people—short-term or long-term consequences to which activities grounded in superstitious or mystical assumptions—either theological or secular—can lead or are leading. [See commentary.*]
- III. Thou shalt research—using the principles and methods of natural science in all natural-science disciplines—the human activities and products that lead to, and support, a sustainable and civilized future for humanity, and disseminate the resulting information.
- IV. Thou shalt recognize that natural scientists and engineers are, like all humans, behaving organisms, and that all their behavior, related to science or not, is behavior under the contingency control of the same kinds of real, measurable variables that control all behavior of all organisms (with recognized adjustments for genetic differences such as “birds fly but pigs don’t”).
- V. Thou shalt take into account the many ways in which the *Law of Cumulative Complexity* [See commentary.*] applies in scientific and liberal arts disciplines and engineering fields, with these ways providing a scientifically sound and humanely meaningful, and parsimonious, alternative to superstitious and mystical (secular or theological) descriptions and explanations of events.
- VI. Thou shalt work with the *simplest yet adequate* (i.e., parsimonious) accounts for any phenomena before ever invoking more complex—and thus more difficult to test—accounts.
- VII. Thou shalt follow all data wherever they lead, although some contingencies make some data mislead, with more data often being corrective (i.e., the ongoing self correction of natural science).
- VIII. Thou shalt, whenever and wherever possible, engage *experimental* methods, and freely share experimental results, conclusions, interpretations, implications, and applications for the benefit of humanity and its web of existence and survival.
- IX. Thou shalt work only with natural—real, measurable—events as independent variables and dependent variables, while respecting the natural functional history of all functional relations across time in all phenomena in all disciplines (e.g., natural sciences, liberal arts) and their related, applied engineering fields.
- X. Thou shalt neither engage research to answer magic/superstition/mysticism-based questions, nor interpret data or research results from perspectives informed by magic, superstition, or mysticism (theological or secular), nor ever fake data.☞

*The commentary appears in the “Ten Commandments of Natural Science” article in the *Journal of Behaviorology* (see the SPECIFIC ARTICLES page at www.behaviorology.org).

A Rose by Another Name: Behavioral Materialism

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Radical Behaviorism is the name Skinner has given the philosophy he had developed. The purpose of the present note is to suggest that *Behavioral Materialism* be considered as a possible alternative.

It is clear that any name should have a reference to behavior since this is the subject matter about which we philosophize. However, there are some important distinctions the word *behaviorism* alone does not clarify. There are the behaviorisms of Watson, Hull, and others that are different in important philosophical ways from that of Skinner.

Adding the word radical to behaviorism may not adequately denote the factors that distinguish Skinner's philosophy. Skinner uses the term *radical* in its primary lexical sense of root or origin. But, a more likely effect of the word on its audience is to suggest the secondary lexical meaning of *extremism*. If one starts with the usual common misunderstandings of the word "behaviorism" and adds "extremism" to that, we may have the basis of a complete misunderstanding.

Adding the word *materialism* to behavior would have advantages. For one thing, it may be the most accurate depiction of Skinner's philosophy. According to Random House Dictionary, materialism holds that "matter and its motions [constitute] the Universe, and all phenomena, including those of mind [are] due to material agencies." As to mind, as early as 1945, Skinner viewed such questions to be issues involving private, real events taking place inside the skin of the individual. He later argued that "a private event may be distinguished by its limited accessibility but not, so far as we know, by any special structure or nature," and, "Private and public events have the same kinds of physical dimension."

This position distanced Skinner from the most prevalent philosophy in psychology at the time, the non-materialist logical positivism. Taking note of his position, Creel, a philosopher writing in the journal *Behaviorism* in the 1980s concluded, "... I see no reason to doubt that Skinner affirms philosophical materialism."

Another philosopher, Flanagan, in the same journal wrote: "Skinner is a metaphysical materialist." Metaphysical in this philosophical sense means only a position that, from a logical standpoint, can never be totally proven. Dr. John C. (Jay) Moore, a scholar in the philosophy of radical behaviorism and conceptual issues in behavior analysis, called Skinner's position "physicalism" or "something akin to metaphysical materialism if it should be called a metaphysical position at all."

Skinner remains clear on the issue. In *Notebooks*, he states, "A basic principle of behaviorism which has guided me throughout my professional life... is the importance of converting mentalistic terms into alternatives which refer to things having physical dimensions."

The history of materialism is a long one going back at least to the fifth century B.C. to Leucippus and Democritus. Materialists have consistently argued against the notion that something other than matter exists. Today, materialist views have generally eliminated supernatural views in chemistry, physics, and biology. It is in the mind that non-materialists have dug in to insist that something other than matter exists. The radical behaviorist critique of mind clearly places it within the materialist tradition and offers the hope of finally sealing the non-materialist coffin by leaving it no place else to go.

Another advantage to the term Behavioral Materialism is that it could allow the intellectual community to more accurately place radical behaviorism on the spectrum of thought.

The similarity between the term *behavioral materialism* and Marvin Harris' *cultural materialism* is intentional [Marvin Harris, 1927–2001, an American anthropologist]. The breadth of similarities have been

*This article begins the *Special Section on Behavioral Materialism* (as described in the Editorial on page 2 of this issue). It was reproduced, with the author's permission, from *Operants, Issue III*, 2017, 24–25 (published by the B. F. Skinner Foundation at www.bfskinner.org). Address correspondence regarding this article to jmorrow223@aol.com

adequately delineated previously and need not be repeated here. Suffice it to say that cultural materialism, like radical behaviorism represents an attempt to explain all human conduct based on real events in a material world.

Generally speaking, the most well-known proponents of materialism today are Marxists. Radical behaviorism and Marxism have similarities and differences. Marx was a consistent determinist and his writings anticipated a part of Skinner's critique of mentalism. Marx wrote:

The phantoms formed in the human brain are also necessarily sublimates of their material life process which is empirically verifiable and bound to material premises... Life is not determined by consciousness but consciousness by life.

Marx, like many after him, did not complete this critique of what he called idealism and radical behaviorists call mentalism. Such was left to Skinner.

However, the philosophical debt owed Marx for his insistence that consciousness and all human behavior is due to events in the real world led Harris to suggest that Marx "had come the closest in the nineteenth century to being the Darwin of the social sciences."

Indeed Harris in choosing the name *materialism* did so "as an acknowledgment of the debt owed to Marx." Marx's brand of materialism is called *dialectical materialism* and herein lies an important distinction from Radical Behaviorism. Vasily Krapivin writing for the authoritative *Progress Publishers* in Moscow on "What is Dialectical Materialism" lists the main components as:

1. An objective approach to social processes
2. A comprehensive analysis
3. A historical approach
4. A study of practical demands
5. Pinpointing the crucial link for change
6. Determining the inner sources of development by exposing the contradictions which caused it.

Radical behaviorists would recognize their own practices in elaborations of the first five points. However, it is the sixth point that led Harris to reject the term *dialectical* and I would urge its rejection for our field on similar grounds.

In elaborating on point six, Krapivin says,

All phenomena and processes of reality have opposite aspects. Everything is shot through with contradiction... The existence and development of living organisms are also

marked by opposites... [The] interaction [of opposites] includes both their unity and their struggle. The unity of opposites means they cannot exist without each other and are mutually dependent... While being in unity the opposites are at the same time in 'struggle' with each other, that is, they mutually negate and rule each other out... [Thus] contradictions are the source of the motion and development of objects and phenomena... The struggle of opposites constitutes the inner content, the source of the development of reality.

Because of its dependence on the logical methods of analysis adopted from the philosopher Hegel, Harris calls this approach the Hegelian monkey on Marx's back. He argued that while certain natural phenomena may well fit the notion of unity and struggle of opposites, a great many do not.

Such verbal behavior seems totally superfluous in describing the functional relationships radical behaviorists observe in operant chambers. For example, in switching from a CRF to a VR schedule, a particular change in performance is noted. In switching from a CRF to a VI, a different kind of performance ensues, and so on throughout the many schedules. The behavior change is accounted for by the reinforcement requirements of the extant schedule (and past history). To then suggest that this process be fitted into a verbal scheme requiring identifying opposites and contradictions borders on the absurd. Additionally, of what value would such a task be? Behaviorists are well aware that behavior changes as a function of changing conditions. Radical behaviorists call these changing conditions contingencies of reinforcement and their basic controlling aspects have been identified relatively free of excess verbal baggage.

Again, it is quite possible the variables Marx studied were appropriately described by dialectics. But behaviorists, out of an appreciation for Marxist materialism, need not cram our observations into inappropriate verbal descriptions of those observations.

In concluding, I would suggest that the name *behavioral materialism* would clearly state the similarity with Cultural Materialism well noted previously. Rejecting *dialectical* and using *materialism* would show the differences from, and similarities with Marxist philosophy. Such a name, I suggest, would more accurately identify Radical Behaviorism on the spectrum of current philosophical systems.☺☺

Behaviorology and Dialectical Materialism: On the Way to Dialogue

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Every science needs philosophy. Perhaps, it is true that in the laboratory we are neither idealists nor empiricists nor dialectical materialists, but experimentalists, but as Skinner wrote, “a theory is never overthrown by facts, but only by another theory.” A theory underlies facts, and philosophy underlies a theory. Therefore, philosophy is inescapable, and behaviorology is forced to seek after its philosophy as any other science. Following Ernest A. Vargas, we define behaviorology as science that addresses the contingent relations between actions and other events. He also makes a very significant remark that “Its Skinnerian contingency-based framework of interpretation, with its firm exclusion of agency, distinguishes behaviorology from other sciences of behavior.”

There are many interpretations of Skinner’s works, and behavioral materialism is the most authentic one. My main thesis is that dialectical materialism is compatible with behaviorology, but there are some problems here.

(A) Firstly, dialectical materialists are often inclined to interpret Skinner’s theory as mechanistic materialism. They are obviously wrong in this case.

(B) Secondly, there are a lot of forms of dialectical materialism, and some of them are even incompatible with materialism itself. Many dialectic materialists incautiously use traditional psychological terms (mind, consciousness, motive and so on), and this leads to a mess. Some consider dialectical materialism as a form of contextualism. We also know that contextualistic interpretations of radical behaviorism exist too. Nevertheless, it was Watson who fairly stated, “behaviorism is new wine that cannot be poured into old bottles.” This is also true in respect to dialectical materialism (in behavioral sciences especially). It needs a new vocabulary, and Skinner’s theory can provide it.

So, what is dialectical materialism? “Dialectical” means (1) that the universe as an integral whole in which

things are interdependent rather than a mixture of things isolated from each other, and (2) that the material world is in a state of constant motion. “Materialism” holds that the only thing that exists is matter. Dialectical materialism combines the elements of naturalism of Marx, Hegelian philosophy and French positivism.

What does dialectical materialism mean in the behavioral sciences? It is fallacious to believe that it is the direct application of the theory of dialectical materialism to the problems of behavior. As Lev Vygotsky [1896–1934] wrote, “we are in need of an as yet undeveloped but inevitable theory of biological materialism and psychological materialism as an intermediate science which explains the concrete application of the abstract theses of dialectical materialism to the given field of phenomena.” Vygotsky fell into a net of traditional terms, but his main idea is clear. Dialectical materialism in behavioral sciences is behavioral materialism. By some amazing fluke, behaviorologists gave the same name to the scientific philosophy underlying behaviorology. In his writings Jerome Ulman suggests the following terms: scientific materialism (the materialist orientation among natural scientists), selectionistic materialism (the materialist orientation among researchers in the life sciences); and behavioral materialism (the materialist orientation in behaviorology). Joe Morrow also uses this term in this manner (in this issue).

*A commentary on Joseph Morrow’s article on *Behavioral Materialism* in this issue, this article was reproduced, with the author’s permission, from *Operants, Issue III*, 2017, 26–29 (published by the B. F. Skinner Foundation at www.bfskinner.org). Address correspondence regarding this article to fedleks@yandex.ru

Key words: behavioral materialism, behaviorology, dialectical materialism, Marxism, philosophy of science, radical behaviorism

For true dialectical materialists, attributes “dialectical materialist” or “Marxist” in fact means “scientific.” For example, Vygotsky wrote, “everything that was and is genuinely scientific belongs to Marxist psychology. This concept is broader than the concept of school or even current. It coincides with the concept scientific per se, no matter where and by whom it may have been developed.” Behaviorology is the scientific study of behavior (within Skinnerian contingency-based framework), so we can carefully examine if behaviorology contains dialectical elements. If Vygotsky is right, we will find them.

However, let us take a step back. I have already written that dialectical-materialist psychologists are inclined to interpret Skinner’s theory as mechanistic materialism, but this is not the only accusation of behaviorism.

Boris Teplov, a well-known figure in the Soviet psychology, wrote, “Dialectical-materialist psychology is directly opposed to behaviorism. The basic task of Soviet psychology is to discover the materialist explanation of man’s psyche and consciousness.” He also contended that behaviorism springs from idealism because it asserts that “the psyche and consciousness are only accessible to introspective knowledge and so cannot be studied by objective method.” If there is any truth in these statements, it concerns methodological behaviorism. Skinner stated, “thought is not a mystical cause or precursor of action, or an inaccessible ritual, but action itself, subject to analysis with the concepts and techniques of the natural sciences and ultimately to be accounted for in terms of controlling variables.” Moreover, “no major behaviorist has ever argued that science must limit itself to public events.” Therefore, behaviorology takes the view that private events including thinking are accessible to the methods on natural sciences.

Another prominent dialectic-materialist psychologist, Rubinstein, pointed out that “behaviorism follows the mechanist schema: stimulus-response. Its description of external connections between stimulus and reaction is in keeping with the pragmatic, generally positivist methodology.” So dialectical materialists assert that behaviorism is not only mechanistic, but also positivistic. But radical behaviorism is aligned with materialism, not with pragmatism or positivism. Skinner wrote himself, “the physicalism of the logical positivist has never been good behaviorism.”

There is a reason why Soviet psychologists deprecated behaviorism so much. And the reason is that psychology and behaviorology are incommensurable. This incommensurability springs mainly from dualism that predominates in psychology, though often latently. Despite the fact that Soviet psychologists formally dissociated themselves from dualism and interpreted psychic processes materialistically as the product of highly organized matter, they were still dualists who

used mentalist terminology. We should understand that dialectical-materialist psychology is not a natural science. Let’s look at the theory of Bonifaty Kedrov, a notable Soviet researcher, philosopher, logician, chemist, and psychologist who specialized in philosophical questions of the natural sciences. Kedrov’s views on the position of psychology among sciences were generally accepted. He followed Engels’ division of the world into three domains (nature, society, and thought) and suggested the triangular classification of the sciences.

A circle unifies sciences in the order of emergence of forms of matter (nature → society → thought | natural sciences → social sciences → philosophy). We see that psychology falls out from this circle of sciences. It is neither a natural science nor a social science nor a philosophical science, though it has its closest ties with philosophy. At the same time, behaviorology is no doubt a natural science so it is incompatible with psychology even from the dialectical-materialist point of view.

But when we compare behaviorology and dialectical-materialistic psychology, the key figure is already mentioned—Lev Vygotsky. I would like to provide a rather long quote from Spanish psychologist Ángel Rivière where the positions of Skinner and Vygotsky are juxtaposed:

Vygotsky’s solution had something in common with that of Skinner’s: In order to explain the origin of the higher mental functions, he considered it necessary to go outside the subject. These functions are considered to be the products which originated in the culture and were made subjective through processes of social interaction. Higher mental functions—language and signs, even consciousness itself, with its semiotic structure—are nothing but refined forms of interaction.

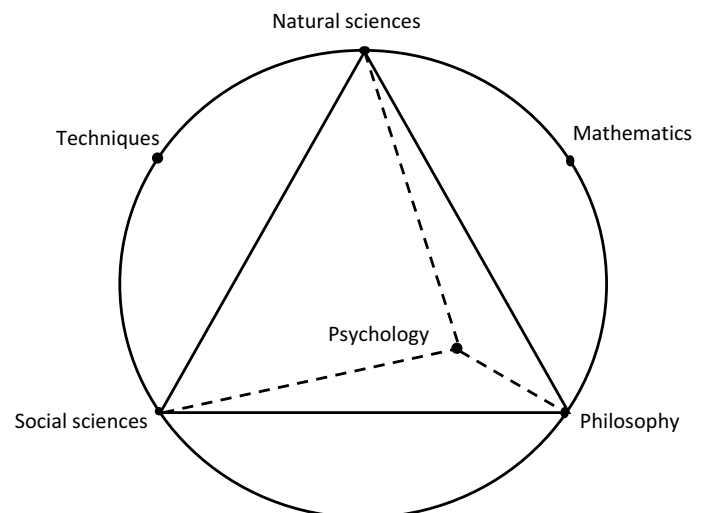


Fig. 1. Kedrov’s classification of the sciences

A second characteristic which draws Vygotsky somewhat close to the position of Skinner is what we might call “instrumentalism”. His [Vygotsky’s] unit of analysis was instrumental behaviour. He thought that the possibility of transforming the material world by means of tools established the conditions for the modification of reflexive behaviour and its qualitative transformation in consciousness. This process is further mediated by a special class of tools: those which permit the realization of transformation of others. We call these tools “signs” and they are essentially provided by culture... [Thus,] the fundamental path of development is that which is defined by the internalization of those instruments and signs, by the conversion of the external system of regulation into means of self-regulation. It is this notion which creates a decisive separation between the instrumentalism of Vygotsky and that of Skinner, because Vygotsky thought the systems of self-regulation, when internalized, dialectically modify the structure of external behavior, which can no longer be understood as an expression of reflexes. In other words, consciousness, which was for him [Vygotsky] “social contact with oneself,” exerts a causal influence over behaviour.

We can see here that Rivière considers that Vygotsky’s and Skinner’s positions are rather close. And we can conclude that cultural-historical theory of Vygotsky may have a lot to offer behaviorology in achieving a better understanding of the nature of behavior. Concerning the agencyism of Vygotsky, however, we should say that there is no generally accepted solution in that case. Rivière writes that in Vygotsky’s words consciousness exerts a causal influence over behavior. But can consciousness be an agency if “consciousness does not occur as a specific category, as a specific mode of being” as Vygotsky wrote in *“Consciousness as a problem of the psychology of behavior”*? Vygotsky stated that consciousness is “a very complex structure of behavior,” and Skinner pointed out that self is “a device for representing a functionally unified system of responses.” To my mind, they agree in views at this point, and I dare say that for Vygotsky consciousness is not an agency, though his contradictory works allow coming to the absolutely different conclusion. In this respect, Skinner has one indubitable and inestimable advantage over Vygotsky: he created a consistent scientific language

while Vygotsky used traditional terms and thereby his works may be read this way and that. However, Vygotsky’s works can be regarded as a manual to apply the dialectic method to psychology, and behaviorologists can take advantage of it.

Summing up this point, we can compare Skinner’s and Vygotsky’s positions using dialectical laws. First of all, Rivière correctly points out that both of them “go outside the subject” in order to explain human behavior. In fact, it is the application of the law of negation that is the first law of dialectics. On the one hand, Skinner and Vygotsky negate the inner entity, which is the cause of itself. On the other hand, both of them negate the former psychology.

Then, Vygotsky tries to use the law of the negation of the negation. Strictly speaking he goes inside the subject turning back to inner causes. As Rivière notes, “the systems of self-regulation, when internalized, dialectically modify the structure of external behavior.” And exactly at this point Vygotsky commits a blunder. He did not take into account that the return to the former language is impossible. He follows a right direction but by a wrong bus. It can sound strange enough but a behaviorist has also to go inside the subject if he tries to follow dialectics. And it is the problem of privacy that concerns the problem of “going inside.” We can construct a logical argument.

1. Skinner considers the “being” of private events. In fact, they are bodily conditions and covert behavior.
2. Nothing can be in existence out of interaction. Mutual connection and mutual conditionality of the phenomena of a material world is one of the axioms of materialism.
3. Private events exist, consequently they are causes of something and effects of something.

Covert behavior does have an influence upon overt one. But we should understand that private events do not cause behavior in the sense that cause is used in traditional psychology. First of all, causation is not necessarily direct. Skinner wrote that “the private event is at best no more than a link in a causal chain, and it is usually not even that. We may think before we act in the sense that we may behave covertly before we behave overtly, but our action is not an “expression” of the covert response or the consequence of it.” So Skinner considers that private events may be at least “a link in a causal chain.” And secondly, causation is not a universal necessity. It has a probable status.

Skinner pointed out that “we cannot account for the behavior of any system while staying wholly inside it.” But can we study the behavior staying wholly outside?

We have to apply the law of negation of the negation and to go inside the subject for more complete description of behavior. But going inside we have to remember that, according to Skinner, "A purely private event would have no place in a study of behavior, or perhaps in any science; but events which are, for the moment at least, accessible only to the individual himself often occur as links in chains of otherwise public events and they must then be considered. In self-control and creative thinking, where the individual is largely engaged in manipulating his own behavior, this is likely to be the case." We have to save no space for dualism. Private and public events are not physical and mental ones. And if a private event may not be distinguished by any special structure or nature, we can't say that it does not have a causal effect on behavior.

We can conclude that:

(a) The distorted image of Skinner's radical behaviorism predominates in dialectical-materialist psychology.

(b) Dialectical-materialist psychology got stuck in mentalist terminology. It may be related to the paradoxical fact that Marx was not a consistent materialist, and psychology was an easy target for this inconsistency as compared with natural sciences. In fact, Marx's naturalism is distinct from both idealism and materialism, and unifies both of them.

(c) However, dialectical materialism is scientific materialism, first and last. The dialectical method demonstrates the power and efficiency in natural sciences (e.g., biology and physics), and behaviorology, as natural science, can rely on this method too.

So should behaviorology dialogue with dialectical materialism? I take the view that it should. And the most essential thing that behaviorology should learn from this dialog is why dialectical materialism miscarried as materialism. Dialectical-materialist doctrine tried to stick to the same ideas as behavioral materialism:

- (a) materialistic monism;
- (b) determinism;
- (c) selectionism;
- (d) study of human behavior within the environment;
- (e) emphasis on change (control) rather than description.

So why did dialectical materialism fail as materialism in the field of behavioral sciences? The answer on this question is something for the future, but we need this answer. The historical records suggest that different behaviorisms led to cognitivism, idealism, contextualism, and so on. Idealistic interpretations of radical behaviorism exist, and behaviorology should be aware of dead-end roads.

The listed similarities are rather general, so in conclusion I would like to give two more concrete dialectical elements of behaviorology.

Firstly, selection by consequences is in essence model of interaction. Interaction is dialectical category that rejects stereotyped notion that cause and consequence are two invariably adversarial poles. Either of interacting sides is cause of another one and consequence of simultaneous influence of opposite side. Therefore, we can suppose that selection by consequences is a dialectical model of behavior determination. A consequence of a certain behavior (change in the environment) is simultaneously a cause of that this behavior will happen more often or rarely. Nevertheless, we have to remember that causality and interaction are not interchangeable.

Secondly, laws of dialectic are applicable to behaviorology. Take, for example, private and public events. Skinner wrote, "Covert behavior often seems to be like overt except that it occurs on a smaller scale." Can we say that quantitative change of behavior leads to qualitative change: public event becomes private one (dialectical law of the transformation of quantity into quality)?

There are three generally accepted domains of science: physical, biological, and behavioral. In fact, this division is a ladder of complexity of matter. Development of physical events leads to the emergence of biological events, and development of biological events leads to the emergence of behavioral events. However, any biological event is at the same time physical one, and any behavioral event is biological and physical. Covert behavior emerges from overt behavior, and can we say that it is the transition of the same order as the transition from, for example, physical level to biological. If it is so, then we can fairly assert that private events are behavioral events, but at the same time they possess some characteristics that are absent on overt behavior level. For example, Vygotsky stated that inner speech emerges from outer speech, but it has additional properties, for example, it is abbreviated. Moreover, if it is so, then private events open up possibilities to collaboration of behaviorology and dialectic-materialist psychology. On this way, both of them should change. Behaviorology should pay more attention for private events, and dialectic-materialist psychology should be less mentalist. ☺

Tempest in a Teapot: Relabeling Radical Behaviorism Will Not Rescue the Science or Practice of Behavior Analysis

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Abstract: As a means of addressing common misconceptions by philosophers of *radical behaviorism*, Morrow (2019) proposed using the substitute label *behavioral materialism*. We view this proposal as part of an important general mission to find ways of speaking that connect constructively with the repertoires of various kinds of listeners who are not experts in behaviorism and its associated science and practice wings. Nevertheless, the scholarly movement begun by B. F. Skinner faces more pressing problems than how it is regarded by philosophers, and we therefore expect Morrow's proposal to have little bearing on the movement's survival.

The scholarly movement that B. F. Skinner initiated—one subsuming philosophy, science, and technology—has for quite a while been hanging on by its metaphorical fingertips. Few would claim that Skinner's movement has become a driving mainstream force in science, technology, or society. And the future is very much in doubt, due in part to erosion of the movement's basic science wing (e.g., Poling, 2010) and an obsessive focus, in the applied wing, on one rare disorder (e.g., Friman, 2006) such that all that separates applied behavior analysis (ABA) from virtual extinction is the lack of a medical cure for autism. Against this backdrop, Morrow (2019; in this issue) identifies yet another manifestation of failure to thrive: that the philosophy of science associated with Skinner's movement has never been widely embraced by philosophers, and in fact is regularly misunderstood by them. Morrow's essay serves as a reminder, as Skinner (1979) himself suggested, to “regard no practice as immutable. Change and be ready to change again” (p. 346). Old ways of doing business have achieved limited acceptance and few friends for Skinner's movement, so new approaches may be needed.

One place to start regards what to call the movement itself, and Morrow's proposal is part of a

long tradition of tinkering. Skinner (e.g., 1938) initially left his science of behavior unnamed, but came to call it the *experimental analysis of behavior* (EAB; e.g., 1966) to clearly distinguish it from approaches that focused on mental constructs. An early name for the applied technology that grew out of EAB, *behavior modification*, was largely abandoned after the discovery that the public associated it with such unpleasant phenomena as brainwashing, electroshock, and excessive application of drugs (e.g., Woolfolk, Woolfolk, & Terrence, 1977). Gradually, custom turned to celebrating the translational links between EAB and applied technology by employing the umbrella label *behavior analysis*, with ABA (e.g., Baer, Wolf, & Risley, 1968) now the preferred substitute for *behavior modification*. Numerous other labels, including *behaviorology* (Vargas, 1994), *praxics* (Epstein, 1984), and *contextual behavior science* (Hayes, Barnes-Holmes, & Wilson, 2012) have been proposed for various aspects of the Skinnerian system. Although the currently popular label *behavior analysis* has shortcomings (see Hantula, Critchfield, & Rasmussen, 2018), we will rely on it here for simplicity of expression.

Morrow reminds us that names can matter not only in science and technology but also in the associated

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philosophy of science. His suggestion to recast *radical behaviorism* as *behavioral materialism* addresses a general problem with deep historical roots, namely that “ways of speaking” in behavior analysis have always been fraught with unintended connotations resulting from speaker and listener behavior being under differential control. Put more casually, the behavioral speaker intends to say one thing, while the nonbehavioral listener hears quite another (e.g., Critchfield, et al., 2017; Foxx, 1990). Lindsley (1991) placed the blame for this problem squarely on Skinner who, as the originator of much of the dialect called “behaviorese,”¹ “sometimes chose words that meant different things to other people than they did to him. He never checked out what his technical words meant to most people” (p. 449). Perhaps exacerbating the problem, Skinner—in abeyance to his own advice to “change” when necessary—could be intransigent when challenged about the audience impact of his verbal system. For instance, when commenting on the fact that people often construe *control* to mean *coerce*, Skinner (1974) stated simply that, “Nothing is to be gained by using a softer word” (p. 181). Skinner also, in a subversion of the dictum that “the organism is always right,” had a tendency to blame the victim when functionally analyzing uncomplimentary responses to his system “In my experience,” he wrote, “the skepticism of psychologists and philosophers about the adequacy of behaviorism is an inverse function of the extent to which they understand it” (Skinner, 1988, p. 472). Morrow takes the more appropriate tack of proposing that if philosophers of science misunderstand radical behaviorism, this may result from how radical behaviorism was discussed by its proponents in the first place.

We applaud the logic of Morrow’s proposal and will shortly consider some of its implications, but as a preliminary point, we wonder how Morrow would suggest that his replacement for *radical behaviorism* be effectively disseminated. For philosophers to encounter *behavioral materialism*, someone must speak and write about it, and presumably this starts in the verbal behavior of radical behaviorists (er, behavioral materialists). How might those accustomed to speaking about *radical behaviorism* be induced to change their verbal ways? Of one thing we are certain: Telling is not teaching, and simply declaring the superiority of a new label rarely is sufficient to assure its adoption. For example, Lindsley (1991), noting that consumers tend to misunderstand the technical language used in applied work, suggested what he called “Plain English replacements”² that he believed, based on a quarter century of interacting with consumers, would be both effective and palatable. Nearly 30 years later, few, if any, of those replacements are in wide circulation. Even the

demise of *behavior modification* more than four decades ago has been exaggerated, as three popular contemporary textbooks on applied behavioral technology retain that term in their titles (Kazdin, 2013; Martin & Pear, 2014; Miltenberger, 2016). Whatever labeling inertia applies to these cases probably applies as well to *radical behaviorism*, and we invite suggestions for how to make *behavioral materialism* a routine component of the scholarly lexicon.

But, more centrally, let us imagine that a wholesale switch can somehow be engineered, so that anyone formerly inclined to speak of *radical behaviorism* henceforth says *behavioral materialism*. What would follow from this relabeling? Morrow frames the answer by noting some incorrect assumptions philosophers of science have made about *radical behaviorism* that might be avoided when the focus is on *behavioral materialism*. If relabeling allows philosophy, as a discipline, to do its work with increased rigor, then we are all in favor... but, with all due respect to philosophers, outside of this limited context it is unclear how much it matters what philosophers of science do or say.

Here we wish to tread carefully to avoid any appearance of disrespect for the difficult work that philosophers undertake. We recognize that philosophy of science can provide valuable guidance to science and technology; thus, the individuals with the greatest odds of finding value in radical behaviorism, er, behavioral materialism, are those working in EAB and ABA. In this regard we view Skinner as a near-ideal within-subject synthesis of philosophy, science, and technology. But does this synthesis describe how science and technology *normatively* operate? More specifically, to what extent is the typical worker in EAB or ABA concerned with, and versed in, philosophy of science? We know of no published data that speak to this issue, but common sense suggests that most people who participate in the movement Skinner initiated are not philosophers of science. To wit: Recently we reviewed a manuscript describing a survey of applied practitioners, only a minority of whom self-identified as radical behaviorists. It is tempting to express alarm at this finding—*the field is losing its philosophical core!*—but the finding is a fact considered out of context. We are aware of no data from any other successful disciplines describing the relative philosophical sophistication of its scientists and practitioners, so it is unclear whether the practice wing of behavior analysis is at all unusual in its lukewarm embrace of philosophy.

If speculation may be permitted, ours is that most basic scientists, applied scientists, and applied practitioners are so busy confronting the practicalities of their full-time jobs that, even if they are well-trained in philosophy, they

¹ This label has come into common usage; the earliest reference we have found for it is Strike (1974, p. 108).

² Examples: *relief* instead of *negative reinforcement*; *try, try again* instead of *experimentally analyze*; and *environmental behaviorism* instead of *radical behaviorism*.

have little time for philosophical reflection or analysis. At best, they may rely on what Dibbs (1982) called an implicit philosophy of science, or what Pepper (1942) called a world hypothesis: a very general (and likely not consciously derived) sense of what constitutes a criterion of truth. Somehow, in the absence of explicit philosophical analysis, a lot of good has been accomplished over the years by a lot of behavior analysts. Without discounting the potential value of Skinnerian within-subject synthesis, this suggests that in practice philosophy of science is mostly the province of philosophers of science. If so, then Morrow's proposal addresses only a small slice of the movement Skinner initiated.

Consider a thought experiment to test this idea. Let us imagine that workers in EAB and ABA all somehow become aware of Morrow's re-designation; relevant textbooks and graduate course become magically revised so that philosophy of science is made central to the training of basic and applied researchers and applied practitioners, with that training now focused on *behavioral materialism* rather than *radical behaviorism*. What in EAB and ABA can be expected to change as a result? Will researchers develop better experimental designs, resolve longstanding theoretical debates, or launch experiments on previously ignored topics? Will applied practitioners craft more powerful interventions and find ways to enhance quality of life for more people than before? Morrow's focus was elsewhere, so he did not say, but if the intent was to suggest valuable trickle-down from philosophy to science and technology, such a claim demands supporting evidence that remains to be supplied.

And there is more. The survival of the movement Skinner started depends not just on the successes of behavior analysts in their everyday work, but also on the acceptance of that work in society. There is a long tradition of bemoaning the Skinnerian movement's chilly reception from mainstream culture (e.g., Bailey, 1991; Critchfield, 2011; Foxx, 1996; Freedman, 2015; Lindsley, 1991; Poling, 2011; Skinner, 1978, 1987). Complaints include that basic scientists have limited access to academic jobs and extramural research funds, and that consumers and public policy makers often favor nonbehavioral applied work over ABA. In a world where the philosophical underpinning of EAB and ABA is *behavioral materialism*, will these problems be mitigated? Will each scientific or practical success receive improved media attention, increased tangible support, and enhanced policy-level promotion compared to the baseline when *radical behaviorism* was its philosophical foundation?

Those questions apply to individuals who have already committed to serving as foot soldiers in the Skinnerian movement, but in our work as university professors we are acutely aware of the challenge of identifying *tomorrow's* scientists and practitioners. Far too many of our students

are uninspired by behaviorism and its associated science and practice; they are drawn instead to disciplines and specializations that, in our opinion, offer less effective tools and murkier conceptual frameworks. In a world where the philosophical underpinning of EAB and ABA is *behavioral materialism*, will students who previously ignored us begin flocking to our movement?

Making science and technology optimally effective is a real and crucial challenge. Ditto for gaining societal support for science and technology, and recruiting new talent to these enterprises. To be very clear, Morrow's general strategy seems relevant to all of these cases, in that carefully chosen verbal practices could help win converts to the movement. For instance, there is evidence that, when shared with non behavior analysts, the jargon of "behaviores" tends to induce unpleasant emotional responses (Critchfield, et al., 2017), to adversely affect the social acceptability of behavioral interventions (Becirevic, Reed, & Critchfield, 2016; Witt, Moe, Gutkin, & Andrews, 1984), and even to impair intervention implementation integrity (Jarmolowicz, Kahng, Invarsson, Goysovich, Heggemeyer, & Gregory, 2008). Systematic, audience-sensitive relabeling of concepts and interventions is likely to help with these problems. Additionally, there is evidence that pairing a consumer product with a pleasant story tends to increase liking for that product (Strick & Volbeda, 2018). Presenting behavior analysis to the public in conjunction with pleasant stories is likely to help with marketing the discipline. What seems *unlikely* is that relabeling the philosophical underpinnings of the discipline will directly address matters like these, or even help indirectly by guiding wise choices of how to communicate with non-philosopher audiences.

In the end, what we call a rose should depend on who sniffs it. In the grand tradition of Skinner's (1957) account of verbal behavior, the most effective ways of speaking are those that intersect productively with the behavior dynamics of an audience. Thus, the utility of a proposal like Morrow's is likely to be highly audience-specific. In this regard, Morrow was astute in identifying philosophers as his target audience, but verbal practices that satisfy philosophers probably will not resolve the problems of scientists and practitioners. Any verbal reformulation applied to those problems will need to take into account the specific audiences that are involved.

Ultimately, what most concerns us is not whether Morrow has identified a real problem or suggested a valid solution to it, but rather whether *this* battle—one targeting the acceptance of Skinner's scholarly movement among philosophers of science—is really the most important one to fight at this particular point in the history of ideas. Does it matter whether philosophers of science give the system Skinner initiated its proper due? Within the bounds of the discipline of philosophy, the answer likely is "yes," and we

commend Morrow for a thoughtful consideration of this problem. Any broader import of the proposal to replace *radical behaviorism* with *behavioral materialism* remains to be demonstrated. Returning to our point that the individuals most likely to find value in radical behaviorism are those engaged in EAB and ABA, we are unconvinced that Morrow's re-branding would substantially affect these enterprises. What seems more certain is that if EAB and ABA cease to exist almost nobody will be left to care about either *radical behaviorism* or *behavioral materialism*.✻

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The Name of the Rose

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In Joe Morrow's (2017) engaging article—"A Rose by Another Name: Behavioral Materialism"—the rose and the *rose* are B. F. Skinner's (1904–1990) philosophy of his science of behavior and his name for it. The philosophy and its name did not emerge fully-formed, of course. They developed in concert with Skinner's science in a bootstrap fashion. In his science, for instance, Skinner originally considered behavior to be reflexive, but by the mid-1930s, he had discovered the operant (Skinner, 1937; see Skinner, 1956). He called his science the *experimental analysis of behavior* (Skinner, 1938). In his philosophy, he was originally inclined toward logical positivism and operationism, but by the mid-1940s, he had extended his science to the behavior of scientists (Skinner, 1945; see Skinner, 1957, pp. 418–431). This was the philosophy of his science of behavior, which he called *radical behaviorism*. Science and philosophy evolve together—sometimes. Morrow notes, though, that Skinner's philosophy is misunderstood because the *radical* in *radical behaviorism* is misunderstood. As an alternate, he suggests that *behavioral materialism* may be "the most accurate depiction of Skinner's philosophy" (p. 24). Morrow's concern is well taken, but it invites elaborating, parsing, and amending, as does *behavioral materialism*. I offer these in the following sections on *radical* behaviorism, behavioral *materialism*, and descriptive behaviorism.

Radical Behaviorism

Morrow (2017) observes correctly that Skinner (1945) used *radical* in its primary lexical meaning of *root* or *origin*. *Radical behaviorism* meant that behavior was ultimately the root or origin of psychology. Behavior is not only what psychology studies, but also its subject matter. Related terms are *all-inclusive*, *fundamental*, and *thoroughgoing* (Michael, 1985; Ulman, 1991). Jack Michael (1985) elaborated in "Behavior Analysis: A Radical Perspective":

Now, what about the term *radical*? Among the common synonyms, *thoroughgoing* is probably the most appropriate for the radical behaviorism of John B. Watson, and likewise for Skinner's use of the term in 1945 to refer to his own approach (p. 277). In that article he was clarifying the status of private stimuli and responses, which, from a logical positivism viewpoint held by many behaviorists at the time, could

not be included as a part of science because science depended on public or consensual validation... Skinner wished to include private events, "feelings, consciousness, states of mind" (1974, p. 4) within his field, even if only by inference, and thus he contrasted his radical or all-inclusive behaviorism with what he called "methodological behaviorism," the more conventional view that insisted on consensual validation. (pp. 100–101)

When Skinner named his philosophy *radical behaviorism* in 1945, this was his first published use of the term. It had a technical meaning.

Morrow (2017) also observes that *radical* has a secondary lexical meaning—*extremism*. This is a vernacular meaning. Here, *radical behaviorism* means *extreme* behaviorism. Related terms include *drastic*, *revolutionary*, and *fanatical* (Heward & Cooper, 1992). Although, this secondary meaning leads *radical behaviorism* to be misunderstood, when the referents are

*I thank Susan M. Schneider for her meticulous history of radical behaviorism and *radical behaviorism* (see Schneider & Morris, 1987) and Bryan D. Midgley for his perceptive comments on earlier versions of the manuscript. Correspondence may be sent to the Department of Applied Behavioral Science, 4017 Dole Human Development Center, University of Kansas, 1000 Sunnyside Avenue, Lawrence, KS 66045. Email: ekm@ku.edu.

Key words: B. F. Skinner, philosophy of science, radical behaviorism, behavioral materialism, behavior analysis, behaviorology

properly parsed, the misunderstanding dissolves. First, *extreme* is not a misunderstanding of radical behaviorism: Mind is a hypothetical construct—it does not exist. This position is extreme in psychology, as noted below. Second, although *extreme* was not Skinner's meaning of *radical*, its technical and vernacular meanings are not opposed because their referents are not opposed. Radical behaviorism is a philosophy; extreme is a characterization of it. Still, radical behaviorism and *radical behaviorism* are misunderstood when the meaning of *radical* as *extreme* causes conceptual confusion about its meaning as *root* or *origin*. Morrow is right.

Some History

At this point, the history of radical behaviorism and *radical behaviorism* needs some amending. First, Skinner did not coin the term *radical behaviorism* in 1945 (Schneider & Morris, 1987). Mary W. Calkins (1863–1930) coined it in 1921. She called John B. Watson's (1878–1958) classical behaviorism *radical behaviorism*, where, by radical, she meant *extreme*. His behaviorism was extreme, she averred, because it “denies or ignores what are known as mental phenomena” (Calkins, 1921, p. 1; see Watson, 1913a, 1913b). Watson did not use the term.

Second, Skinner's first known use of *radical behaviorism* was not in 1945, but in an unpublished book he began in the early 1930s—*A Sketch for an Epistemology* (Skinner, 1979, pp. 115–119, 146, 166, 311, 395; Skinner, 1983, pp. 279, 395). The only part he published was his article, “The Generic Nature of the Concepts of Stimulus and Response” (Skinner, 1935). In the *Sketch*, Skinner distinguished between radical behaviorism and methodological behaviorism. When asked in the 1980s what he meant by *radical behaviorism* in the 1930s, he replied: “I don't believe I invented the phrase ‘radical behaviorism.’ I think it was in the air at the time” (Schneider & Morris, 1987, p. 33). What was in the air was Watson's *radical behaviorism*.

In naming his behaviorism *radical behaviorism* in the 1930s, Skinner may have meant *radical* in one or both of two senses, but not in opposing senses. He may have meant that it was extreme in psychology or that it denied or ignored mental phenomena. Regarding the latter, he wrote in his 1979 autobiographical volume, quoting in part from the *Sketch*:

...I preferred the position of *radical behaviorism*, in which the existence of subjective entities is denied. I proposed to regard subjective terms as “verbal constructs, as grammatical traps into which the human race in the development of language has fallen.” (Skinner, 1979, p. 117)

Thus, in the early 1930s, Skinner's philosophy was *radical* in being extreme and in what it was extreme

about—denying or ignoring mental phenomena. This is not a misunderstanding.

Behavioral Materialism

Turning to behavioral *materialism* as an alternate for *radical behaviorism*, Morrow (2017) offers a definition of *materialism* from the *Random House Dictionary* (1980): “materialism holds that ‘matter and its motions [constitute] the Universe, and all phenomena, including those of mind [are] due to material agencies’” (Morrow, 2017, p. 24). He then introduces his alternate—*behavioral materialism*. Ulman (1991) had introduced the same term earlier for the same reasons: “The ontology of radical behaviorism is materialistic monism. We could just as appropriately call this philosophy *behavioral materialism*” (pp. 61–62). Morrow turns for support of this term in Skinner, behavior analysis, the social sciences, and philosophy.

B. F. Skinner

From Skinner's works, Morrow (2017) offers three illustrative quotations: (a) “a private event may be distinguished by its limited accessibility but not, so far as we know, by any special structure or nature” (Skinner, 1953, p. 257); (b) “Private events and public events have the same kinds of physical dimensions” (Skinner, 1963, p. 953); and (c) “A basic principle of behaviorism which has guided me throughout my professional life [but which I have neglected to emphasize in my writings (it is neglected in *About Behaviorism*)] is the importance of converting mentalistic terms to alternatives which refer to things having physical dimensions” (Skinner, 1980, p. 197). The quotations, however, do not include *matter*, *material*, or *materialism*, but instead, *nature*, *structure*, and *physical*, the last implying physicalism.

Skinner's use of *physical* may have been due to a greater familiarity with and affinity to physicalism than materialism. First, materialism (contra. immaterialism) dates to ancient Greek philosophy, whereas physicalism was more modern. Rudolf Carnap (1891–1970) and Otto Neurath (1882–1945) introduced it into the philosophy of science—notably, into logical positivism and operationism—in the 1930s, after which it sometimes supplanted *materialism* (Stoljar, 2017; see Moore, 2008, p. 40). Second, in being inclined to logical positivism and operationism in the 1930s (Skinner, 1938, 1945), Skinner was acquainted with Carnap's work, even as their physicalisms later differed (Moore, 1985). At the time, Skinner referred to Carnap as the “latest behaviorist” (Skinner, 1979, p. 149; see also pp. 158, 159, 213, 281; 1983, p. 128; see Flanagan, 1980).

Behavior Analysis

In behavior analysis, Morrow (2017) notes that materialism and *materialism* are aligned with Skinner's philosophy of science. In support, he quotes Creel (1980), who noted that "Skinner affirms philosophical materialism" (p. 34); Flanagan (1980), who concluded that Skinner was a "metaphysical materialist" (p. 10); and Moore (1985), who called Skinner's physicalism "something akin to metaphysical materialism" (p. 59). I offer two additional supports.

In "Some Fundamentals of B. F. Skinner's Behaviorism," Delprato and Midgley (1992) included materialism as a fundamental assumption. They described it concisely—"Materialism: Dualism Is False; the Only World Is a Physical World" (pp. 1511–1512)—and then defined it: "Materialism asserts that the world is composed of physical or material things, varying in their states and relations, and nothing else" (p. 1512). This, they wrote, was Skinner's monism—his material monism (see also Flanagan, 1980). They also provided five illustrative quotations from Skinner, but none of them referred to matter or materialism, only to the physical, for example:

No special mind stuff is assumed. A physical world generates both physical action and the physical conditions within the body to which a person responds when a verbal community arranges the necessary contingencies. (Skinner, 1974, p. 230)

This may have been due, again, to Skinner's greater familiarity with and affinity to physicalism.

In *Radical Behaviorism for ABA Practitioners*, Johnston (2014) includes *radical behaviorism* in his glossary, but not *materialism* or *physicalism*. However, he defined *radical behaviorism* in terms of the physical: "Radical behaviorism: The philosophy of the science of behavior analysis, which focuses on behavior as a purely physical phenomenon" (p. 207). Johnston's book is full of the physical, but not the material, for example:

In spite of any discomfort with the implications of determinism, the assumption that physical events are fully explainable in terms of other physical events has a long and respected position in the natural sciences. (p. 5; see also p. 182)

To the extent that materialism is synonymous with physicalism, *behavioral materialism* (or *behavioral physicalism*) may be a more accurate depiction of Skinner's philosophy than radical behaviorism, but materialism can be misleading, as I note later.

Social Sciences

In the social sciences, Morrow (2017) puts *behavioral materialism* into a broader context. He begins with Marvin Harris's (1927–2001) *cultural materialism* (Harris,

1978, 1980), noting that "The similarity between the terms *behavioral materialism* and *cultural materialism* is intentional" (p. 25)—Morrow's intention. Both radical behaviorism and cultural materialism "explain all human conduct based on real events in a material world" (p. 25). Their complementarity is now well-accepted (see Glenn, 1988; Lloyd, 1985; Malagodi, 1986; Vargas, 1985). Morrow (2017) next turns to Karl Marx's (1818–1883) dialectical materialism (K. Marx 1867/1887), noting that the similarity between *dialectical materialism* and *cultural materialism* was also intentional—Harris's intention. Just as Skinner may be regarded as the Darwin of the behavioral sciences, Harris regarded Marx as "the Darwin of the social sciences" (p. 25).

Like Skinner and Darwin, Marx had destructive and constructive programs. In his destructive program, he criticized mentalism. For example: "Life is not determined by consciousness, but consciousness by life" (Marx & Engels, 1845–1846/1932, p. 47; see also the Preface in K. Marx, 1859/1977). In Marx's constructive program, Morrow (2017) lists six components of dialectical materialism that advance the social sciences. The first five are consistent with radical behaviorism: "(a) an objective approach to the social sciences, (b) a comprehensive analysis, (c) a historical approach, (d) a study of practical demands, and (e) pinpointing the crucial link for change..." (p. 25; see Skinner, 1953, 1974). The sixth component is inconsistent: "...determining the inner sources of development by exposing the contradictions which caused it" (p. 25). What separates Skinner's, Harris's, and Morrow's materialism from Marx's was Marx's incorporation of Hegel's (1770–1831) dialectics (Hegel, 1817/1991) and his version of them (see K. Marx, 1867/1887), which Morrow properly critiques.

Although Marx—like Darwin and Skinner—was misunderstood (Ulman, 1979, 1986), the materialism associated with Hegel, Marx, Engels, and then Communism might lead *behavioral materialism* to be further misunderstood. Behavioral materialism would be associated with Stalinist-style dictatorships and anti-Capitalist economics (see, e.g., Foster, 1978), associations that might be strengthened by Skinner's writings on intentional communities, freedom and dignity, and religion (e.g., Skinner, 1948, 1953, 1971, 1987). In Western democracies, these associations would make Skinner's philosophy unappealing at best. Still, complementarities do exist between radical behaviorism and Marxism that warrant closer analysis (see, e.g., Kolb, 1988; Skinner, 1985; Ulman, 1991; see Cavalcanti e Castro, 2016).

Philosophy

In philosophy, Morrow (2017) correctly dates the origins of materialism to the Greek philosophers, Leucippus (ca. 5th century B.C.E.) and Democritus

(~460–370 B.C.E.). Their materialism, though, was atomistic. It reduced matter to inert, indivisible elements, making their materialism reductionistic, mechanistic, and essentialistic. Although Skinner equivocated on biological reductionism (Delprato & Midgley, 1992), Greek materialism was not Skinner's materialism (see Moore, 2008; Morris, 1993; Palmer & Donohoe, 1992). Two thousand years later, materialism re-emerged in Western philosophy as the body in Rene Descartes' (1596–1640) mind–body dualism. Nonhuman animals were machines; humans were not. Humans had minds; nonhumans did not. When the French Materialist, Julian Offay de La Mettrie (1709–1751) proposed that humans were animals, too, then their bodies were also machines and, as machines, they were material. This version of materialism, though, was vitalistic—biology's version of agency. Thus, although the historian, Thomas Hardy Leahey (2013, p. 177), noted an affinity between Skinner's science and system and French Materialism, it was again not Skinner's materialism (Stoljar, 2017; see Moore, 2008, p. 40). This was, perhaps, another reason Skinner preferred physicalism to materialism.

Two related terms provide perhaps better support for Morrow's (2017) *behavioral materialism*. One is Aristotle's (384–322 B.C.E.) material cause among his four causes—the material, formal, efficient, and final causes. A material cause is “that out of which a thing comes-to-be..., for example, the bronze is a cause of a statue...” (see Aristotle, 1941). In Skinner's science, the biological organism and the physical environment are “that out of which” the three-term contingency comes to be (see Killeen, 2001; Moore, 2008, pp. 70–72). Another term is *naturalism*—Aristotle's naturalism (contra. supernaturalism). Its role in the origins and success of science is not disputed, nor is its role in attempts to naturalize psychology, albeit as-yet unrealized (see Kantor, 1963; N. Smith, 1993).

Descriptive Behaviorism

Thus far, I have addressed four meanings of materialism in *behavioral materialism*. The first was materialism and *materialism* in Skinner's writings, but Skinner more often used *physical* than *material* or *materialism*. The second was materialism and *materialism* in behavior analysis, but they, too, were more physical than material. The third was the materialism and *materialism* in cultural and dialectical materialism, but the latter has political and economic associations that might lead to misunderstandings. The fourth was Leucippus's and Democritus's materialism, but its ontology is inconsistent with Skinner's, as is that of French Materialism. In this section, I address a final meaning of materialism—one related to descriptive behaviorism.

In the history of psychology, psychology's first school or system was Structuralism—1880–1910. It sought to describe the structure of the mind through the introspection of its elements. The second was Functionalism—1900–1915. It sought to describe the functions of mind and behavior. The third was Behaviorism—1910–1930. It sought to describe the functions of behavior, while setting mind aside or denying it. In the early 1930s, Skinner named his behaviorism *radical behaviorism*, but it was not often called that until the 1960s. Between the 1930s and 1960s, it was sometimes called *descriptive behaviorism* (Leahey, 2013, p. 385; Schneider & Morris, 1987), as it is today, but Skinner did not use the term. He criticized it:

Descriptive behaviorism is too close to mere structuralism. We are dealing with functional relations. They are not carried by “radical behaviorism” either, but no contrary suggestion is made. (Schneider & Morris, 1987, p. 34)

Materialism is subject to the same criticism as descriptive behaviorism: It is too close to structuralism and does not deal with functional relations. *Behavior analysis* is misleading in the same sense. As a noun, *behavior* implies structure or form, not meaning or function. For this reason, in part, other terms have been proposed for the name of the field and its philosophy, among them, *praxics* (Epstein, 1984), *behaviorology* (Fraley & Vargas, 1986), *empirical behaviorism* (Bijou, 1999), and *functional contextualism* (Zettle, Hayes, Barnes-Holmes, & Biglan, 2016). This point notwithstanding, the distinction between description and explanation further clarifies what Skinner meant by *radical behaviorism*.

Description and Explanation

Skinner's criticism of *descriptive behaviorism* above is unusual. By *description*, he meant *structure*, which he contrasted with *function*, whereas *description* is usually contrasted with *explanation*. As I note later, Skinner was aware of the latter distinction, which I introduce with a definition of *descriptive behaviorism* from the *APA Dictionary of Psychology* (Vandenbos, 2006), which only a few psychology dictionaries include:

Descriptive behaviorism an approach to the study of behavior espoused by B. F. Skinner, who felt that psychology should limit itself to a description of behaviors of organisms, the conditions under which they occur, and their effects on the environment. It requires that theoretical explanations in terms of underlying biological or hypothetical psychological processes be avoided. (p. 271)

The definition is equivocal. If *description* concerns the study of the structural relations among “behaviors of organisms, the conditions under which they occur, and their effects on the environment,” this was not Skinner’s approach. His approach was functional: the study of the functional relations among them. More to the point, the definition states that descriptive behaviorism avoids “theoretical explanations in terms of underlying biological or hypothetical psychological processes.” On this account—a standard account—Skinner’s approach describes behavior, but does not explain it (see Hilgard, 1948, p. 116; Kendler & Spence, 1971; M. Marx, 1951, p. 439). This is misleading and mischievous.

Skinner (1938) addressed the distinction between description and explanation in *The Behavior of Organisms*, but used the terminology of logical positivism and operationism. This has contributed to misunderstandings of radical behaviorism (see Flanagan, 1980; Moore, 1985):

So far as scientific method is concerned, the system set up in the preceding chapter [“A System of Behavior”] may be characterized as follows. It is positivistic. It confines itself to description rather than explanation. Its concepts are defined in terms of immediate observations and are not given local or physiological properties. A reflex is not an arc, a drive is not the state of a center, extinction is not the exhaustion of a physiological substance or state. Terms of this sort are used merely to bring together groups of observations, to state uniformities, and to express properties of behavior which transcend single instances. They are not hypotheses, in the sense of things to be proved or disproved, but convenient representations of things already known. (p. 44)

By *explanation*, Skinner meant explanation in terms of mental phenomena and subjective entities and hypothetical–deductive theories about them. In psychology, these explain behavior. In radical behaviorism (Skinner, 1950), they do not explain behavior because they appeal to immaterialism—immaterial processes and structures—or to material structures and processes acting in immaterial ways (e.g., mentalistically; see Barrett, 2011; Bennett & Hacker, 2012). By *description*, Skinner meant descriptions of functional relations, their prediction and control, and empirical–inductive theories about them. These explain behavior.

Functional relations. As for functional relations, the experimental analysis of behavior discovers them among responses and their consequences and their antecedents (e.g., in the three–term contingency). Relations that are highly reliable over time and place are basic principles

of behavior, for instance, principles of operant behavior (e.g., reinforcement; see Catania, 2013). These relations explain much of behavior, just as they do in any natural science. Experimental analyses also discover derived or higher–order functional relations (e.g., stimulus control, relational frame theory; see, e.g., Catania, 2013). These explain more behavior, just as derived and higher–order functional relations do in other natural sciences.

Theory. One class of theories are empirical–inductive integrations of basic principles and derived or higher–order functional relations. These might be designated as Theory, which is ubiquitous in science. According to Skinner (1950), this is “a formal representation of the data reduced to a minimum number of terms [that] may yield greater generality than any assemblage of facts” (pp. 215–216). From this, hypotheses about behavior might be deduced, basic and derived or higher–order functional relations might be predicted, and hypotheses and predictions about them might be confirmed, with the new functional relations then subject to experimental analysis (Skinner, 1947; e.g., Honig & Staddon, 1977). Theory₁ explains behavior, as it does in other natural sciences and in natural history. Psychology has no hegemony over theory.

Another class of theories is behavioral interpretation. It, too, is ubiquitous in science. It might be designated as Theory₂; interpretations of behavior based on and constrained by its basic principles, derived or higher–order functional relations, and Theory₁ (Donohoe & Palmer, 1994). Theory₂ may be informal, as in Skinner’s (1957) *Verbal Behavior*, or a formal basis for empirical research (e.g., Valdez–Menchaca & Whitehurst, 1988), as it is in other natural histories. Again, psychology has no hegemony over theory.

This distinction between description and explanation is oversimplified. It does not address the deeper and broader implications of those terms and their relations in philosophy, science, explanation, theory, empiricism, hypothesis, induction, deduction, and logic. For fuller reviews, see Cheisa (1994); Hineline (1990); Moore (2000, 2003); Morris, Todd, and Midgley (1993); L. Smith (1986, pp. 258–297); Tonneau (2008); and Verplanck (1954). Work remains.

Conclusion

Morrow’s (2017) concern that the meaning of *radical* in *radical behaviorism* might lead to misunderstandings of Skinner’s philosophy of the science of behavior is well–taken. As an alternate, he suggests that *behavioral materialism* may be “the most accurate depiction of Skinner’s philosophy.” I am not as sanguine. It may lead to other misunderstandings, some graver than those implied by *radical* behaviorism. Even if Skinner’s philosophy is the most effective philosophy for a science

of behavior, the history and philosophy of science may care little about what it is (or was) called. What is more important is psychology's evolution as a natural science and natural history. Still, we should not countenance misunderstandings of radical behaviorism that would impede its evolution. Thank you, Joe, for reminding us.✻

Coda

“That which we call a rose by any other name would smell as sweet.”

Shakespeare (1597/1914)

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At www.behaviorology.org TIBI provides information on as many behaviorology resources as possible, including books and audio/visual materials, as well as electronic versions of back issues of *Journal of Behaviorology* and its predecessor *Behaviorology Today*. Some recently described books are (a) *Science Works on Human Behavior* by Stephen Ledoux, (b) two *Study Question* books by Lisa Ramond (AKA Lisa Brothers) on Lawrence Fraley's *Dignified Dying* book and his *Rehabilitation* book, (c) *What Causes Human Behavior—Stars, Selves, or Contingencies?* by Stephen Ledoux, and (d) several behaviorological books about companion animal training by James O'Heare. Check out them all!

The Behaviorology Movement Differs from Other Behavioral Organizations: Comments prompted by Joseph Morrow's Behavioral Materialism paper

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Abstract: Morrow (2019) describes the benefits of an alternative name for the philosophy of science of the natural science of behavior. But the success of any new name, and even the success of this discipline, rests mostly on the training and organizing of scientists of behavior.

The paper under discussion (Morrow, 2019) pointed out the ongoing problems with the term *radical behaviorism* as the name of the philosophy of science of the natural science of behavior, and then described a carefully considered solution of switching to the term *behavioral materialism* as the name of this philosophy of science. The success of such a solution, with this or some other term, and even the success of the natural science of behavior, faces constraints by another, broader, and potentially more vital consideration regarding the training and organizing of the behavior scientists whose philosophy of science is being addressed. These constraints are the point of this paper.

Organized behaviorology represents a group of natural scientists whose field is the study of behavior. More specifically, the primary concerns are (a) why on a given occasion a particular response occurs, and (b) refinement of the contingency–engineering interventions that would be required to change the form and frequency of such a response. Behaviorology derives its philosophy of science, and its way of solving problems, from its respect for the naturalistic perspective. Behaviorological problem solving is free of any recourse to supernatural or mystical aspects. Within the organized field of behaviorology, a practitioner who would focus narrowly on behaviorological solutions only for certain kinds of behavioral problems, while resorting to mystical causation in approaching other kinds of behavioral issues, would be regarded as a behaviorological scientist of diminished quality—especially by other behaviorologists whose specialties

focused on behavioral phenomena with respect to which that deviating practitioner tends to “go mystical.”

As has been traditional, most organizations that focus on behavior tend to rely on political strength and thus tend to be focused heavily on their population growth. Such politics is not necessarily exercised with respect to matters of state, but more typically reflects the organization’s approach to academic and professional matters. Political objectives are, of course, ubiquitous. However, the traditional approaches to solving organizational problems politically are less emphasized within organized behaviorology, which remains focused on the quality of its science. Among other organizations focusing on behavioral phenomena, a higher premium tends to be placed on amassing a numerical predominance in membership to enhance the organization’s “political clout,” which tends to occur at the expense of that organization’s scientific integrity. In such organizations an individual’s mere membership tends to trump the scientific quality of that individual’s contribution. The organization’s ranks become swollen by lowering admission standards as numerical strength becomes more important than strict adherence to a philosophy of natural science under any name. Consequently those politically focused organizations, in simplifying their membership requirements, typically strengthen their traditional political power at the expense of their scientific integrity (Fraley & Ledoux, 2015). Furthermore, the training of potential recruits tends to become oversimplified, thus making it easier for larger

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numbers of individuals to present as potential members of such organizations.

With respect to a concern being addressed in this journal issue, within a behaviorology organization debate often erupts with respect to terminology. B. F. Skinner was a master of nomenclature. He chose his terms with great accuracy and sophistication, a fact to which the “worn and torn” state of my Websters dictionary attests. I taught his terms for over 30 years to a wide spectrum of university students. And they mastered them. As a general observation, in my experience the quality of instruction offered by most university faculty members is commensurate with their own formal training in the contingency–engineering practices to which the phrase *instructional process* refers.

In contrast to the approaches featured in politically purposed organizations, our behaviorological organization exists, not in general service to political goals, but in support of our natural science. As such, while the depth of our ranks is important, natural science requires the kind of conceptual integrity that characterizes our behaviorological activity. The objective of our organization is to bring about a major cultural change—namely the inclusion of behavioral phenomena as the fourth major subject matter at the roundtable of natural sciences: energy (physics), matter (chemistry), life (biology), and behavior (behaviorology). The culture–wide importance of behavioral phenomena demands this change. Having noted that human behavior causes global problems, and that changes in human behavior are required to solve global problems, traditional natural scientists have called for a natural science of human behavior (Ledoux, 2014). As they have not yet realized

that such a science, now called behaviorology, has existed for over 100 years (Ledoux, 2012), it becomes our responsibility to make this more clear. And it is the existing natural science community per se that must recognize this fact by comparing the scientific integrity of behaviorology to that of alternative behavior–focused organizations. Only then can the natural–science community effectively address its need to complete itself by incorporating the only behavioral field that maintains an uncompromised commitment to pure natural science.✻

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Radical is right for Behaviorism

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Abstract: A brief evolutionary synopsis is presented as the basis for the defense of the use of “radical” to adequately complete the definition of the natural science philosophy of behaviorism. Skinner’s definition of radical behaviorism is the foundation of Behaviorology, the natural science of behavior. Behaviorology is dedicated to the task of accumulating and disseminating information based on operationally defined variables thereby eliminating the need to rename or re-label the philosophy of behaviorism.

Philosophy, the love of wisdom, has long been regarded as the study of the nature of knowledge, existence, reasoning, values, and the human mind. Fundamental questions in this quest for knowledge led to philosophical methods of discovery such as questioning, discussions, rational arguments, logical debates, and organized presentations.

By the nineteenth century Western philosophy had encompassed specialized subfields such as astronomy, medicine, chemistry, and physics that were collectively referred to as natural philosophy. It was during this period that the rapid growth of research universities continued to support the specialization of academic disciplines. Psychology was one of the disciplines that separated from philosophy and then professionalized by adopting the position as the science of behavior and mind including conscious and unconscious phenomena. It attempted to understand human mental functions in addition to social and cognitive behaviors. Introspection or the reliance of self-observation remained one of its principal methodologies. Bertrand Russell (1967, p. 19) described his impression of introspection by stating that “... in psychology we use data which can only be obtained when the observer and the observed are the same person whereas in the other ways of studying Man all our data can be obtained by observing other people.”

Early in the twentieth century at least three major protests developed against the traditional concept of introspective psychology especially as it was related to depicting the analysis of conscious states. Two of the dissenting factions were Gestalt psychology which was founded in Germany and Freudian psychoanalysis which

challenged the sufficiency of consciousness in the world of psychiatry and placed its emphasis upon unconscious dispositions. The third dissenting discipline was American behaviorism which evolved into the present-day radical behaviorism.

The purpose of this paper is to offer a brief synopsis of the evolution and defense of “radical behaviorism” from its initial pubescent relationship with psychology to the current time-tested maturity within the philosophy of behaviorology. To psychologists, a variety of behaviorisms offered several methodological approaches to animal and human study with the promise that psychology would one day make itself as objective as the physical sciences. In addition, some behaviorisms would provide a mechanistic or materialistic view of psychology consistent with methodological behaviorism. Neither of these objectives were met.

Psychology continued to be dominated by introspective mind concepts despite the vigorous opposition from methodological behaviorism. John B. Watson, who had coined the term “behaviorism” and was a formidable supporter of its position relative to psychology, responded with what was considered to be an extreme environmentalistic stance. He summarized and justified his position in a now-familiar statement, “I am going beyond my facts and I admit it, but so have the advocates of the contrary and they have been doing it for many thousands of years”. (Watson, 1970, p. 104). His concerns and comments were a portrait of the state of methodological, descriptive, and semantical behaviorism in a collective effort to dispense with psychology’s commitment to inner agents or explanatory fictions.

**Address correspondence regarding this article, a commentary on Joseph Morrow’s article on *Behavioral Materialism* in this issue, to the author at jbf721@aol.com.

Key words: behaviorism, introspection, radical behaviorism, science of behavior, behavioral materialism, behaviorology, philosophy of science, dialectical materialism, Marxism, behavior analysis

Behaviorism's trend away from introspection resulted in a natural science that rejected metaphysical concepts such as the mind, cognition, mentalism, spiritualism, and introspection. B. F. Skinner was among the first to explain that behaviorism, as he understood it, did include all behavior including endosystemic or internal responses. He extended the term "behaviorism" to include "radical" and in doing so, laid the controversy regarding internal behaviors to rest. His position was clearly presented when he said, "A science of behavior must consider the place of private stimuli as physical things, and in doing so it provides an alternative account of mental life. The question, then is this: What is inside the skin, and how do we know about it? The answer is, I believe, the heart of radical behaviorism." (Skinner, 1974, p. 211).

Attempts have been made to describe behaviorism as a movement in psychology that focuses on the external aspects of behavior thereby denying the internal experiences in a manner that is reminiscent of the methodological aspects of Watsonian behaviorism. Still other attempts are suggested to recall "radical" behaviorism and replace it with a description consistent with earlier behavioral off-shoots such as structuralism, materialism, and similar philosophical paradigms that are related to the concepts of the introspective consciousness of traditional psychology. Again let Skinner speak to the heart of radical behaviorism with, "Mentalism kept attention away from the external antecedent events which might have explained behavior, by seeming to supply an alternative explanation. Methodological behaviorism did just the reverse: by dealing exclusively with external antecedent events it turned attention away from self-observation and self-knowledge. Radical behaviorism restores some kind of balance. It does not insist upon truth by agreement and can therefore consider events taking place in the private world within the skin." (Skinner, 1974, p. 16). We must not continue with the outdated practice of fabricating explanatory fictions to describe phenomena yet to be discovered and explained.

Cooper, Heron, and Heward (2014, p. 33) elaborated on these essential components by pointing out that, "A firm grasp of the philosophy of radical behaviorism, in addition to knowledge of principles of behavior, can help the scientist and practitioner resist the mentalistic approach of dropping the search for controlling variables in the environment and drifting toward explanatory fictions in the effort to understand behavior." These statements of advocacy for radical behaviorism and the logical consistency of its conceptual framework have convinced those devoted to the advancement of the study of radical behaviorism. Nonetheless, there have been whispers of concern for lay audiences who might misconstrue the word "radical" to mean "extremism". Morrow (2019, p. 13) addresses his concerns that "... a

more likely effect of the word [radical] on its audience is to suggest the secondary lexical meaning of *extremism*. If one starts with the usual common misunderstandings of the word 'behaviorism' and adds 'extremism' to that, we may have the basis for a complete misunderstanding."

The Oxford Desk Dictionary and Thesaurus (American Edition) offers a primary definition of "radical" as "fundamental, basic, elementary, inherent, and essential". The tertiary definitions offered are "drastic, fanatical, militant, left-wing". (Abate, 1997). There seems to be little danger of the tertiary definitions eclipsing the preferred meaning when using radical with behaviorism. Skinner's (1989, p. 122) definition provides a source of facile dissemination, "I don't believe I coined a term *radical behaviorism*, but when asked what I mean by it, I have always said, 'the philosophy of a science of behavior treated as a subject matter in its own right apart from internal explanations, mental or *physiological*.'"

Any concerns about the misunderstanding of what "radical" is intended to impart when used with behaviorism can be put to rest. Like most terminology introduced as a neologism specific to a particular science or technology, the phrase "natural science of behaviorism" must be presented and defined by those who are competent in the theory and practice of the natural science of behaviorism. Consider presenting terminology such as quantum mechanics, uncertain principle, stationary states or atomic orbitals, isotopes, exothermic or calcitonin, immunization, neuro-endocrine, to lay audiences without the assistance of physicists, chemists, and biologists. A disaster!

Behaviorologists are prepared and willing to advance the natural science of behavior by offering assistance in understanding the value of radical behaviorism and related terms. It would be absurd to re-label, replace, or remove legitimate terminology of any science simply because a lay audience might misconstrue or misunderstand some lexical constructs. Any natural science is expected to operationally define its terms with the intent of minimizing misunderstanding. Its objective is to disseminate information while avoiding any socio-political commentary, especially in the arenas of religion, politics, personal and economics.

Behaviorology, the natural science of behavior, is based on Skinner's philosophy of radical behaviorism and is committed to the accumulation and dissemination of information with the understanding that, "... a primary assumption in natural science is that a real event is theoretically measurable in terms of mass, time, distance, temperature, and charge (and perhaps some additional esoteric properties to be encountered in the ken of theoretical physicists). If an event cannot be measured in terms of those fundamental variables, it is not real and need not be taken into account." (Fraley, 2008, p. 15).

When all is considered, it appears that radical behaviorism provides a stable, clear description of what the natural science of behavior is and has been attempting to accomplish since its inception more than a century ago. Ledoux (2014, p. 7) aptly put it, “We consider 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’.” There is no need to introduce yet another “behaviorism” into the exhaustive litany of metaphysical-psychological behaviorisms of years past. Our energies must be oriented toward the growth and development of a well-founded responsible science of behavior. *Radical is right for behaviorism!* ❖

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More Commentaries

Journal of Behaviorology will have more commentaries, as *In Response* articles, in the next, and possibly following, issues starting with the Spring 2020 issue, Volume 23, Number 1.

Quote by B. F. Skinner on the Misunderstood Value of Behavior Science

In *About Behaviorism* Skinner wrote: “Those who say that a science of behavior is oversimplified and naïve usually show an oversimplified and naïve knowledge of the science, and those who claim that what it has to say is either trivial or already well known are usually unfamiliar with its actual accomplishments.”

(From the email that Julie Vargas sent on 2017 November 18 announcing that the “Issue III, 2017” issue of *Operants* is available).

Syllabus Directory*

The most recent issue of *Journal of Behaviorology* that features a Syllabus Directory contains two lists of TIBI's current course syllabi. These lists show where to find the most up-to-date versions of these syllabi in number, title, and content. The first list organizes the syllabi by numerical course number. The second list organizes the syllabi by the chronological volume, number, and pages where you can find each course syllabus.

Each of these syllabi contain only information explicit to a particular course. You will find all the relevant generic information in the article, *General Parameters & Procedures for Courses from The International Behaviorology Institute*, in *Journal of Behaviorology*, Volume 18, Number 2 (Spring, 2015) pp. 3-6.

Current Syllabi by Course Number

- BEHG 100: *Child Rearing Principles and Practices*;
Volume 19, Number 2 (Fall 2016) 3-5.
- BEHG 110: *Introduction to Behaviorology Terminology*;
Volume 20, Number 1 (Spring, 2017) 19-21.
- BEHG 210: *Introduction to Behaviorology I*;
Volume 19, Number 2 (Fall 2016) 6-8.
- BEHG 211: *Introduction to Behaviorology II*;
Volume 19, Number 2 (Fall 2016) 9-12.
- BEHG 330: *Companion Animal Training*;
Volume 19, Number 2 (Fall 2016) 13-15.
- BEHG 340: *Introduction to Verbal Behavior*;
Volume 19, Number 2 (Fall 2016) 16-18.
- BEHG 350: *Behaviorology Philosophy and History*;
Volume 20, Number 1 (Spring, 2017) 22-24.
- BEHG 405: *Basic Autism Intervention Methods*;
Volume 19, Number 2 (Fall 2016) 19-21.
- BEHG 425: *Classroom Management and Preventing School Violence*;
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- BEHG 430: *Resolving Problem Animal Behavior*;
Volume 20, Number 1 (Spring, 2017) 25-28.
- BEHG 435: *Performance Management and Preventing Workplace Violence*;
Volume 19, Number 2 (Fall 2016) 25-27.
- BEHG 455: *Behaviorological Thanatology and Dignified Dying*;
Volume 19, Number 2 (Fall 2016) 28-31.
- BEHG 465: *Behaviorological Rehabilitation*;
Volume 19, Number 2 (Fall 2016) 32-34.

- BEHG 480: *Green Contingency Engineering*;
Volume 20, Number 1 (Spring, 2017) 29-31.
- BEHG 512: *Advanced Behaviorology I*;
Volume 19, Number 2 (Fall 2016) 35-37.
- BEHG 513: *Advanced Behaviorology II*;
Volume 19, Number 2 (Fall 2016) 38-40.
- BEHG 541: *Advanced Verbal Behavior*;
Volume 19, Number 2 (Fall 2016) 41-43.♣

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- BEHG 100: *Child Rearing Principles and Practices*;
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*All of these TIBI course syllabi were either updated in 2016 or new in 2017. Many have older version appearing in earlier issues under different course numbers; see the *Syllabus Directory* in Volume 18, Number 1 (Spring 2015) for details.

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contact with the organization, receive its publications, and participate in its activities, but who are neither students nor professional behaviorologists. Benefits include *all* those from the previous levels plus these: Access both to additional activity options at the interface of their interests and behaviorology, and to advanced membership levels for those acquiring the additional qualifications that come from pursuing behaviorology academic training. On the basis of having earned an appropriate degree or TIBI Certificate, Affiliate members may apply for, or be invited to, Associate membership.

\$60 Associate membership (requires completed paper application and annual dues payment). This level is only available to qualifying individuals. Admission to TIBIA in the Associate membership category is open to all who are not students, who *document a behaviorological repertoire at or above the masters level* (such as by attaining a masters-level TIBI Certificate or a masters degree in behaviorology or in an accepted area) and who maintain a good record—often typical of “early-career” professionals—of professional activities or accomplishments of a behaviorological nature that support the integrity of the organized, independent discipline of behaviorology including its organizational manifestations such as TIBI and TIBIA. Benefits include *all* those from the previous levels plus TIBIA voting rights, and access to contributing by accepting appointment to a TIBIA or TIBI position of interest. On the basis of documenting a behaviorological repertoire at the doctoral level, an Associate member may apply for, or be invited to, Advocate membership.

\$80 Advocate membership (requires completed paper application and annual dues payment). This level is only available to qualifying individuals. Admission to TIBIA in the Advocate membership category is open to all who are not students, who *document a behaviorological repertoire at the doctoral level* (such as by attaining a doctoral-level TIBI Certificate or a doctoral degree in behaviorology or in an accepted area), who maintain a good record of professional activities or accomplishments of a behaviorological nature, and who demonstrate a significant history—usually typical for experienced professionals—of work supporting the integrity of the organized, independent discipline of behaviorology including its organizational manifestations such as TIBI and TIBIA. Benefits include *all* those from the previous levels plus access to contributing by accepting election to a TIBIA or TIBI position of interest.☺

TIBIA Membership Cost Details

Establishing the annual dues structure for the different membership categories takes partially into account, by means of percentages of annual income, the differences in income levels and currency values among the world's various countries and economies. Thus, the annual dues for each membership (or other) category are:

CATEGORY	DUES (in US dollars)*
Student member	The lesser of 0.1% of annual income, or \$20.00

Affiliate member	The lesser of 0.2% of annual income, or \$40.00
Associate member	The lesser of 0.3% of annual income, or \$60.00
Advocate member	The lesser of 0.4% of annual income, or \$80.00

Member of Board of Directors:	The lesser of 0.6% of annual income, or \$300.00
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*Minimums: \$20 Board Member; \$10 others

(Retired Associate, Advocate, or Board Members: ... 50% less)

TIBIA MEMBERSHIP APPLICATION FORM

(FOR CONTRIBUTIONS, A FORM ENSURES ACKNOWLEDGEMENT BUT IS NOT REQUIRED.)

Copy and complete this form (please type or print)—for membership, contributions, back issues, or subscriptions—and send it with your check (made payable to TIBIA in US dollars) to the TIBIA treasurer at this address:

Mr. Chris Cryer
TIBIA Treasurer
406 North Meadow Drive
Ogdensburg NY 13669
USA

Check if applies:

Contribution:

Subscriptions*:

Back issues:**

* Vol. __, # __

** Vol. __, # __

Name: _____

Membership (category): _____

Office Address: _____

Amount enclosed: us\$ _____

Home Address: _____

Office Phone #: _____

Home Phone #: _____

FAX #: _____

CHECK PREFERRED MAILING ADDRESS:

E-mail: _____

Office: Home:

Degree/Institution:*** _____

Sign & Date: _____

*Subscriptions are US\$40 annually, the same as affiliate membership.

**Back issues: US\$20 each.

***For Student Membership:

I verify that the above person is enrolled as a student at: _____

Name & Signature of advisor or Dept. Chair: _____

TIBI/TIBIA Purposes*

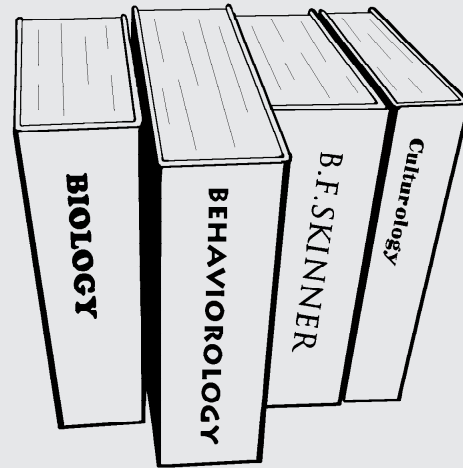
T_I**B**_I, as a non-profit educational corporation, is dedicated to many concerns. TIBI is dedicated to teaching behaviorology, especially to those who do not have university behaviorology departments or programs available to them. TIBI is also dedicated to expanding and disseminating the behaviorological literature at least through the fully peer-reviewed *Journal of Behaviorology* (originally called *TIBI News Time* and then *Behaviorology Today*) with editors being appointed by the TIBI Board of Directors, usually from among the TIBIA Advocate members. 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 the purposes of TIBI/TIBIA. These activities include (a) encouraging and assisting members to host visiting scholars who are studying behaviorology as well as holding conventions and conferences; (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 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 and TIBIA 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.

*Adapted from the 2017–updated TIBI By-Laws. ☺

ABOUT
BEHAVIOROLOGY,
TIBI, AND
Journal of Behaviorology



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 CONTINGENCY–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 *Journal of Behaviorology* 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.)☺

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