Journal of Behaviorology

ISSN 2331–0774

A journal of TIBI: The International Behaviorology Institute

Behaviorology *Conductologia* *Xingwei Xue* *Gedragsologie* *Behaviourology*

Contents

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.

* 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.)

Volume 23, Number 2 **Fall 2020**

Editorial

James O'Heare

Companion Animal Sciences Institute

(Action Editor for this issue)

Recently the *Journal of Behaviorology* has experienced some "firsts." Last year saw the publication of our first double issue (i.e., Spring and Fall, 2019; Volume 22, Numbers 1–2). This occurred, because the issue included seven papers, six of which were part of our first Special Section, which focused on the philosophy of science of the natural science of behavior, and its name. This double issue speeded up our publication schedule, something that continues to benefit the journal. For example, the Spring 2020 issue (Volume 23, Number 1) went out last November, and now this issue, for Fall 2020 (Volume 23, Number 2) comes out early also. Such schedule contingencies enable handling more manuscripts, so keep them coming.

Meanwhile, both issues of Volume 23 contain graphics that use color appropriately. Such color use represents another first for our journal. You will also notice that, like the last issue, this issue is printed on white paper. This enables better color rendition for the color components, which enhances the appropriate stimulus control over reader behavior that the figures evoke. This includes not only the color figures in the article by Fedorov in the last issue but also one of the figures in the article by Clayton, Boron, and Wang in this issue.

That article describes some publication trends of editors as authors in the *Journal of Applied Behavior Analysis* (JABA). The other article in this issue, by Ledoux and Fraley, revisits some material relevant to the increasing interest in contingencies on cultures and cultural practices, an interest for which the authors use the term *culturology.* Rather than reviewing everything various authors have published in the last 30 years on this topic, the point of this paper is to provide an impetus for readers not only to study the past authors and papers but also to research the topic more, and then write more on it to enlarge the group taking interest in the topic.

That topic may bear heavily on the contributions that our natural science, and its contingency–engineering applications and intervention, can have in helping to solve global problems. Increasingly other natural scientists, and even the general public, are recognizing that human behavior causes global problems, and solving these problems requires changes in human behavior, which clearly increases the need for our science to be understood and available to as many people as possible. This endeavor requires that each of us who are already familiar with the natural science of behavior (under any label) help in every way that we can.

As part of those efforts, and as part of an ongoing set of prompts, please consider preparing a submission for publication. Like many, I too have an interested in Culturology and may consider preparing submissions on various considerations that this topic suggests. I would also urge others to consider making a submission on culturology topics, or on other topics.

By the way, the order of appearance of journal papers gets determined in no small part by the convenience (for our volunteers who layout the journal) of laying out the papers in the order in which they successfully work their way through the submission and peer review process.

Revisiting Culturology

Stephen F. Ledoux*
Lawrence E. Fraley*

Abstract: Even as the natural science of human behavior, under various names, and its contingency engineering applications and interventions, expanded during the twentieth century and beyond, *albeit under most scientific radar,* the need for its potential contributions to solving humanity's growing global problems prompted calls from other natural sciences explicitly for a "natural science of human behavior." Such circumstances also supported extending this science to an area that some have called *culturology.* Under various labels this area studies contingencies covering the behavior of groups of people in relation to cultural circumstances and prompting broad practices and consequences operating beyond the lifetime of individuals. Some currently pertinent practices (e.g., polluting, and sustainability) directly affect human survival, but human understanding of these practices suffers from misunderstanding the human–behavior components of the practices. Extending education reduces these misunderstandings and supports solving global problems.

In the natural science of behavior, the term "contingencies" refers to the wide range of functional relationships, some quite complex, that are responsible for generating, maintaining, and changing behavior. Details of contingent relations appear in textbooks (such as Ledoux, 2014). For example, in one kind of multi–part contingency, stimuli evoke the occurrence of responses that then produce consequences that affect the further occurrence of the responses by altering the effectiveness of the evoking stimuli. This is not magic; the stimuli are not themselves changing. Rather, stimuli operate on the physiology that makes an organism; that physiology mediates—it does not originate—the responses, a constant role about which we need not know very much to maintain effectiveness in the applications that we call contingency engineering (see Ledoux, 2020).

Those kinds of contingency events operate at the individual level—on the *behavior* of animals, all animals, including humans—so we have come to call the science studying such contingencies *behaviorology* (Fraley & Ledoux, [1992] 2015). Due to the wide range of behavior–controlling contingencies, we refer to them generically as "contingencies of reinforcement," even though only some contingencies involve "reinforcement."

With human behavior also occurring at the more complicated level of cultures that involves not only groups

---

*Chapter 6 of Fraley & Ledoux, 2015, covered most of the points in this paper in nearly identical ways. We originally published that piece in 1992, so we cannot now say for sure who contributed which words. Ledoux did the work on this revisit, so we put his name first. *The current interest in the culture–level accounts and applications of behaviorology for solving global problems prompts this revisit.* It is, however, a *revisit;* it is ***not*** a new, comprehensive, expanded elaboration based on all available—long past or recent—materials.

Rather, the occurrence of this revisit provides new audiences with material that originally appeared in behaviorology sources—easily missed by authors of the time but nevertheless foundational to interests in the topic—around the same time that other authors (e.g., Sigrid Glenn) were drafting related materials and publishing them in some wider–circulation journals of the time (e.g., *The Behavior Analyst)*. Thus, adding citations and references for those authors' articles to this merely revisited material seems out of place. Instead, this revisit provides an appropriate prompt for readers to continue by looking up Glenn and the other authors who have written on this topic and follow the strands of the topic through both their older and more recent contributions, *and then further extend the topic while taking **all** these past materials into account.*

Address correspondence regarding this paper to ledoux@canton.edu. The BOOKS and JOURNAL pages at www.behaviorology.org provide details on many of the references plus many other related resources. For more on behaviorology, also see www.BehaviorInfo.com (available by the middle of 2020).

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

of people but time beyond individual life spans, little surprise occurs when we observe complex contingency–like events also occurring at the cultural level and affecting behavior on this level. Some natural scientists of behavior have begun to study human behavior at this level, although a name for this science has not yet reached consensus. While avoiding some available but longer names, in 1992 Fraley and Ledoux (2015) began using the name "culturology." Some elaboration about this name, and especially about the science that it names, may help in assuring that this "natural science of human behavior at the cultural level" develops swiftly, because humanity's need for it, in parallel with the need for behaviorology, has greatly increased in the last 50 years.

The increase in the need for these sciences has occurred due to what many people see as the most serious circumstances confronting humanity today. This is the ballooning of global problems that have set constraints on the time frame people have for solving these problems before their effects overwhelm humanity. With human behavior causing many of these problems, and changes in human behavior required for solving them, the natural sciences of behaviorology, for the individual–behavior level, and culturology—or whatever it comes to be called—for the group–behavior level, have become ever more needed. (Note that some researchers prefer to restrict the term, "group behavior," to metaphoric usages. While positions on this question fluctuate, the data to clarify the question remain as yet inadequately collected.)

This need itself presents a conundrum. Most traditional natural scientists remain unaware of even the over 100–year–old (see Ledoux, 2012) individual–level behavior science, behaviorology. Yet some of them have made various calls, some of book length, for a natural science of human behavior (e.g., McIntyre, 2006). Yet natural scientists of human behavior, under any name, are unprepared for meeting these demands, which would require far greater numbers of basic–science programs and departments of behaviorology and culturology in college and university natural–science units (see Chapter 27 of Ledoux, 2017; also see Ledoux, 2018a, 2019, 2020). A closer look at "culturology" might support its expansion and so help move developments along.

The occurrence of these more recent reasons for developing culturology (i.e., including *both* the calls for the natural science of behavior to help solve global problems, which working at both the individual and cultural levels enhances, *and* the educational developments needed to provide this help) argue for the value of revisiting this material on culturology. Otherwise, because it first occurred before being so clearly needed, it tends to disappear in other topics of the past in our early disciplinary literature.

Philosophical Foundations and Culturology

Reviewing some cultural and philosophical context sets the stage for revisiting "culturology," which is known, and discussed in depth but not always in agreement, under some more recent names (e.g., macro–contingency analysis and meta–contingency analysis; for some related details, see Glenn, 1988; Fraley & Ledoux, [1992] 2015). Early behaviorological scientists developed their science in a way consistent with functioning in the kind of quality–controlled environment provided by an appropriate philosophy of science (i.e., behavioral naturalism; see Ledoux, 2020). This philosophy, originally known as radical behaviorism (Skinner, 1963), and later known as behavioral materialism (Morrow, 2019), extends the philosophy of science, naturalism, of the traditional natural sciences, and maintains various tenets one of which allows no breaks, no discontinuities, in the functional chain of material events that accumulate, link by link, in a *natural history.* Non–natural disciplines (see Ledoux, 2002) allow these links of material events to be broken by non–material, or metaphysical, events (e.g., the non–spatiotemporal activities criticized by Hayes & Brownstein, 1986). Both behaviorology and culturology adhere to the tenets of this philosophy of science, although culturology may also have some philosophy–of–science tenets of its own.

Culturology—at least initially—has a scientifically informed philosophy of science, related to behavioral naturalism, that developed in a certain school within the broad field of anthropology, namely the cultural materialism of Marvin Harris (Harris, 1979). While the professionals who represent that school will ultimately specify their philosophies and name their own discipline, the term *culturology* began as an interim name for this discipline that avoided long and possibly inaccurate labels such as "anthropology informed by cultural materialism."

The value of philosophy of science comes from interpretive extensions of the discoveries and findings of the original 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 with its contingency–engineering applications. When, in 1987, some practitioners of this science formally separated from a shared history with psychology, they adopted this name for their decades–old discipline. 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, concepts, extensions, implications, and interpretations—all of which are needed, not just the principles, methods, and concepts—that support the contingency–engineering practices of Applied Behavior Analysis (ABA) professionals in their wide range of applied 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) (Ledoux, 2019). Culturology extends this subject matter.

Behaviorology and Culturology Among the Life Sciences

Traditionally the natural sciences divide into physical sciences and life sciences. Foundation life sciences—biology, behaviorology, culturology—rely heavily, though not exclusively, on the causal mode of selection in their accounts. On the other hand, foundation physical sciences, such as physics and chemistry, rely more on mechanical causality. (See Skinner, 1987, Ch. 4, for details on this distinction.)

The term "culturology" fills a gap in the labeling of the domains of concern across the life sciences from the sub–cellular level to the level of cultures. Like the label "behaviorology," the label "culturology" has had various origins (e.g., see White, 1949, pp. 115–117 & 409–415; Ledoux composed it independently in 1986; see Fraley & ledoux, [1992] 2015, p. 147). In the most general sense, culturology refers simply to "the study of cultures."

The scientific study of life, including human life, stretches across several levels of analysis. On one end is the discipline of biology, which studies—from the sub–cellular level to the level of the organism, across the history of each species—the physical and chemical activities of individuals. In biology one can approach "behavior" as a subject matter from those physiological foundations. But in social and environmental contexts, that knowledge tends to be insufficient for *practical* purposes; it needs to be supplemented by appeals to science at a different level of analysis. This happens, for example, when attention turns from *how* a body behaves, which is a question for physiology and how physiological operations mediate (not originate) behavior, to *why* an organism behaves, which is a question for behaviorology and what natural, measurable independent variables produce the behavior (see Ledoux, 2014, 2017 for some elaboration of these connections that respect "natural functional histories"). The contingency engineering in behaviorology works poorly when its basis involves scientific principles induced from strictly biological investigations of behavior.

With biology at one end of the life–science continuum, the discipline of culturology sits at the other end, where it chiefly studies the social behavioral/cultural activities, especially of verbal species, at the level of the group or population. In culturology "behavior" as subject matter essentially involves the study of group–occurring contingencies and group–produced effects (i.e., the combined effects of concerted individual responses). The shared practices that give a group its cultural identity also interest students of culturology. Importantly to culturologists—a verbal shortcut for names like "anthropologists informed by cultural materialism" and others—such group behaviors/products can endure beyond the range of individual lifetimes. In conducting their studies, culturologists naturally concern themselves to some extent with the behavior of individuals. Thus they share some concerns with behaviorologists.

Meanwhile behaviorology resides between biology and culturology, chiefly studying the functional relations between internal and external environmental events and the behavior—overt and covert—of individuals. Thus behaviorology overlaps many behavior–related concerns in both biology and culturology. Figure 1 provides one way to illustrate these disciplinary relations.

While biology provides a sub–individual, or micro, analysis of life, culturology provides a supra–individual, or macro analysis. Between them behaviorology chiefly focuses on the functional, environment/behavior contingency relations of individuals within each individual's lifetime. Behaviorology deals with

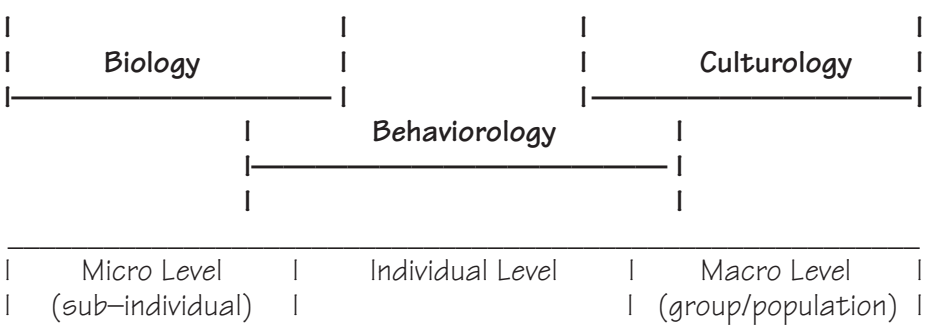

Figure 1. Disciplinary coverage for three main levels of analysis in the life sciences.

determinants from (a) the biological history of the species, (b) the behavioral contingency history of the individual, (c) the current physiological state of the individual, and (d) the current environmental context, including cultural factors sharing in the control of the individual's behavior. Thus behaviorology is the study of all behavior–controlling functional relations between the environment, both within and outside the body, and the organism, *as both organism and environment change.* The study of species evolution, ecosystems, and the behavior of animals in groups by some animal biologists implies that a disciplinary overlap also exists between biology and culturology. So one could redraw Figure 1 as a triangle with extended sides that cross each other. Each side would then represent one of these domains and its related discipline. Areas where the lines cross would then represent the overlap in the interests of the intersecting disciplines.

Group and Individual Levels of Analysis

Those disciplinary boundaries remain somewhat flexible. The discreteness of any discipline becomes apparent in proportion to the quality of the products produced by its members. Disciplines arise, not from special sanctions or protections guaranteed by political, economic, or legal contrivances, but from one group producing better disciplinary products than others acting upon alternative disciplinary foundations. Thus these disciplinary regions are not mapped here as territorial claims but merely as domains of phenomena, available for scientific study, in which the mentioned groups have demonstrated adequacy in scientific address.

One sees the play of this qualitative principle in the overlap between culturology and behaviorology. Here is an example (Hayes, 1988) that clarifies the difference between the behavior of individuals and a maintained cultural practice. Regarding the repulsive jokes that many people hear, Hayes invited the reader to suppose

> …that a situation emerges in which joke telling is expected. You may find to your dismay that the only joke you remember is one of these disgusting jokes. You may repeat it. Noting the reaction, you may never say it again. In the meantime, however, you have infected your audience with this terrible joke. They may go through the same cycle. Thus, we may have a wave of horrible jokes swiftly propagated across the country, even though this behavior may fail to be maintained, even for a short while, in each individual engaging in the practice (p. 16).

Notice the two levels of analysis. One level analyzes the behavior of an individual with respect to (a) why that person exhibited that behavior, (b) at what rate and to what end the individual exhibited that behavior, and (c) the fate of that behavior in the repertoire of that individual. Alternatively, at a different level, one separately analyzes the *cultural practice of repulsive joke telling.* Note, for example, that the joke telling, as a cultural practice, can continue (a) beyond the tenure of that particular kind of verbal behavior in the repertoire of any one individual and (b) beyond even the lifetime of many of its mediating individuals.

Culturologists, studying cultural practices at the descriptive level, chart their spread among a culture's members, and measure and record their strengths and durations. And these activities occur without concern about the specific controls on the behavior of the individuals who participated in mediating the practices. That implied division of scientific labor allows behaviorologists and culturologists to work concurrently and maintain differentiated disciplinary identities.

However, when objectives move from *description and prediction* to *control,* scientists concerned with culture must then design and develop new cultures (or change existing ones) by producing practices that have yet to occur. Throughout the history of their original anthropology discipline, culturologists have traditionally eschewed intervention. They have mostly identified, described, and analyzed. They have also produced some accurate predictions. But the production of new cultural behavior requires access to independent variables that control the behavior of the individuals who contribute to the cultural practices of concern. This is the level of operation at which the disciplinary distinctions can become blurred, because culturologists would then need the intervention capabilities of behaviorology (see Fraley, 1988, which elaborates on this point and pursues the disciplinary implications).

Group and Individual Effects

Operating at the level of *control* represents a more recent trend in culturology. Increasingly, circumstances impose this trend in spite of traditional disciplinary ethics that oppose it. Regarding processes and procedures, contingencies of reinforcement can simultaneously operate on, or be applied to, all members of a group so that the individual responses occur concurrently, yielding group effects. An approximation might consist of something like universally applied food rationing. Another class of group effects occurs when one or more contingencies successively impinge on different individuals at different times. An example is the illusion of motion described as the "wave," which spectators sometimes generate in stadiums for an American football

game. The previous joke–telling example represents a variation in this class of effects.

Thus a predictive science of *group–produced* effects (beyond a science of individually produced effects) is possible. Furthermore, a *controlling* science of group–produced effects is also possible. Such a science has begun to developed in support of the activities of anthropologists and sociologists, who began the discipline that we are here calling culturology," but it could develop further. While the summation of the behavior of individuals produces group effects, a science of group effects *can* support interventions in which the analytical repertoire of the cultural engineers does *not* penetrate to the level of individuals. For example orchestra conductors reliably produce prescribed group effects without needing to know the details of how any particular orchestra member is playing his or her instrument during each moment of a piece. In this case the audience–appreciated properties of the group effect are characteristics of the combined products or activities of the behaving performers. The contributing individual producers of this group effect are *not* each producing a small one–person version of the audience–appreciated group effect. An individual contributes something different—often extremely so—from the appreciated group effect.

That typical orchestra example shows how one cannot pursue the reality of the behavioral group effect *intact* back to its stimulus–controlled behavioral origins. In this example the different responses of each player occur under the control of at least the notes (i.e., evocative stimuli) on the score, which differ from player to player. Similarly, one can try to approach a distant Olympic flag that a stadium section of card holders generates. But ultimately one merely arrives at any one of many persons each holding up a colored piece of cardboard. The flag, so clearly perceived from afar, can no longer be detected; a person handling a colored square does not evoke a flag–seeing response by an observer. (Perceived? Detected? To experience shaping that gradually changes illegitimate mystical, agential responses into legitimate verbal shortcuts, see Ledoux, 2014.)

Yet, the level of the behavior of those individual orchestra players, or those individual card handlers, is the only level at which interventions pertinent to the group effect can be *functionally* effective (e.g., a conductor's motion for an increase in intensity—volume—reaches to each individual player). Only when intervention attempts, designed to alter the characteristics or properties of the orchestral sound–making responses, or the flag–seeing response, in remote observers, reach down to affect the behavior of all or some of the players, or card handlers, can those group–level interventions possibly work (e.g., card–change cues *producing* a change of cards that together shows a different flag). Insofar as any group–level behavioral intervention must have its ultimate effect on the behavior of individuals whose combined activities yield the group effect, any capacity for intervention (i.e., control) that develops at the group level of analysis must, for its effect, functionally exert control over the behavior of individuals, a province of behaviorology well worked by its contingency engineers in ABA.

On an historical note, the term "contingency engineer" deserves comment regarding a change in a common cultural practice. In the second half of the twentieth century, the then widely used term "behavior modification" ran into some serious resistance, to the point that students were warned against using it and professionals stopped using it, under penalty of some censure contingencies. Supposedly the term "modification" was somehow offensive and, in any case, was inaccurate; professionals do not directly modify behavior; they modify the contingencies, the variables that cause behavior, that change behavior. Thus, the problem resides not only with "modify" but also with "behavior." A subsequent term was "behavior engineering." But professionals also do not directly engineer behavior; they engineer the contingencies, the variables that cause behavior, that change behavior. For this reason some behaviorologists have encouraged the alternative practice of using the term "contingency engineering," for it accurately describes the work of changing the contingencies, the variables that cause behavior, that change behavior (e.g., Ledoux, 2014, 2017, 2020). Practitioners then, who develop and implement interventions, are known as "contingency engineers."

In producing effects at the group level, contingency engineers arrange to evoke the behavior of many individuals. But in many cases they give inadequate attention to the resulting behavior *of particular individuals.* Instead, the resulting group effect maintains their attention while they deliver stimuli and consequences in a blanket fashion. Group–level engineers—conductors, economists, parliamentarians, social revolutionaries, or general culturologists—can impose adjustments that produce changes at the group level while treating the whole analytical level of the affected individuals as a scientific "black box." Culturologists thus need not be behaviorologists to operate at the scientific level of control from the perspective of their group level of analysis. However, that level of intervention lacks the sensitivity for fine–tuning the group effect, which requires changes to the behavior of *specific individuals.*

Natural scientists of behavior have long recognized that efforts to affect the behavior of groups are more successful when informed by an understanding of how and why *individuals* behave under the provided arrangements (see Skinner, 1953, Ch. 19). By adding behaviorological knowledge to their capacity,

culturologists can fine–tune their engineering. They can trace many of the circumventions or breakdowns of group–level interventions to anomalies at the individual level, such as when a single stadium card holder raises a card of the wrong color. Then they can deal with those anomalies. If only group–level intervention technologies and controls were available, imagine the difficulty for a social engineer whose plan for large–scale waste management works poorly because one waste hauler, despite the engineered policies, regulations, and social ethics—all manipulated at the group level—cuts costs by dumping his individual loads into a river from a remote bridge, loads so toxic that they nullify the rest of the engineering effort. That hypothetical cultural engineer, uninformed as to the workings of events at the individual level, would not know in a technical sense how or why such anomalous dumping occurs. Thus she or he would not be able to down–focus the engineering effort to the individual level to fix that specific fault which is degrading the designed group effect.

A culturologist, if really skilled *only* at group–level engineering, could only continue to impose blanket contingencies while hoping—not a data–based technique—that errant individuals will share at least some appropriate response with others under those contingencies. Thus good cultural engineering requires skills at both the individual and group levels of analysis. Those responsible for cultural engineering must be capable of operating, and cooperating, across the combined range of these levels of analysis as situations demand. They would be most effective when educated in both behaviorology and culturology, or at least have their foundation knowledge and skills in the full behaviorology discipline, and their specialization knowledge and skills in culturology.

Currently, obtaining those skill sets presents difficulties. To reduce these difficulties, all natural scientists of behavior, under whatever name, including the many working in various contingency–engineering areas, must support every effort of anyone that brings us together with each other and with our traditional natural–science colleagues for enhanced mutual understanding and collaboration. Such collaboration helps establish departments and programs of our natural science of behaviorology (e.g., in green contingency–engineering programs; see Ledoux, 2018b). These departments and programs necessarily extend to culturology components, including culturology departments and programs, that supports our share in the efforts of all natural sciences to help solve global problems (i.e., see Chapter 27 of Ledoux, 2017; also see Ledoux, 2018a, for potentially helpful experiences in developing natural science of behavior courses and programs). Otherwise, the unmitigated outcomes of our current global problems will likely make all of these discussions rather meaningless (Thompsom, 2010; Ledoux, 2020, provides more details).

In the meantime, those behaviorologists who are additionally concerned with the engineering of cultural practices focus on controlling the behavior of the individuals whose behavior contributes to cultural practices. The behaviorological literature is rich in basic material applicable to that sort of science. Consider, for example, *Walden Two* (Skinner, 1948) and a sequel to it (Shuler, 2020), and the culture–related chapters in *Science and Human Behavior* (Skinner, 1953) and *Beyond Freedom and Dignity* (Skinner, 1971). The Los Horcones community in Mexico provides a living laboratory. Ledoux (1985) addressed some concerns of experimental communities. And Beach (1988), in an article suggesting that the design, construction, and operation of experimental communities might be called "sociocultural systems engineering," provides a sample of this type of disciplinary blending. (For the relevance of this blending to culture design in space settlements, see Beach, 1991a, 1991b; also see Ledoux, 2015, pp. 117 and 311.)

Summary and Conclusion

Behaviorology serves the culture as a basic natural–science discipline productively informing the work of practitioners in a wide variety of behavior–related fields. The behaviorological level of analysis puts that discipline between biology, with its more micro–level analysis, and culturology, with its more macro–level analysis, although behaviorology overlaps both biology and culturology. Scientists are still discovering the contributions of these and other disciplines with respect to saving the culture by solving global problems. Apparently the culture cannot be saved without massive interventions based on the knowledge and products of the these and other natural sciences, especially the contingency sciences—with their contingency–engineering components—of behaviorology and culturology.

In conclusion, under various labels, *culturology* studies contingencies covering the effects of the behaviors of groups of people in relation to cultural circumstances prompting wide ranging practices and consequences operating within and beyond the lifetime of individuals. This discipline also helps solve global problems, thus reducing the risks from the disasters that otherwise currently threaten to overtake humanity. Education departments and programs, especially today in behaviorology and culturology, need substantial expansion to better enhance understanding of the basic science, as well as its contingency–engineering practices (i.e., ABA). This would improve effectiveness in contributing to making a better future.☘

References

Beach, S. (1988). *Genesis Two: An Ethnographic Description.* Fair Oaks, CA: Scott Beach, Cultural Engineering and Design Associates.

Beach, S. (1991a). The Martians are coming. *Behaviorological Commentaries*, *Serial No. 1,* 25–28.

Beach, S. (1991b). Behaviorology and space settlement. *CONTACT Newsletter, 2* (2), 2–3.

Fraley, L. E. (1988). Introductory comments: Behaviorology and cultural materialism. *The Behavior Analyst, 11,* 159–160.

Fraley, L. E. & Ledoux, S. F. ([1992] 2015). Origins, status, and mission of behaviorology. First published in 1992 but now available in S. F. Ledoux. *Origins and Components of Behaviorology—Third Edition* (pp. 33–169). Ottawa, Canada: BehaveTech Publishing.

Glenn, S. S. (1988). Contingencies and metacontingencies: Toward a synthesis of behavior analysis and cultural materialism. *The Behavior Analyst, 11,* 161–179.

Harris, M. (1979). *Cultural Materialism: The Struggle for a Science of Culture.* New York: Random House.

Hayes, S. C. (1988). Contextualism and the next wave of behavioral psychology. *Behavior Analysis, 23* (1), 7–22.

Hayes, S. C. & Brownstein, A. J. (1986). Mentalism, behavior–behavior relations, and a behavior–analytic view of the purposes of science. *The Behavior Analyst, 9,* 175–190.

Ledoux, S. F. (1985). Designing a new *Walden Two*–inspired community. *Communities, No. 66,* 23–31, 84.

Ledoux, S. F. (2002). Defining natural sciences. *Behaviorology Today, 5* (1), 34–36. (Also in Ledoux, 2018c, 19–23.)

Ledoux, S. F. (2012). Behaviorism at 100 unabridged. *Behaviorology Today, 15* (1), 3–22. (While this full, unabridged paper extends B. F. Skinner's 1963 paper in *Science,* "Behaviorism at fifty," a shorter version, simply titled "Behaviorism at 100," appeared in 2012 in *American Scientist, 100* [1], 60–65, which also extended Skinner, 2012].)

Ledoux, S. F. (2014). *Running Out of Time—Introducing Behaviorology to Help Solve Global Problems*. Ottawa, Canada: BehaveTech Publishing.

Ledoux, S. F. (2015). *Origins and Components of Behaviorology—Third Edition.* Ottawa, Canada: BehaveTech Publishing.

Ledoux, S. F. (2017). *What Causes Human Behavior—Stars, Selves, or Contingencies?* Ottawa, Canada: BehaveTech Publishing.

Ledoux, S. F. (2018a). More assistance in developing behaviorology courses and programs. *Journal of Behaviorology, 21* (2), 19–28.

Ledoux, S. F. (2018b). Running out of time for new "Behaviorology and Green Engineering" programs to be effective. In S. F. Ledoux, *Science Works on Human Behavior* (pp. 77–88). Ottawa, Canada: BehaveTech Publishing.

Ledoux, S. F. (2018c). *Science Works on Human Behavior.* Ottawa, Canada: BehaveTech Publishing.

Ledoux, S. F. (2019). Ten commandments of natural science. *Journal of Behaviorology, 22* (1–2), 3–12.

Ledoux, S. F. (2020). Changing terms is insufficient to save our science and practice: A response to the Special Section on the term "Behavioral Materialism." *Journal of Behaviorology, 23* (1), 3–9.

McIntyre, L. (2006). *Dark Ages—The Case for a Science of Behavior.* Cambridge, MA: MIT Press.

Morrow, J. E. (2019). A rose by another name: Behavioral Materialism. *Journal of Behaviorology, 22* (1–2), 13–14.

Shuler, M. (2020). *A World of Our Own Making—A sequel to Walden Two.* Santa Fe, NM: Golden Word Books. (A network of designed, experimental communities brings Skinner's *Walden Two* into the 21st century.)

Skinner, B. F. (1948). *Walden Two.* New York: Macmillan.

Skinner, B. F. (1953). *Science and Human Behavior.* New York: Macmillan. (The Free Press, New York, published a paperback edition in 1965.)

Skinner, B. F. (1957). The experimental analysis of behavior. *American Scientist, 45* (4), 343–371.

Skinner, B. F. (1963). Behaviorism at fifty. *Science, 140,* 951–958.

Skinner, B. F. (1971). *Beyond Freedom and Dignity.* New York: Knopf.

Skinner, B. F. (1987). *Upon Further Reflection.* Englewood Cliffs, NJ: Prentice–Hall.

Skinner, B. F. (2012). The experimental analysis of behavior. *American Scientist, 100* (1), 54–59. (These excerpts, from Skinner, 1957, became an *"American Scientist* Centennial Classic," which now included the short version of Ledoux, 2012.)

White, L. A. (1949). *The Science of Culture: A Study of Man and Civilization.* New York: Farrar, Straus, & Giroux.