Behaviorism in 1942: A Précis of
Tilquin's *Le Behaviorisme: Origine et Développement
de la Psychologie de Réaction en Amérique*

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Book-length treatments of behaviorism from a philosophical and historical perspective are few in number. Tilquin's (1942) is one of these, but its publication in French during World War II and the limited number of available copies make for difficult access. In this paper, I summarize the contents of the book for a general audience of behavior analysts. Tilquin's work is a useful tour of the behaviorism of its time, and most of the topics discussed in it remain relevant to behavior analysis.

Key words: behaviorism, behavior analysis, philosophy, history

André Tilquin's *Le Behaviorisme: Origine et Développement de la Psychologie de Réaction en Amérique* (*Behaviorism: The Origin and Development of Behavior Psychology in America*) (1942) was published during World War II by the bookstore Vrin, located 6, Place de la Sorbonne, Paris. The volume was sold as part of the series *Études de Psychologie et de Philosophie* (Studies in Psychology and Philosophy), and remains so far the only book-length treatment of behaviorism written from the perspective of a French philosopher.

With a graduate degree in philosophy and under the tutoring of the experimental psychologist Henri Piéron (1881–1964) and of the Gestalt theorist Paul Guillaume (1878–1962), whose influences are acknowledged in a foreword, Tilquin seemed well prepared to evaluate the behaviorism of his time. Tilquin's book is 531 pages long and contains 455 references, most of them in English. The journals most referenced are the *Journal of Philosophy* and *Psychological Review*, which published a number of conceptual articles relevant to

behaviorism (including, of course, Watson's 1913 manifesto). Other journals cited by Tilquin include, for philosophy, the *Philosophical Review*, *Mind*, *Philosophy of Science*, and *Erkenntnis*, and for psychology, the *Journal of Comparative Psychology*, *Journal of Animal Behavior*, *Journal of Abnormal and Social Psychology*, *American Journal of Psychology*, and *Psychological Bulletin*.

Tilquin gathered his information from the library of the psychological institute founded by Piéron in 1921, a library that is now part of Paris 5-René Descartes University. Tilquin had also access to Piéron's personal library, and acknowledges the help of Miss N. Adereth for sending him various papers from London and Mr. Serge Ho for reading and summarizing documents written in Chinese (p. 9). The book presents a scholarly analysis of the development and philosophical grounding of the behaviorisms of Watson, Kuo, Meyer, Weiss, Hull, Kantor, and Tolman. Tilquin also offers interpretations, evaluations, and criticisms of the works he reviews, and proposes arguments of his own to complement those that could be found in the literature. His assessment of behaviorisms is thus colored by his own philosophical perspective.

I start this précis with a summary of Tilquin's book. To avoid attribu-

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tion errors, I do not include any statement or quotation from the authors whose work Tilquin reviewed. The following descriptions of Watson's behaviorism, for example, are my summary of Tilquin's claims, not Watson's. Thus, all quotations in this first section refer to statements by Tilquin himself. To avoid confusion, I refrain from commenting on Tilquin's descriptions, which I usually found to be accurate. Additional information appears in footnotes, and the translated table of contents of Tilquin's book is presented in the Appendix. All translations are mine.

In the second part of this paper, I discuss Tilquin's arguments, review some of the scientific and philosophical topics mentioned in his book, and evaluate their relevance to contemporary behavior analysis. I argue that even though some of Tilquin's philosophical views seem misguided, most of the topics he reviewed remain significant today. Some of them lurk in the background of current operant research and deserve renewed attention, whereas others underscore the need for philosophical clarity in behavior analysis.

THE BACKGROUND OF BEHAVIORISM

In his introduction, Tilquin reviews the antecedents and postulates of behaviorism, and describes its rise in America against the backdrop of Titchener's structuralism and the functionalism of Dewey and Angell. Tilquin remarks that although the rejection of the introspective method was crucial to behaviorism, additional assumptions were needed to establish stimuli and responses as legitimate objects of psychological inquiry. Why, for example, should behaviorism have emphasized stimuli and responses instead of more central events? Tilquin answers by pointing to the usefulness of stimuli for behavioral prediction. Stimuli were much

easier to observe than neural states and processes and allowed more effective predictions of behavior in real time.

Aside from their causation by stimuli, Tilquin notes that responses also have a function, which is to adapt the organism to environmental changes. Thus, according to Tilquin, behaviorism exemplifies the Darwinian emphasis on adaptation and supports the hypothesis of continuity between humans and nonhumans (irrespective of the mental life, or lack thereof, of the latter). The behaviorism that Tilquin describes assumes materialism, neural functioning by reflex arcs, adaptation, continuity between species, and psychology as a practical science. The roots of these five postulates can be found in the work of Lloyd Morgan and Thorndike, of German objectivists such as Beer and von Uexküll, and in the Russian school of Pavlov and Bechterev. Behaviorism gained strength from the materialist tradition and was affected by evolutionary biology through American functionalism. Other influences derived from Dewey's conception of the reflex and from Cattell's promotion of applied psychology. Thus, "behaviorism is the grandson of Darwinian biology, the son of functionalism and American animal psychology, and the cousin of mental testing" (p. 41).

Watson's Behaviorism: From Methodological to Ontological

Past the introduction, Tilquin's work is organized in three main sections or books. Book 1 focuses on Watson's behaviorism. The first chapter presents a detailed analysis of Watson's (1913) behaviorist manifesto,¹ with numerous excerpts, explications of Watson's methodological proposals (e.g., the study of sensory capacities through conditioning), and

¹Tilquin uses the French term, *manifeste* (p. 51).

discussions of his position on imagery and language. The chapter also stresses the practical nature of Watson's psychology and the role of predictions through stimulus-response laws. Tilquin emphasizes the usefulness of forecasting when control is impossible: "If we cannot adjust the universe, at least we can adjust our acts to our predictions" (p. 93).

In the other two chapters of Book 1, Tilquin surveys general topics in Watson's behaviorism. An important issue for Tilquin is Watson's transition from "methodological" to "ontological" behaviorism (p. 95). In 1913 Watson's behaviorism was methodological; it did not deny psychological phenomena but ignored them for commodity. Under the guidance of Watson and Weiss, however, behaviorism quickly became ontological, that is, based on materialistic monism. According to Tilquin, this hardening of behaviorism allowed it to maintain its own identity and avoid becoming a reformulation of traditional psychology. These changes in Watson's views were facilitated by his belief that there was no entity or *stuff* (*étouffe*) of consciousness (p. 97), a metaphysical thesis inherited from James' neutral monism and from the neorealism of Montague and Holt.² The "philosophical behaviorism" (p. 98) of the latter supported Watson's adoption of a stronger metaphysical stance. Another factor behind the development of behaviorism was Watson's realization that Pavlovian conditioning could serve not only as a laboratory technique but also as a fundamental explanatory principle.

²Neorealists such as Holt identified consciousness, not with behavior itself, still less with a neural process, but with a part or cross-section of the environment related to behavior in a lawful fashion. For more on the background of neorealism and its influence on psychology, see Heft (2001, chap. 2) and Smith (1986, pp. 74–80). For a recent update on neorealism, see Tonneau (2004).

The Content of Watson's Behaviorism

Starting as a broad methodological proposal, Watson's behaviorism evolved into a variety of theses that Tilquin describes in detail. As Tilquin points out, in Watson's system behavior can be decomposed in reflexes, but integrated responses form acts that can be identified by their names in ordinary language ("walking," "building a house," etc.). Hence, an analysis of behavior in physiological components is not necessarily the best one. Responses should rather be identified through pragmatic criteria that lead to a concrete and useful science. Watson classifies responses as explicit or implicit (i.e., more or less easily observed), and innate or acquired. No impermeable boundaries exist within these classes, however, because explicit behavior can become implicit (e.g., when learning to read silently) and acquired responses are built from innate ones. Watson's psychology is fundamentally a study of behavioral development, with the possibility of conditioning in utero.

Tilquin then reviews Watson's developmental theory of the visceral, manual, and verbal behavioral systems. Starting from primitive "fear," "anger," and "love" responses, visceral development involves processes of conditioning, extinction, differentiation, and integration, in interaction with manual and laryngeal responses. The manual repertoire of an infant evolves into that of a typical adult through an initial stage of behavioral variability followed by the "fixation" and "automatization" of the "correct" response (p. 147). Watson, suspicious of the law of effect with its hedonistic overtones, aims at explaining response selection in terms of frequency, recency, and statistical sampling. Finally, the laryngeal repertoire comprises circular reflexes³ in which a sound evokes the

³In a circular reflex, the sensory conse-

corresponding vocal response, which is then conditioned to external objects and concurrent manual habits. Language further evolves into sub-vocal talking or thinking.

Tilquin stresses that in Watson's psychology, thinking should be characterized not by formal features (e.g., those of implicit vocalization) but rather by functional properties, in terms of behavioral substitutes for stimulus objects and manipulative reactions. Tilquin also discusses Watson's thesis that the visceral, manipulative, and laryngeal systems form three aspects of one's behavior stream or personality. Dissociations or phase lags among the three repertoires may underlie infantile amnesia, forgetting, and the unconscious. By contrast, a well-balanced education should provide, or restore, a degree of integration among the child's visceral, manipulative, and laryngeal response systems.

In the last pages of Book 1, Tilquin mentions some early attacks on Watson's views, paving the way for Book 2 (see below). Some criticisms came from the introspective and Gestalt psychologies, whereas others typified the "methodological behaviorism" (p. 196) of Thorndike and Yerkes, who thought of Watson's position as too extreme. Criticism also arose from the "radical behaviorism" (p. 190) of Zing-Yang Kuo.⁴ Kuo attacked the very distinction between acquired and innate behaviors, arguing that the two concepts stand or fall together. His explanations involved neither instincts nor habits, but only the organism with its current mechanisms of response and the environment. Tilquin favorably

reviews Kuo's experimental work on behavioral plasticity in cats and chickens, but feels that his criticisms of acquisition and innateness are somewhat misplaced; these notions merely express the dependence or independence of behavior on previous conditions. Once this issue is cleared up, the differences between Watson's and Kuo's positions seem more terminological than substantive.

HETERONOMIC BEHAVIORISMS

Book 2 is entitled *Le Développement du Behaviorisme (The Development of Behaviorism)*. Tilquin explains that stimuli and responses can be described in terms of common sense, or by using the abstract language of science. Watson did both, moving freely from one viewpoint to another. Hence, according to Tilquin,

Watsonian psychology is ambiguous. It is simultaneously abstract and concrete, popular and learned, autonomous and subsidiary to the sciences that are already constituted, descriptive and explanatory, analytic and holistic. This is why Watson's disciples will incline behaviorism either to the side of the natural sciences or to the side of human sciences. (p. 212)

The theorists who drive their behaviorism to the side of natural sciences appeal to physiological or even physical characterizations of stimuli and responses. An advantage of rooting behaviorism in physiology or physics is that one avoids the circularity of describing stimuli and responses in terms of the very meanings and functions that one should explain. Any form of behaviorism that derives its explanatory power from nonpsychological (e.g., physiological) descriptions of stimuli and responses is *heteronomic*.

Meyer's Physiological Models

An example of heteronomic behaviorism is Meyer's speculative physiology, the topic of the first full chap-

quence (S) of a response (R) becomes an antecedent stimulus for this very response. Thus, a circular reflex functions like a positive feedback loop between S and R. For a historical review and further developments, see Holt (1931, chap. 7).

⁴ *Radical* is Tilquin's term (used in the sense of "extreme," presumably). See Schneider and Morris (1987) for elaborations on this theme.

ter of Book 2. In anticipation of a full physiological analysis, Meyer proposes the formulation of simplified "models" (p. 219) as provisional aids in predicting behavior. Meyer's philosophy is a sort of psycho-physiological parallelism or epiphenomenalism in which the subjective correlates of behavior are bracketed in favor of strictly neural explanations.⁵ Regardless of Meyer's stance on the mind-body problem, his emphasis on behavior as the prime datum of psychology is typical of behaviorism.

Tilquin examines Meyer's models, in which the nervous system is represented as a network of tubes and valves along which a compressed fluid can flow. Real neurons are not tubes, of course, but hydraulic analogies allow us to picture neural functioning with facility. In this analogy, behavior results from fluid compression, tension resolution, and drainage. The direction taken by the neural flow is determined by the relative resistance of various conductors and their spatial distribution.

How do Meyer's models explain that a flame first evokes approach in a child, and then—after the child touched the flame and got burned—withdrawal? According to Tilquin, Meyer assumes that the sight of a flame evokes a relatively slow approach, whereas a burned finger evokes a quick withdrawal of the hand. Temporal contiguity between the two stimuli generates joint activity in the corresponding neural centers, which in turn produces a direct flow from the first center to the second. On later trials, the child's reactions to the flame reflect the quicker avoidance response, activated indirectly through the second center, rather than the slower approach evoked directly by the first center.

⁵ Tilquin speculates (p. 225) that Meyer adhered to a brand of materialism stronger than that he expressed publicly, but kept his views under the mantle to avoid alienating readers.

Similar short-circuiting mechanisms may be involved in response automatization and explain the resistance of habits to the neural diseases that affect higher centers. Other phenomena reflect a transient phase of higher neural susceptibility, distinct from the long-term formation of new linkages. Increasingly complex activities, including categorization, language, and social behavior, are attributed to the general principles of "neural dynamics" (p. 250). Tilquin asks why these dynamic models had little impact on behaviorist research, in spite of their heuristic value. His answer is that Meyer's diagrams suffered from a lack of physiological plausibility and were seen as didactical artifices at best.

The Deductive Systems of Weiss and Hull

In the second chapter of Book 2, Tilquin briefly examines the heteronomic behaviorisms of Weiss and Hull, which in different ways function as deductive systems inspired by physics. Weiss does not deny the importance of physiology in accounting for behavior, but goes down to fundamental physics for his reductive explanations. Appealing to physics to describe stimuli and responses minimizes possible disagreements and grounds our explanations in concepts that are clear and exact.

According to Weiss, scientific explanations can be contrasted with the animistic tendency to personalize nature and invoke godlike persons behind physical phenomena. In psychology, animism leads to the belief in a "second man hidden within the first" (p. 263), the homunculus. The general success of naturalistic explanations, however, buttresses Weiss' claim that physical accounts should replace the myth of a *psyche*. From basic assumptions about charged molecules governed by inverse-square laws, Weiss proposes to "deduce" (p. 268) the aggregation of matter into ever larger units,

with corresponding increases of complexity and instability. Basic principles of physical organization are supposed to explain the apparition of membranes, cells, and organisms with a neural system and stimulus and response organs.

In a critique of Weiss' program, Tilquin suggests that relying on the changing concepts of molecular physics is not the best way to obtain a stable definition of human behavior. Besides, what Weiss should derive from his physical postulates is not the mere existence of stimuli and responses (which nobody doubts), but stimulus-response laws of the sort actually studied by behaviorists. In such a deductive process, physiology should probably serve as an intermediate level between physics and behavior; unfortunately, this physiological middle ground is too poorly understood to guarantee the success of Weiss' reductive enterprise. Tilquin also points at logical confusions between postulates and theorems in Weiss' system.

Tilquin is more positive about Hull's contribution, which he reviews briefly. From various postulates about physiological mechanisms, Hull derives properties of Pavlovian conditioning and the law of effect (which he attributes to the same associative processes), response acquisition, persistence, sequencing, and transfer. Because Hull's postulates may be derivable from physical assumptions, his system could provide a missing link between Weiss' microphysical perspective and empirical behavior laws. Tilquin comments that constructing machines to simulate psychological phenomena is another way to validate physicalist explanations of behavior.

AUTONOMOUS BEHAVIORISMS

In the third chapter of Book 2, Tilquin turns to the place of language and society in Weiss' behaviorism.

Although Weiss' principles of physical organization are supposed to favor ever more complex organisms, once the latter are available language plays a crucial role in the emergence of societies. As stimuli, verbal symbols are substitute for things; as responses, they substitute for object manipulation. This double aspect of language is the cement of social organization, the response of an individual serving as a stimulus for another. Linguistic communication then permits a division of labor among society members, and results in a sort of higher order individual, with a full sensory-motor organization and functional continuity among different organisms.

As Tilquin notes, the fact that an organism's verbal behavior affects other individuals has important implications for psychological theory as well. Physiologically different responses can lead to the same social effect, whereas behaviors that are similar from a physiological viewpoint (e.g., striking a match to light a cigarette or to set a house on fire) can produce vastly different consequences. Accordingly, the social properties of behavior are largely independent of its biophysical properties, and allow psychologists to classify responses in terms of their social functions. For example, human actions can be "discriminative" (i.e., controlled by a specific range of stimuli) or "relational" (saying "larger," "before," "after," etc.) and function as reports for conspecifics (pp. 299-303).

That behavior can be described in terms other than those of physiology or physics is a recurrent theme in the second part of Book 2. In contrast to the heteronomic proposals of Meyer, Weiss, or Hull, the *autonomous* behaviorisms of Kantor and Tolman proceed in the absence of reductive explanations. In support for this notion, Tilquin reminds his readers of the distinction, credited to the philosopher C. D. Broad and adopt-

ed by Tolman, between “molecular” and “molar” aspects of a situation (p. 320). Just as Holt distinguished stimuli from objects and responses from acts, Kantor and Tolman point to “emergent” (p. 319) properties of behavior absent from its constituents. In this respect, their autonomous behaviorisms amplify themes that are already present in Watson’s work.

Importantly, whereas in the Gestalt school “the whole is primary to its parts,” molar behaviorism sees “each totality as the result of a composition, a combination of preexisting isolated elements” (p. 321). According to Tilquin, for the behaviorists the reflex always comes first, and the emergence of teleological properties is entirely compatible with an underlying mechanistic explanation. Through the decomposition of behavior into its constituents, finality gives way to mechanism.

Kantor’s Organic Psychology

One chapter of Book 2 is devoted to Kantor’s autonomous behaviorism. Tilquin assumes that Kantor keeps psychology on a purely descriptive plane. There are abstract sciences, such as physics and physiology, and concrete sciences that stick to experience to describe it. Psychology falls in the second group.

The object of Kantor’s psychology is seen as the interaction, or interbehavior, of the organism and its environment. All sciences deal with behavior in one sense or another, but psychological interbehavior is distinguished by its variability, differentiation, modifiability, organization, and delays (or inhibition), five properties that involve plasticity and previous experience. Tilquin notes that these features are also present, to some extent, in biological behavior, and that no dichotomy between biology and psychology is possible, unless one adopts

a distorted view of biological phenomena.

Kantor stresses the organism’s reactional biography and the development of new stimulus and response functions through historical, cumulative interactions. According to Tilquin, however, in Kantor’s psychology the emphasis is put on environmental objects (despite the putative reciprocity of stimulus and response), and the influence of organic characteristics is mostly negative, in the sense of forbidding more complex adjustments. The result is a descriptive psychology with a strong historical and environmental flavor.

Tilquin objects to Kantor’s talk of developing stimulus functions in that it is the organism that changes during development, not the environment. Kantor “*projects in the current object the result of the previous interactions that happened between this object and the organism*” (p. 344), whereas this result should be localized instead in physiological states of the organism. Tilquin also questions Kantor’s behaviorism for being nothing more than a feat of terminology in which, for example, attention becomes “attention behavior,” desires, “desiring responses,” and the will, “voluntary conduct.” Here Tilquin reminds his readers of the functionalists who thought they could break with the old psychology “by adding to its chapter headings the magic little word, ‘process’” (pp. 350–351).

Tolman’s Teleological Behaviorism

The last chapter of Book 2 is devoted to Tolman’s “molar” and “teleological” (p. 356) views. Tolman’s behaviorism, like Kantor’s, is autonomous in the sense of not appealing to reductive or physicalist explanations, and enriches the behaviorist doctrine through the inclusion of intentional terms. Tolman insists that behavior displays emergent intentional properties. Most notably, it tends to persist until a particular state

of affairs is achieved—behavior is *purposive*—and it is objectively dependent on features of the environment—behavior is *cognitive*.

Tilquin emphasizes the hierarchical nature of Tolman's behaviorism. Gnawing, masticating, and swallowing, for example, are parts of the more complex act of eating. Similarly, the environment functions as a causal and probabilistic system in which cues, means, and end states are related, and in which local cues signal distal consequences with varying degrees of reliability. As the animal is exposed to environmental regularities, its behavior comes to reflect a system of increasingly differentiated and refined *sign-gestalt-expectations*. These "cognitions" and other "immanent determinants" (p. 378) consist not of internal or private psychical entities but of "functions" that relate initiating causes (such as external stimuli and physiological states) to purposive behavior. An animal's expectation, for example, resides in the fact that behavior is disrupted by environmental changes, and preferences manifest themselves as differential rates of acquisition or choice proportions. Finally, some implicit adjustments, known as "consciousness," prepare the organism for action or (in the case of insight) reorganize the field of sign-gestalt-expectations.

In a careful critique of teleological behaviorism, Tilquin suggests that the use of intentional notions, even at a purely descriptive level, tends to discourage more detailed analyses of the causal and historical determinants of performance. Tilquin also questions whether Tolman's concepts are really driven by behavioral considerations; these concepts may derive from introspection instead. As an example of ambiguity in Tolman's system, its "immanent determinants," which are supposed to be features of performance, are also said to *prepare* behavior or *lead* to it. Because Tolman declines to identify

these determinants with covert muscular or glandular responses, the behaviorist nature of his system can be questioned.

FOUNDATIONS OF BEHAVIORISM

Behaviorism and Epistemology

Book 3 is entitled *Les Fondements du Behaviorisme (The Foundations of Behaviorism)*. In the first chapter, Tilquin examines behaviorism in the light of epistemology. By identifying the mind with behavior, doesn't the behaviorist commit a fallacy, not unlike identifying heat with the height of a column of mercury in a thermometer? Identifying heat with its effects may appear to be a mistake, but Tilquin counters that a new epistemology supports behaviorism by defining scientific concepts "in terms of the operations through which their scientific status is established and their verification achieved" (p. 428).

This new epistemology is operationism, which Tilquin discusses in detail. Because operationism identifies a scientific concept with a given system of measurement, different measurement procedures often give rise to different concepts. However, when their results (e.g., "ordinary length" and "Einstein's length") coincide within a restricted range, one of the two concepts may be seen as an extension of the other.

Tilquin also examines the impact of operationism on behaviorism. From an operationist standpoint, for example, Tolman's "immanent determinants" are not mere descriptions but hypothetical constructs, the values of which can be ascertained through experimental calibration. In the operationist version of Tolman's system, the numerical value of a construct (e.g., drive intensity *D*) is identified with a measure of behavior under standard circumstances (e.g., *x* hours of deprivation with food as a reward). The concept of drive

intensity is then extended to situations in which *D* is not reflected directly in behavior.

Tilquin notes that operational definitions have been defended by Carr, McGeoch, Boring, and Stevens, among others. Yet ambiguities remain on what may count as a defining operation. Tilquin's brief survey of the literature shows that *operation* can refer to a method, to a set of observations, to scientific knowledge and perception, or even to a scientist's own conscious experience. This flexibility might allow everyone to justify his or her preexisting psychological beliefs in terms of operationism. Tilquin nonetheless maintains that behaviorism and operationism express the same philosophy of science.

Behaviorism and Metaphysics

The second chapter of Book 3 deals with the relations among behaviorism, operationism, and metaphysics. Tilquin restates that operationism is not a fallacy but a scientific method, the only one that can dispel confusion. In science, as in mathematics (interpreted constructively), essence comes after defining operations. This operationist rejection of essences is paralleled by behaviorist metaphysics, in which the stimulus is not an object with intrinsic qualities but merely a potentiality for our responses: "The stimulus is only a bundle of stimulating functions, and these functions can only be defined through evoked responses" (p. 471).

But, one may object, isn't there a support for these functions, a reality behind the stimuli? Consistent with a strict operationism, Tilquin rejects the question as meaningless. Pursuing his argument, Tilquin stresses that the physical realism of Weiss is only apparent. Weiss attributes no ontological status to physics, which is only a set of responses from the physicist. One can take the physicist's behavior as a basis for studying the lay person's, or vice versa, and "re-

ality" consists in nothing more than the possibility of "translating" one set of responses into another. This perspective might lead to a form of solipsism in which reality is exhausted by one's behavior. Solipsism as such is useless, however, whereas the hypothesis of an independent world allows human beings to cooperate, and through their cooperation, to develop science. Thus, the hypothesis of an external world derives its legitimacy from its social usefulness.

In response to the further argument that consciousness reveal properties of reality (e.g., colors) that are independent of our behavior, Tilquin attacks the notion of experience as a "given" (p. 484) and points to developmental and cultural constraints on the acquisition of sensory qualities (defined as what people can actually communicate to others). Far from being aberrant, a response-centered view of phenomenology follows the general tendency of science to remove intrinsic qualities from the object. In this sense, behaviorism merely continues the tradition of Descartes, Hobbes, Locke, or Berkeley. For Berkeley, to be is to be perceived; for the behaviorist, to be is to be reacted to.

In a short conclusion, Tilquin reiterates that behaviorist knowledge is not supposed to duplicate immediate experience (whatever the latter may be). This scientific requirement marks the difference between knowledge and art, between interpretation and emotion. Dead as a movement, behaviorism can begin its life as an empirical science open to new methods and facts.

BEHAVIORISM IN 2006

Tilquin's work obviously bears the mark of its time. With at least 150 pages, Watson's behaviorism dominates the book, whereas Tolman, Weiss, Meyer, and Kantor are assigned fewer than 50 pages each.

Even less space is devoted to Kuo and Hull. Tilquin makes no more than passing references to Hunter, Lashley, and Stevens, and Guthrie is mentioned only in a footnote on mechanism and teleology.

More striking from a current perspective, there is nothing on Skinner and his operant behaviorism. In his foreword, Tilquin acknowledges a research scholarship from the Centre National de la Recherche Scientifique for the 1939–1940 academic period, which suggests that he wrote his book mainly in these 2 years (fewer than 20 references cover the years 1938–1940, with only two references for 1940). If such is the case, then Tilquin's failure to discuss *The Behavior of Organisms* (Skinner, 1938) is not particularly surprising. That he does not discuss Skinner's earlier papers either (e.g., Skinner, 1931, 1935) may reflect a lack of preeminence of the operant research program before 1940 (see Catania, 1988) or Tilquin's limited access to some of the periodicals in which this work was published.

Other differences between Tilquin's treatment and present ones undeniably reflect the shifting fortunes of individual behaviorists and of their views. More recent analyses of behaviorism are much less likely to spend time on Meyer and Weiss, for example, whereas Watson remains a central figure (see Todd & Morris, 1994) and the contributions of Kantor are still evident today (e.g., Hayes & Fredericks, 1999). Most notably, the intervening years have seen the emergence of behavior analysis as an independent field under the influence of Skinner and his followers (e.g., Rachlin, 1994), and, in philosophy, the waxing and waning of the behaviorist proposals inspired by Ryle and Wittgenstein (Dennett, 1978).

In light of such changes, Tilquin's book may seem to be of mere historical interest. The topics of development, memory, categorization, language, emotion, and social behavior retain all of their significance

today, but the ways in which Watson and other early behaviorists addressed these issues diverge, at least in part, from contemporary operant treatments. In examining possible relations between the behaviorisms of 1942 and behavior analysis, however, two mistakes should be avoided. The first is to assume, on the basis of a shared label, the existence of behaviorism as a unitary scientific movement. This assumption is clearly unwarranted. Meyer's models of neural dynamics, for example, have more in common with connectionism (e.g., Rumelhart, McClelland, & the PDP Research Group, 1986) than with behavior analysis, whereas the opposite may be said of Kantor's approach. That some behaviorisms of 1942 anticipate cognitive modeling (see Malone, 1990) shows that "behaviorism" should be seen in terms of family resemblance at best (Zuriff, 1985) or, alternatively, that the very label should be discarded. The "behaviorism" that appeared homogeneous against a background of explicit vitalist and dualist beliefs has since then revealed significant lines of cleavage.

Concluding on this basis that early behaviorisms are irrelevant to operant research would be another mistake, however, as grievous as the first. Skinner's widespread influence on the field he created brought with it strong methodological commitments, some of them antagonistic with pre-existing research programs (Skinner, 1969, pp. 106–108). As a result, some of the behavioral issues of concern to Watson or Tolman have been largely neglected and require more attention (see below), whereas other non-Skinnerian topics and methods eventually made their way in behavior analysis. Stimulus control in humans, for example, is often studied in discrete trials (e.g., Sidman, 2000), a pre-Skinnerian legacy (cf. Logan & Ferraro, 1970). Resistance to extinction, one of C. L. Hull's (1943) measures of habit strength, is an active

topic in behavioral-momentum research (see Nevin & Grace, 2000). Most prominently, the matching law and its variants (Herrnstein, 1970) focus on relative rates of response, following Tolman's vision that "all behavior is choice" (see Williams, 1987, p. 182)—a conceptual heritage not lost on Skinner (1986, p. 231).

At a more philosophical level, Skinner's (1945/1984) radical behaviorist views on consciousness and introspection are continuous with those of his main predecessors, a fact that the dichotomy of "radical" versus "methodological" behaviorism (Day, 1983) tends to obscure. Although treatments of consciousness in terms of overt behavior or dispositions to behave can be found in some variants of philosophical and molar behaviorism (e.g., Boyer, 1985; Rachlin, 1988), psychological theorists such as Watson, Hull, and Tolman regularly identified private experience with covert stimuli and behaviors, just as Skinner did (Zuriff, 1985, pp. 229–233). If some difference must be found between Skinner's behaviorism and its predecessors, therefore, it resides in their respective treatment of overt behavior, not in their common reference to covert factors. One likely candidate is the type of explanation being developed in behavior analysis (Baum, 2004a). Arguing that these explanations are nonmediational will demarcate the behavior-analytic use of empirical laws (e.g., Baum, 1974; Herrnstein, 1970) from Hull's or Meyer's hypothetical physiology, but will not fit easily with the inclusion of covert events in radical behaviorism (Schnaitter, 1987).

Influences and Trends

Contrasting current research with the historical influences listed by Tilquin reveals an equally complex mix of continuity and opposition. The relevance of Thorndike's law of effect for behavior analysis (see Cat-

ania, 1999) has more to do with the empirical domain of operant behavior than with Thorndike's associative theorizing, although his emphasis on stimulus–response relations, suitably updated, may prove useful in understanding the nature of reinforcement (Nevin, 1999). Similarly, Pavlov's influence on behavior analysis lies less in his models of brain functioning than in the ongoing importance of classical conditioning phenomena (e.g., Schwartz & Gamzu, 1977; Tonneau, 2001).

Aside from neurally inspired models, what Tilquin calls the "materialist tradition" is perhaps most evident in the use of physical concepts in behavior theory. Behavior analysts are unlikely to invoke physical explanations in the way that Weiss did, but they still explore heuristic relations between physical and behavioral phenomena (e.g., Marr, 1992; Nevin & Grace, 2000). Applying the concepts of physics to behavior is made on the basis of formal, quantitative commonalities, and no ontological reduction is assumed.

In terms of relevance, however, the most important discipline for behavior analysis does not seem to be physics but evolutionary biology, one of the influences mentioned by Tilquin. Appeals to evolutionary concepts in behavior analysis can take two distinct forms (Tonneau & Sokolowski, 2000, pp. 159–160). The first approach is to examine dependencies between behavioral and evolutionary processes, treating operant behavior as a biological characteristic and applying evolutionary models accordingly (e.g., Maynard Smith, 1978). Attempts at integrating reinforcement and optimal foraging (e.g., Fantino & Abarca, 1985) are typical of this approach. The other use of evolutionary concepts in behavior analysis is not causal but analogical, and focuses on a possible similarity between natural selection and operant reinforcement (see Skinner, 1981; Staddon & Simmelhag,

1971). This analogy has been criticized for its superficiality (e.g., Tonneau & Sokolowski, 2000), however, and the overall issue remains controversial (D. L. Hull, Langman, & Glenn, 2001).

Another difficult topic is that some aspects of evolutionary theory contradict some commonly accepted theses about behavior analysis. For example, Chiesa (1994) has argued that behavior-analytic accounts proceed inductively and embody a rejection of hypothetico-deductivism. Yet, as argued convincingly by Ghiselin (1969), Darwin's work on natural selection exemplified the hypothetico-deductive methodology (e.g., by elaborating various evolutionary scenarios and contrasting them through experiment). If such is the case, then sound objections to cognitive theorizing must be found elsewhere than in its mere reliance on hypothetico-deductive methods (e.g., Malcolm, 1971).

In sum, behavior analysis still entertains relations, however difficult, to the roots of behaviorism; of the disciplines mentioned by Tilquin, only mental testing has faded to the point of seeming completely foreign to behavior analysis. Four of Tilquin's five postulates (materialism, neural functioning by reflex arcs, adaptation, continuity between species, and psychology as a practical science) remain influential among behavior analysts, for example in their emphasis on behavioral processes shared among species (Sidman, 2004) and on the philosophical importance of technology (Creel, 1987). Tilquin's postulate about reflex arcs, by contrast, appears to clash with the Skinnerian concept of emitted behavior. Irrespective of whether the latter is as stimulus free as it seems (Donahoe, Palmer, & Burgos, 1997), it is important to keep in mind why Tilquin emphasized the notion of reflex arc. Replaced in its rhetorical context, the notion was used to justify the dispensability of internal

mediators in environment-based explanations, as in Skinner's (1969) argument against "mental way stations" (p. 236). If behavior (B) is a function of a mediator (M) that is itself a function of the environment (E), then the relation between E and B must be a lawful one and can be studied directly (so the argument goes). In this simple form, the reflex-arc argument is easily refuted (Nelson, 1969), but more sophisticated variants of it exist and remain an important support for environment-based explanations of behavior (Schnaitter, 1986).

Anything Left Behind?

A recurrent theme in Tilquin's book is that of behavioral organization. From Watson's interest in development to Tolman's hierarchical conception of behavior, the issue of structure looms large. Starting with Lashley's (1951/1960) seminal discussion of serial order in behavior, the topic of behavioral structure has also been a historical impulse for the formulation of cognitive theories (Bever, Fodor, & Garrett, 1968; Chomsky, 1957) explicitly opposed to the "associationism" (alleged or real) of behaviorist conceptions. In behavior analysis, however, with significant exceptions in the field of verbal responding (Catania, 1980; Skinner, 1957), the issue has been hardly explored.

Consider, for example, Baum's (2004b) advocacy of a "molar" paradigm in which, as in Tolman's system of purposive behavior, activities are nested within one another (e.g., *making one step into walking three blocks into going home*).⁶ Baum correctly points to the flaws of molecular

⁶Whereas the molar-molecular issue of Watson, Holt, and Tolman mainly concerned the spatial dimensions of behavior, in contemporary behavior analysis the controversy focuses on time (Malone, 2004). Thus, the old and new molar-molecular debates are different ones. The old debate has not vanished, however, and if Baum (2004b) is

explanations based on discrete responses and chaining (p. 351), but his molar alternative, in which behaviors just "are" nested within one another (p. 356), leaves the ontogeny of organization largely unspecified. Accordingly, Watson's central issue is still with us: How do more complex behaviors emerge from simpler ones (Teitelbaum, 1977; Thompson & Lubinski, 1986)? Are the relevant variables limited to contiguity and temporal correlation (Baum, 2004b), or is it necessary to invoke more complex principles (e.g., Fischer, 1980)? As Reid, Chadwick, Dunham, and Miller (2001, p. 304) emphasize, the processes responsible for changes in the complexity of reinforced responses are still poorly understood, even in the operant laboratory.

At a philosophical level, the issue of realism and, more generally, of the place of metaphysics in behavior analysis, is worth clarifying. There are, of course, a number of realisms (e.g., Haack, 1987), which range from the interpretation of scientific theories to the philosophy of perception. Irrespectively of these variations, some behavior-analytic discussions of the topic have linked "realism" to the mentalistic notion that knowledge involves internal representations of reality (e.g., Leigland, 1999). Realism is then found guilty by association (for a particularly strained attempt to tar realism with a mentalistic brush, see Barnes-Holmes, in press). What the charge of mentalism misses is that it is only *indirect* realism that contains assumptions about internal representations (see Katz & Frost, 1979). *Direct* realism, by contrast, dispenses with representations and identifies perceptual contents with selected parts of the environment itself, as in the "naïve realism" of common sense. Thus, perceptual contents are supposed to

be literally identical with an independent reality (Holt, 1914; Tonneau, 2004; Wilcox & Katz, 1981). Whatever the faults of direct, nonmediated realism, it entertains no mentalistic assumptions and motivates research programs that are consistent with behavior analysis (e.g., Turvey, Solomon, & Burton, 1989).

Interestingly, Tilquin's own reasons for rejecting realism (in any of its forms) have less to do with the charge of mentalism than with putative characteristics of the concepts of stimulus and response. Based on an operationist interpretation of behaviorism (the validity of which is debated; Smith, 1986), Tilquin claims that stimuli have no existence apart from the responses that they evoke, and he interprets the physical world as a bundle of functions realized in our behavior (see *Behaviorism and Metaphysics*, above). His statements are strikingly similar to the recent behavior-analytic proposal that the universe is somehow defined by our response to it (see Barnes & Roche, 1994). In both cases, the claims being made are flawed; there is no inconsistency in being a behaviorist and a realist about the physical world (Tonneau, in press). Dismissing realism on the basis of flawed arguments about stimuli and responses has no force, and only amounts to repeating Tilquin's mistakes.

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