

John B. Watson's Legacy: Learning and Environment

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John B. Watson's contribution is evaluated in relation to his own time, with respect to his historical influence, and in light of current issues in developmental psychology. A survey of a nonrandom sample of current developmental psychologists revealed no consensus with respect to Watson's legacy to developmental psychology. The influence of Watson's insistence on an objective methodology in psychology remains, although is not necessarily acknowledged. His extreme environmentalism has been rejected. His concern to understand the principles of learning is reflected in the subsequent work of the Hullians and the Skinnerians. The influence of his underlying premise about the importance of environment and of learning is to be found in such work as studies of the effects of intervention programs. I question the possible costs to the field of the continued rejection of a Watsonian emphasis on learning as an important process in development and behavior.

In his time, John Broadus Watson (1878–1958) was controversial. So he remains. In preparation for this reflective essay on his legacy to developmental psychology, I sent a questionnaire to a nonrandom sample of mostly senior developmental psychologists.¹ The 45 respondents ranged widely in their perceptions of Watson's contributions and in their evaluations. Watson's name, it appears, can still elicit strongly negative reactions. For example, in relation to his contribution to developmental psychology and psychology in general, Watson was described as "an embarrassment," "harmful," "very important, but mostly a negative influence." One respondent said his "main contribution was obfuscation," another that "he had little lasting effect," and yet another that the "long-term effect of Watson was harmful."

Other comments were more positively valenced, such as, that his "biggest contribution was balancing the scales between nature and nurture by overstating the case," his "major contribution was to establish behavior as an important phenomenon in its own right," his "thoroughgoing empirical orientation was of the greatest import," and his "methodological behaviorism is to be found in neobehaviorism, behavior analysis and much of cognitive psychology." One person wrote, "Contemporary developmental psychology would not be the same had not Watson contributed to this field."

John B. Watson died more than 40 years ago. His active contributions to the field of psychology ceased more than 50 years ago, and an evaluation of him and his work still evokes strong reactions and little consensus about his legacy. About half of the respondents rated Watson on the positive side in agreeing that his main contribution was in the area of methodology; the other half shaded to the disagreeing side. A few more than half

felt he had ignored biological variables, but the remainder tended to disagree with that characterization.

Diversity of opinion is rife in developmental psychology today, but when asked to evaluate the theoretical and methodological contributions of Baldwin, Binet, Darwin, Freud, Gesell, Hall, Lewin, Piaget, and Vygotsky, this same group of respondents showed much more consensus. This was true even for the figures in the list whose active careers had ceased around the same time as or before Watson's. For example, the theoretical contributions were strongly and positively acknowledged for Darwin, Freud, Lewin, Piaget, and Vygotsky. There was also a general consensus about the methodological contributions of Binet, Lewin, and Piaget.

Evaluating John B. Watson's legacy to developmental psychology thus appears to involve a considerably more complex set of considerations than is the case for other major figures. Indeed, some of the respondents objected to identifying Watson as a developmentalist, claiming that he was, at best, a psychologist concerned only with defining psychology as a natural science and, at worst, a dogmatist who went far beyond his data to popularize his beliefs about development. If there was any consensus to be found, it was that Watson's tireless championing of behaviorism as the only acceptable way of looking at behavior succeeded in making his point of view the dominant one for many years.

To be sure, there were balanced evaluations: Some of them were thoughtful and lengthy, pointing out that Watson had to be

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evaluated in the context of his time, that his extreme views were necessary to establish behaviorism, and that the field was the better for it in the long run even as less dogmatic perspectives came to pass. There was also consensus, among those who chose to comment on it, that the extreme nature of his environmentalism as it was translated into popular child rearing advice was regrettable.

It will be useful, in examining Watson's legacy to developmental psychology, to consider his contributions in his own time, his influence in the years after he ceased to be a contributor, and his current and perhaps future impact.

In His Own Time

The opening sentences of Watson's (1913) manifesto, "Psychology as the Behaviorist Views It," declare clearly and unequivocally that "psychology as a behaviorist views it is a purely objective experimental branch of natural science. Its theoretical goal is the prediction and control of behavior" (Watson, 1913, p. 158). He was, as everyone notes, sounding the charge against introspection, establishing a purely American position in the field, and, interestingly enough, in a somewhat anti-Darwinian spirit, suggesting there was no necessary relationship between the laws governing animal behavior and human behavior.

Seven years later Watson was deeply embroiled in the nature-nurture controversy. He had claimed the principles of learning as the central and practically only variable controlling the acquisition of human behavior. He had come to focus his attention largely on the application of behaviorism to the study of the behavior of infants and young children. And he was soon to leave his academic position at Johns Hopkins University and take up employment in the field of advertising even though he would continue to write about behaviorism and to engage in the popularization of his ideas in magazines and on the radio for almost 20 years (Buckley, 1989; Nance, 1970).

It is not easy to separate the impact of Watson's ideas about behavior and development in his own time from Watson's persona. By all accounts he was a man given to opportunism, to making extreme statements, to evincing strong ego needs for visibility and notoriety, and to displaying a cold and imperious style. He did not have many personal supporters when he was ousted from Johns Hopkins University in the wake of what was then considered public scandal in relation to his divorce and remarriage (Buckley, 1989). It is not clear whether any university would hire him after that, and he went, quite profitably, into the field of advertising, where his application of behavioristic principles was very successful.

Although the 1913 statement defining the behavioristic view of psychology was not about development, Watson's major focus, ultimately, was on the development of behavior. Even so, many developmentalists today do not count him as a developmentalist. In his time, neither Watson nor most of his contemporary developmentalists distinguished between behavioral development and the acquisition of specific responses. Gesellians saw behavioral acquisition and development as an unfolding of largely inherited behaviors. Watson—taking an opposing, environmental point of view—credited learning, namely conditioning, as the sole process responsible for development.

By the time Watson published the first edition of his text,

Psychology From the Standpoint of a Behaviorist in 1919 (which had second and third revised editions in 1924 and 1929, respectively), he was applying behavioristic analyses to development and using the analyses to explain the acquisition of behavior. The basic principles he asserted in the 1919 publication were repeated in his 1924 publication *Behaviorism* (Watson, 1924/1970) and are relevant to my discussion. First, Watson exhibited a healthy respect for the biological functions of the human organism, discussing at length what was then known about genes, the nervous system, and the human muscular system. He recognized the human body as an extremely complex organismic system that was highly integrated with the behavioral system. He was wont to stress, again and again, that the body acts as a whole and that behavior is rooted in and roots the organism.

The second observation is that Watson clearly believed that learning was almost entirely responsible for behavioral development but also acknowledged the role of structural change. In fact, in discussing the motor behaviors that develop in the infant and young child, he used italics to stress the point:

In the great majority of these later activities [i.e., crawling, standing, sitting up, walking, running, jumping] it is difficult to say how much of the act as a whole is due to training or conditioning. A considerable part is unquestionably due to the growth changes in structure, and the remainder is due, we believe, to training or conditioning. (Watson, 1924/1970, p. 135–136)

A third observation involves the strategies and program Watson advocated for developmental research. He stressed the need to study infants, he focused heavily on the central role of emotions, and most obviously, he was relentless in his insistence on learning as the major mechanism for explaining behavior and development. He had already used the experimental method to show learning as the basis for the acquisition of emotional responses in the young infant. The particular experiment for which Watson is most known purported to demonstrate how emotional reactions in a young child could be conditioned and to suggest, by implication, that this was the model for the acquisition of most emotional responses (Watson & Rayner, 1920). This experimental effort, involving the use of infants to study emotional behavior, was considered a breakthrough, though there had been earlier reports of the conditioning of motor responses using infants (Krasnogorski, 1909; Mateer, 1918). Its findings and advocacy for the experimental strategy were strengthened in subsequent reports by Jones of experiments designed to show the conditioning and the unconditioning of the fear response in the very young child (Jones, 1924a, 1924b).

Watson's developmental model was exceedingly simple, containing no discussion of stages and little of sequences; there was no consideration that learning principles were in any way influenced by the age of the child. Furthermore, the developmental progression, despite the nod to structural change as a variable, was linear and cumulative.

Finally, *Behaviorism* (Watson, 1924/1970) reflects the major thrust of Watson's position, the aspect that served as the main lightning rod for his critics and caricaturists then and now: a practically unqualified belief in the role of experience and environment in shaping the human behavioral repertoire.

Give me a dozen healthy infants, well-formed, and my own specified world to bring them up in and I'll guarantee to take any one at random and train him to become any type of specialist I might select—doctor, lawyer, artist, merchant-chief and, yes, even beggar-man and thief, regardless of his talents, penchants, tendencies, abilities, vocations and race of his ancestors. (Watson, 1924/1970, p. 104)

This passage is widely quoted and often ridiculed, but it is generally provided without the two sentences that follow it:

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. Please note that when this experiment is made I am to be allowed to specify the way the children are to be brought up and the type of world they have to live in. (Watson, 1924/1970, p. 104)

Throughout the book, Watson the scientist took care to indicate the limitations of the data and the need for more research. After presenting a strong argument for the pervasiveness of conditioning of emotional reactions, he concluded with a cautionary note drawing the reader's attention to the fact that all his conclusions "are based now upon too few cases and too few experiments" (Watson, 1924/1970, p. 195), but he was optimistic that those already at work on the problems would rectify the situation.

Watson was not only scientist but advocate, in this book and elsewhere. The aspect of Watson's career that elicits the strongest negative reactions was his willing and unqualified popularization of his belief in the efficacy of extreme measures of environmental control in the form of advice to parents and teachers about the rearing of children. For example, he took the position that physical affection and expressions of love impeded good development. His judgments about what was good and bad for children rested on a model in which he advised that it was good to limit the influence of emotion on behavior and to train children so as to maximize independence and skill acquisition. Interestingly, he appeared to accept Freud's observations, made reference to Freudian concepts, and believed them entirely amenable to a learning analysis.

By any standard his environmentalism was unbridled. He saw no role for inherited characteristics as ultimately having any determining role in developmental outcome. He did not deny genetic influences, but he believed that what the environment provided in the way of experience and training could override organismic variables and ultimately determine developmental outcome. Watson's view about human potential was egalitarian in the extreme, and he plied the perspective in every arena.

Watson did not shy away from admitting that there are inherited differences, but he made a distinction between the inheritance of structures and the inheritance of function. The former was clearly heritable, the latter not. Function was the result of how the environment shaped the hereditary structure, such shaping beginning in the prenatal environment. He rejected behavioral differences as being due to racial or other hereditary variables, claiming that environmental experience alone would account for observed differences (Watson, 1924/1970). Watson, on every issue, took the extreme environmental position in the nature-nurture controversy.

A tireless advocate for the relevance of psychology, Watson

believed strongly in the application of psychological principles to the solution of practical problems. He plumped for the importance of applied research; his view of its potential for doing good in society was optimistic in the extreme. In some of this he was not unlike Gesell. Perhaps it was part of the American zeitgeist that Gesell and Watson both believed that the application of the principles of development (in Watson's case the principles of learning) to the rearing of children would result in happier children, despite Gesell's not buying any of Watson's environmental determination of developmental outcome.

The America of Watson and of Gesell was coming to value science more and more, to see science as a panacea for social ills. Industrialization had taken hold. Science applied to making an industrialized society efficient and socially progressive was the desideratum. Watson's ideas about social engineering were a positive fit for the times.

Watson Diffused

By the end of the 1930s, John B. Watson had been separated from academic psychology and laboratory science for almost 15 years. His expression of his own point of view remained static, unperturbed by new data or theoretical advance. His active participation in psychology had begun to decline, but his methodological behavioristic credo that insisted on the necessity for objectively collected, independently verifiable data gained wide acceptance and became the standard for doing psychological science.

Though Watson's persona was beginning to fade from the field, his influence spread to experimental psychology, to social psychology, and to developmental psychology. Clark Hull and his Yale colleagues and students took up the interest in conditioning. They elaborated on Watson and Pavlov and explored the parameters of classical and instrumental conditioning. They embellished the philosophical rationale for behaviorism by adopting the point of view of the logical positivists; they made formal theory drive experimental research in a manner exceedingly more sophisticated than Watson's efforts (Hull, 1943). One difference between the Hullians and Watson was that the Hullians were more inclined than Watson to see animal behavior as an analogue for simple human behavior.

A Watsonian emphasis on stimulus-response (S-R) relations and the primacy of learning in the context of a Hullian approach found outlets in work on imitation (Miller & Dollard, 1941), frustration and aggression (Miller, 1941), and personality and psychopathology (Dollard & Miller, 1950). Watson's belief in the efficacy of studying the young, relatively naive organism to understand how the principles of learning operated was reflected in the flourishing field of experimental child psychology (McCandless & Spiker, 1956).

The explicit developmental emphasis in all of these efforts was mainly muted. There was not much developmental theory per se guiding the research. A linear, cumulative model was generally accepted, if not articulated, though an early study by Kuenne (1946) introduced something of a counterweight. Kuenne's work on transposition suggested that the level of a child's language development modified how learning occurred, thus introducing a quite modest developmental caveat into the learning literature. A stronger developmental focus was eventu-

ally to find expression in the work of the Kendlers (H. H. Kendler & Kendler, 1961, 1969; T. S. Kendler & Kendler, 1959; 1966; Kendler, Kendler, & Learnard, 1962).

The translation of Freudian theory into behavioristic terms and an emphasis on dyadic interactions stimulated what eventually was to become social learning theory (Sears, 1951). A stimulus-response analysis married to Freudian developmental stages provided for a strong behavioristically oriented developmental approach with ties back to Watson through the Miller-Dollard work. During the 1950s Watson's methodological influence was unquestioned. His methodological influence on developmental and child psychology research was pervasive. So, to a lesser degree, was his environmentalism.

Watson's most direct descendent is generally identified as B. F. Skinner. Skinner published *The Behavior of Organisms* in 1938, focusing on operant learning as the basic mechanism controlling behavioral acquisition. The influence of this book may have been restricted by the subsequent onset of World War II and by the diversion of the efforts of most psychologists, Skinner included, to the war effort. An alternate view is that Skinner's effort would, in any event, have been eclipsed by the intensity of the debate between Hull and Tolman and the advocates for their positions.²

Skinner's (1953) publication of *Science and Human Behavior* restated many of the basic views of the 1938 book, though it was less theoretical and had a more applied focus. A reading of *Science and Human Behavior* gives one a strong sense of being in contact with "Watson updated" and "Watson sophisticated," although Skinner's emphasis on the overriding importance of contingent reinforcement in the shaping of human behavior might well have been deemed too teleological by Watson. The empirical work stimulated by Skinner was fully in the Watsonian methodological tradition and revived the labeling of these efforts as *radical behaviorism*, with *radical* suggesting extremism.

Watson and Skinner shared an unyielding commitment to environmentalism, though Skinner's analysis was placed in a larger evolutionary context than Watson ever entertained (Skinner, 1974). Skinner advocated an almost singular focus on operant conditioning; Watson recognized both instrumental and classical conditioning. Watson's interest in classical conditioning stemmed, in part, from his conviction about the centrality of emotional behavior. He felt, from an applied point of view, that it was important to be very careful about how the emotions were conditioned early in life so as to shape an independent, self-reliant, and unemotional personality that would thus result in the most functional and happy of people.

The application of the Skinnerian approach to study the basic principles of learning in children was taken up by Bijou (1955, 1957, 1958) and Bijou and Baer (1961, 1963). The basic research on children's learning continued, but it was the growth of applied research under the rubrics of *behavior modification* or *behavior analysis* that came to characterize the Skinnerians. Watson's vision for an applied psychological science driven by experimental results was to find its fullest realization in the work inspired by Skinnerian principles. Skinner, himself, had served the theoretical vision in writing *Walden Two* (Skinner, 1948).

Watson would have cheered the outpouring of research de-

signed to apply behaviorism to the real world, research conducted first by Skinnerians and subsequently in fields such as behavioral medicine, industrial and organizational psychology, and community psychology. Particularly, Watson would have applauded the testing and application of the principles of learning to improve the functioning of persons with mental and physical handicaps, to improve classroom deportment and learning, and to modify the behavior of delinquent youths.

In 1970 the *Journal of Applied Behavioral Analysis* was founded. It lent the field of applied behaviorism a professional stamp. A year before, in his essay on "Behaviorism at Fifty," Skinner declared, "In the fifty years since a behavioristic philosophy was first stated, facts and principles bearing on the basic issues have steadily accumulated" (Skinner, 1969, p. 228). Watson would have, with gratification, agreed.

Watson's Influence Now and in the Future

Gustav Bergmann (1956) considered that John Broadus Watson was, with the exception of Freud, "the most important figure in the history of psychological thought during the first half of the century" (p. 265). Skinner's obituary for Watson, appearing in *Science*, likened Watson's stature to that of Darwin and Lloyd Morgan (Skinner, 1959). Bergmann's estimate rested solely on Watson's methodological contribution of wresting psychology from introspection and mentalisms. He deemed Watson's social philosophy and what he called Watson's metaphysical outlook as "silly" (Bergmann, 1956). Today Skinner is widely—and somewhat erroneously—regarded as being as arch an environmentalist as Watson was; Skinner's estimate of Watson, however, was that his extreme environmentalism and his inclination for being polemical undermined both his impact and his effectiveness.

One does not know, of course, how and to what degree Watson's ideas would have changed had he lived the rest of his life as an active empirical psychologist or, consequently, what impact he might have had on the field of developmental psychology. It is something of a paradox that in the 1950s Bergmann and Skinner placed Watson in the same league as Darwin and Freud, whereas some psychologists today regard Watson as an embarrassment and as having done harm to the field. Some today make the quite harsh judgment that Watson cost psychology in general, and developmental psychology in particular, 50 years of floundering, using a wrong and unproductive paradigm. Others still see, on balance, Watson's legacy as positive and enduring. Some of the distinctions that he insisted on making with respect to definitional and methodological practices, for example, have remained cornerstones in psychology. Definitional standards for stimuli and responses and criteria for making objective and reliable observations can be traced back to Watson and continue to characterize acceptable investigatory practices today.

To weigh these contradictory estimates of Watson's contribution, it is necessary to consider the current condition of developmental psychology, particularly as practiced in the United

² I am indebted to the anonymous reviewer for this alternative perspective.

States. The present state of affairs in the field can be traced to the late 1960s and early 1970s. At that time, by many accounts, S-R psychology and behaviorism and its strong environmentalist orientation were, with the exception of the Skinnerian brand, eclipsed (overthrown?) by the organismic/cognitive revolution (Horowitz, 1987; Stevenson, 1983). At first this was fueled by American developmentalists' having discovered Piaget. There followed an almost "gee whiz" response as it was shown that infants and young children were capable of much more complex behavior than had been previously supposed (Kessen, Haith, & Salapatek, 1970; Stone, Smith, & Murphy, 1973).

At the same time, the development of some new methodologies involving techniques to study habituation in infants (Berlyne, 1958; Fantz, 1964) and assessments of neonatal behavior produced an explosion of information on infant capabilities. As a result of many demonstrations, it became obvious that there was a much more well developed behavioral repertoire in the newborn and young infant human organism than anyone had previously described (Brazelton, 1973; Kessen et al., 1970; Stone et al., 1973).

This growing body of evidence about the abilities of the infant and young child served to challenge the behaviorist assumption that learning accounted for the acquisition of early behavior. This evidence, coupled with the demonstration of the Piagetian phenomena, particularly in the realm of cognitive development through adolescence, called into question the entire behavioristic enterprise. If Gesell's name did not surface in the discussion of these matters, it was certainly a return, albeit in a more sophisticated framework, to some of Gesell's basic tenets.

Even as Piagetian theory was being modified, the discussions of systems theory and transactional theory applied to developmental theory offered attractive theoretical alternatives to behaviorism (Sameroff & Chandler, 1975; Sameroff, 1983). The infant was not a tabula rasa; experience could not write anything it wished. No one denied some role to learning, but it certainly was not considered a central mechanism. Basic research on learning in children declined precipitously. Studies of children's learning were increasingly confined to research inspired by Skinnerian principles.

At the same time, the 1960s bloom of optimism about the power of early intervention programs to change developmental outcome began to fade (Clarke & Clark, 1976). Though many of these programs were not behavioristic in their programmatic orientation, the rationale for mounting them was strongly influenced by the environmentalism that had predominated since the 1930s. However, the fledgling intervention efforts had failed to demonstrate dramatic changes in developmental outcome, school achievement, or IQ (Horowitz & Paden, 1973; Jensen, 1969). Advances in genetics identifying genetic contributions to behavior strengthened further the growing belief in organismically determined behavioral development and developmental outcome. No one was suggesting that experience and the environment were irrelevant to behavioral development, but the pendulum had clearly swung away from environmental determinism and toward genetic and organismic determinism.

The inclination to cognitivism in developmental psychology and to organismic and genetic determinism is, however, just

that: an inclination rather than a reflection of consensus. In fact, clear theoretical labels are hard to come by among today's developmentalists. When the 45 respondents to the survey used in preparation for writing this essay were asked to identify how they classified themselves theoretically, a total of 26 different labels were used. The two most frequent classifications were *eclectic* and *constructivist*, each typifying four persons. Eight persons used some variation of *cognitive: cognitive developmental, cognitive social learning, sociocognitive*. Adding the one who used *cognitive behaviorism, cognitive* was by far the most frequently used theoretical term. Seven persons, however, used some form of *behaviorist: descriptive behaviorist, behavior analyst, liberalized S-R, or social interactive behaviorist*. One person proposed *social evolutionary cognitive behaviorism* as a preferred label.

The respondents also did not agree about whether most current psychologists are, from a methodological point of view, functionally Watsonian behaviorists. A little over 60% disagreed or tended to disagree with such a claim. Thus, in this sample, there was a lack of agreement even about what many have felt was the methodological standard for the field. In response to a question asking whether the emphasis on learning and environment will reassert itself in the field, the respondents split almost evenly in their tending to agree or disagree that this was a likely possibility.

Although those responding to the questionnaire were not a random sample, almost all of the respondents were relatively senior developmentalists (see footnote 1), and they obviously represented a wide spectrum of opinion. The dispersion of self-describing theoretical labels and the ambivalence with respect to the likelihood of a return of emphasis on environment and learning suggest that developmental psychology is currently in a rather fluid theoretical period. In trying to identify Watson's legacy and the possibility of a Watsonian presence in the field in the coming years, one is struck by a number of contradictory possibilities.

Putting methodology aside, Watson's basic position was that the principles of learning would account for the largest share of behavioral development and developmental outcome and that these principles are exercised almost exclusively through environmental opportunities for children to learn. Though the theoretical interest in children's learning has waned, in fact, there is a great deal of research on learning in the field of education as well as among those who identify themselves as Skinnerians. Though the belief that environment and experience are the main shapers of human behavioral development no longer exists in its extreme form, there is, in fact, widespread acceptance of the idea that experience is important to development. Intervention programs continue to be mounted, albeit often without any recourse to an explicit use of learning principles even as the intervention appears to rest on the assumption that experience will make a difference. Environment and experience are given importance in recent discussions of cultural diversity and how cultural experience contributes to the shaping of the behavioral repertoire. However, the mechanisms by which this occurs are often not addressed (Horowitz, 1987).

Transactional theory (Sameroff & Chandler, 1975), dynamical systems theory (Thelen, 1990; Thelen, Kelso, & Fogel, 1987) as well as Vygotsky's theory (Brown, 1982; Rogoff, 1990) are

heavily referenced these days and arrayed with the organismic approach. Yet an analysis of Vygotsky and of transactional theory and even of systems theory reveals that these approaches give a healthy role to both the environment and to learning in an interaction with the organism. No developmentalists totally exclude experience and the environment as variables contributing to developmental outcome, so one wonders whether the negative reactions to Watson and behaviorism are focused still on Watson's persona or on what some have perceived as extreme Skinnerian claims for the power of the environment, or just on the simplistic nature of Watson's developmental approach.

One survey respondent stated that the misguided theoretical position of Watson and behaviorism was responsible for a loss of some 50 years of productive developmental research. Is it possible to ask whether the retreat from basic research on learning in a developmental context, the dismissal of Watson and behaviorism, and the isolation of much of applied Skinnerian research has not had *its* costs?

Is the current quite fluid state of developmental theory related to the lack of a clear vision about how to parse into the developmental equation a functional role for learning and environment in development? Is there now a sufficient body of new data that makes this a possibility?

There are a number of signs that the pendulum is swinging back to a middle position. The proposal for a structural/behavioral model to account for development outcome (Horowitz, 1987) suggests, among other things, a possible rapprochement between the behavioral and organismic emphases. It does this by focusing on the idea that a productive approach to understanding behavioral development is to consider that there are two groups of behaviors that develop: those that are universal behaviors and those that are nonuniversal behaviors.

In the structural/behavioral model, the universally acquired behaviors are defined as species typical. They have an evolutionary base, and they occur with almost 100% probability in all normal human organisms. Although some environmental transactions, perhaps learning, are necessary for their acquisition, these behaviors are rooted in organismic characteristics. The nonuniversal behaviors are acquired only as learned behaviors and are dependent on environmental opportunity, though they may have a base in the universal behavioral repertoire. In the adult repertoire the larger share of the repertoire probably is made up of nonuniversal behaviors. Furthermore, many of these define whether a person will be able to function productively and successfully in a society or culture.

From the perspective of the structural/behavioral model a full understanding of development will not be achieved unless ways are found to account for the acquisition of both the universal and nonuniversal behaviors. This means psychologists must include in their scientific agenda basic research on all the mechanisms involved in learning.

Terms like *contextualism*, *transaction*, and *transcontextual*, as well as discussions of a developmental contextual model (Lerner, 1991), are broadening the perspective of developmental psychology. Thus behavior and development are placed in a dynamic systems perspective in which the organism is in constant transaction with the environment, particularly with the social environment (Cairns, 1991). Environment, experience,

and the mechanisms that describe the organism-environmental relationships must, ultimately, include some understanding of how learning operates in dynamic systems.

The strongest case currently being made for the role of experience and environment in a systems context involves the recognition of the mutually influential gene-environment relationships. Here it is acknowledged that genetic expression requires an environmental context and is affected by variations in environment (Oyama, 1985). Expanding on Waddington's (1966) notions of the canalization of development, Gottlieb (1991) has proposed that normally occurring experience can also serve the canalization process. These ideas bring us full circle back to Watson.

Watson believed that environmental shaping of behavior began prenatally. His ideas stimulated Z-Y. Kuo, a skeptical Chinese scientist, to undertake in the 1930s and 1940s a series of experiments in which Kuo systematically altered the prenatal embryonic environments of chicks and other species to see if he could produce different behavioral repertoires. He found evidence for Watson's speculations. Due to the vagaries of life in China during those and subsequent years, Kuo's work did not become widely known in the United States until the 1960s and 1970s (Kuo, 1976).

Numerous studies supporting Kuo's data (and, indirectly, a number of Watson's ideas) have appeared. All of them demonstrate the same basic principle: Manipulations of prenatal and postnatal environments in a variety of animal species produce different patterns of behavior and affect behaviors once thought to be innate, genetically controlled, and unalterable (e.g., Gottlieb, 1978; Marler, 1977).

Watson's legacy to developmental psychology, aside from methodology, is the emphasis he placed on the importance of learning and experience in development and on the need to understand the principles by which learning and experience function. He insisted that learning and experience could be the sole elements determining development and took the position to its extremes. As soon as other data were seen as challenging Watson's assertions, dislike for both his dogmatism and his persona appears to have given critics broad license for dismissing and caricaturing him and all of behaviorism. His point of view has been labeled *mechanistic*, which is seen as synonymous with simplistic. Yet, mechanisms need not be simple, and complex systems are only understandable in terms of the mechanisms that account for their functioning. Is this likely to be less true for behavior?

What has flourished in the name of behaviorism has been largely associated with Skinner and with applied psychology, though not necessarily applied developmental psychology. Applied behaviorism has been relatively isolated from the mainstream of developmental psychology. In the broadening view of contexts and transactions and dynamic interchange that appears to be gaining in developmental psychology, will there be a return to some meaningful inclusion of the processes of learning in the developmental research agenda?

Prognostication about the direction in which a scientific field will move is risky business. The strength of Watson and behaviorism in focusing on learning is that it is a focus on process. To understand behavior, development, contexts, and systems, we must ultimately understand the processes that ac-

count for the phenomena of interest. It is difficult to think that much progress will be made on understanding processes in development without understanding how the principles of learning operate across the life span.

Today's discussions of developmental theory and developmental psychology refer to an exceedingly more complex enterprise than existed in Watson's time. We now have many more facts about both behavioral and biological events. The ability to relate behavioral and biological functioning and social context as interacting or transacting with one another and to think of doing this developmentally has put us on the threshold of a much more powerful developmental science than we might have envisioned even 10 years ago. If Watson has any enduring legacy to the field of developmental psychology beyond his methodological manifesto, it is currently to be found in his active descendants. Among these are a small group of experimental child psychologists working still with Hull-Spence theory (e.g., Cantor & Spiker, 1989) or actively studying learning in young children using experimental techniques (e.g., Rovee-Collier, 1986; Rovee-Collier, Earley, & Stafford, 1989). A larger group works within the Skinnerian tradition (e.g., Poulson, Nunes, & Warren, 1989; Riegler & Baer, 1989). Watson's influence may continue in the future among those who elect to bring back into mainstream developmental psychology an emphasis on understanding the principles of learning and how they operate in developmental processes.

Watson's methodological position has been widely regarded as his most enduring influence. Yet, many psychologists today deny that they are methodological behaviorists. It is not clear whether this is a rejection of the label or of the methodological tenets themselves. A scan of the basic psychological journals reveals, still, a general use of the standards of independently verifiable observations in ways obviously Watsonian, though not necessarily involving only experimental paradigms. Watson's point of view on experience and environment has been moderated by most contemporary psychologists and sometimes dismissed. Yet there is considerable evidence that the influence of experience and the environment on development are acknowledged even as the mechanisms by which they operate are not articulated or a focus of much theoretically sophisticated research. Watson's S-R psychology is clearly of the past. Yet, even in complex systems there are relationships of stimuli and responses for which psychologists need to account.

John Broadus Watson was a controversial man. His theory was controversial. His advocacy for an uncompromising position on the role of the environment was extreme. It will be to the benefit of developmental psychology if we can finally overcome his persona, his ill-advised extremism, and the unproductive caricaturing of both in favor of a greater understanding and appreciation of the roles that learning and experience play in behavioral development. The data, if not human tolerance, ought to push us in that direction.

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