New Directions in Behavior Development / edited by Sidney W. Bijou and Emilio Ribes

192 pp. Hardback. ISBN 1-878978-24-1

Gewirtz, J. L., & Pelaez-Nogueras, M. (1996). New Directions in behavioral development. In S. W. Bijou and E. Ribes (Eds), pp. 15-34.

Chapter 2

In the Context of Gross Environmental and Organismic Changes, Learning Provides the Main Basis for Behavioral Development

Jacob L. Gewirtz
Martha Pelaez-Nogueras
Florida International University

In this paper, we outline the features of a behavior analytic approach to development and discuss some associated issues in developmental psychology. Wherever possible, we also contrast details of the behavior-analytic approach with those of the modal, we shall here term it "traditional," approach to development as well as to other approaches. In the traditional approach, the conception of development depends entirely on identifying the behavior changes that vary with gross units of chronological age. With Werner (1926, 1957) and Piaget (1952, 1964, 1983) as exceptions to the rule, the traditional behavior-change-with-age approach does not specify how to deal with the gross sequential changes in behavior systems that they take to comprise the corpus of behavioral data denoting development. Further, the traditional approach, and Piaget-based approaches like Bjorkland's (1989), have considered relevant *neither* the search for changes in the controlling environment that might be associated with the behavior changes that denote development to them nor the ways of changing the course (or rate) of behavioral development by environmental manipulations that facilitate or inhibit that course.

The Nature of Development

The behavior-analytic approach to the study of behavioral development has differed dramatically from approaches to development that have defined relevant developmental changes to be those associated with gross changes in *age*. At times, this fundamental difference has led to behavior analysis, with its emphasis on development-as-learning, being put beyond the pale as "nondevelopmental," as has been the frequent fate also of other nontraditional approaches to development like that of Heinz Werner (1926, 1957). (In Werner's theory, development is not an area of study but a way of studying phenomena. Thus, development is comprised of a set of issues or questions that researchers raise about the phenomena they study.) Behavior analysis has also considered development differently from the mainstream

pproaches that have focused on gross age differences. Its way of studying develop-ıental phenomena is via the use of learning paradigms (primarily that of operant earning) with their derivative and associated principles and processes.

The focus of the behavior-analytic approach has been termed "merely learning, ot development" by those who favor the age-correlated mainstream or other raditional approaches. Thus, some traditional child-development theorists have ontrasted *development* with *learning*, arguing that while both development and earning are reflected in changes in behavior over time, *development* unfolds sponta-eously, occurs over a broad range of behavior, and typically occurs over relatively ong time segments, with response-contingency stimulation playing no role or a inimal role; whereas *learning* is not spontaneous but environmentally determined, ıvolves narrowly-focused behaviors and specific stimulus conditions, and typically ccurs over very short time segments. Based on these arguments, the traditionalists ave concluded that the operant-learning approach is not a legitimate method for ie study of organismic development. This conclusion is, to say the least, paradoxi-al, for few would deny that environmental factors play some role in development nd, it is clear, that the operant-learning paradigm can focus the systematic effects f environmental factors on the developing-organism's behaviors more efficiently ıan any other approach to behavioral development.

It is recalled that, under the more traditional views, normative, often large, age nits are employed to facilitate identifying the behaviors that comprise "develop-ıent." A corollary of this age-validating logic is that behavioral development must ecessarily be slow. This is because the major behavior changes that qualify as evelopmental change would be more likely to be detected in terms of long rather ıan short units of time. Another corollary of this usage is to delegitimize the otential-relevance of the results of process-oriented conditioning paradigms that rganize behavior change efficiently in very short time segments. This is paradoxical, or the behavior changes involved can be analogous, or very similar, to those ehavior changes validated against the gross-time-unit metric that is conventionally aken to denote development. At other times, the argument is that learning provides roblematic leverage on development insofar as, being a function of specific xperiences, it is difficult to predict what a particular child will learn and when that earning would occur without knowing individual details (e.g., Bjorkland, 1989). In ther words, by ignoring potentially relevant idiosyncratic environmental influ-ıces, such theorists necessarily emphasize the gross understanding of behavioral evelopment. In contrast, taking such experiential factors into account would ermit the developmental picture to be organized more precisely and completely.

As will be seen in this paper, principles based on age as the sole index of the assage of time (e.g., critical and sensitive periods) must inevitably be weak in ccounting for development, as reflections of the reality that process theories in sychology have had no place for age as such, except as a "space," as it were, in which rocess variables can operate sequentially to produce their effects in behavior. In eneral, behavior theorists also have a position regarding development. The

behavior-theory idea is that development is comprised of changes in behavior effected by consequences that combine and build on each other to become "hierarchically organized." As has been indicated, in practice the methods of research under the behavioral conception of development typically reduce to the use of learning procedures. In the laboratory, rapid sequential changes in behavior have been demonstrated in very short time spans–behavior changes that are analogous to those that are validated against relatively gross-time-unit changes that conventionally denote development for the traditional developmental approach. That such rapid behavior changes can be implemented in itself, however, falls short of explaining the organization of the systematic behavior changes (behavioral skills–motor, social and cognitive) that encompass "development" for behavior analysts.

For the most part behavior analysts have focused on the principles and processes underlying behavior, and not on either the organization and content of progressive behavior changes or the increasing complexity of the patterns of controlling stimuli (Gewirtz & Pelaez-Nogueras, 1992c; Schlinger, 1992). Although at present no contemporary approach deals with development in an ideal fashion, the case is made in this paper that behavior analysis handles the matter as well as, or better than, the existing heterogeneous array of approaches to development. Behavior analysts have approached development as derivative from the principles of operant learning in the context of gross environmental and organismic changes, the main vehicle used by behavior approaches to relate environmental (stimulus) determinants to systematic behavior change. This behavior-analytic focus is analogous to the extra-developmental focus of Heinz Werner's approach to organismic development (mentioned earlier and to be discussed in a subsequent section).

Directional Criteria for Development

The directional criteria usually employed for development, such as increasing behavioral adaptiveness and complexity, are arbitrary. Relevant indices of these criteria will vary with contextual variables, and the segment of the life span being considered. For example, behavior changes in infants may be scored in a different, even opposite, way from behavior changes in the elderly. In addition, measures of adaptiveness and complexity of behavior may not intercorrelate. Moreover, implicit in the concept of development as it has often been used is the assumption that behavior change is *irreversible*.

The assumption that advances in developmental level with age are reflected only in the direction of increased complexity of behavior systems is in error. For instance, holding stimulus level constant, some members of response classes that are complex (containing undifferentiated and many response components) may be shaped into differentiated, and simple, efficient response classes by consequences. Thus, the direction of systematic developmental change often may be from the "complex" to the "simple" and not from the "simple" to the "complex" and, thus, may run counter to what is conventionally considered to be a developmental advance. Similarly, holding the response level constant, a child's repeated exposure to a gross stimulus

complex may result often in the child selecting out the salient stimulus elements. Hence, while the child's response classes steadily increase in efficiency by coming to be controlled by fewer and simpler stimulus elements, s/he will attend decreasingly to irrelevant elements of that stimulus complex. Here, too, what is often termed development may reflect changes in the direction of simplifying (rather than making more complex) the stimuli controlling a behavior system.

A Behavior-Analytic Approach to Development

Due to the operational-research conception and the variegated body of research of B.F. Skinner (1935, 1938, 1953), the work of Keller and Schoenfeld (1950), and numerous others, a massive body of conceptional and research literature on operant learning has accrued involving the behavior of many species. Pioneering developmental psychology within the behavioral approach, Bijou (1976, 1979), Bijou and Baer (1961, 1965, 1978) and Gewirtz (1956, 1961, 1969, 1978, 1992) have employed operant principles and methods to organize and investigate infant learning and development. These researchers have approached infant behavioral development as the result of progressive interactions between the behavior of the infant and the sequences of discriminative and contingent stimuli produced by the environmental events comprising its functional environment. A substantial sub-body of this research literature has accrued on the operant conditioning of diverse behaviors of human neonates, infants, and children, involving numerous types of environmental contingencies (Gewirtz & Pelaez-Nogueras, 1992c). This literature on human young has demonstrated that response*learning* can: (1) occur efficiently and rapidly (in brief time segments); (2) reflect efficiently moment-to-moment changes in environmental units; (3) be facilitated or inhibited by contextual/setting factors; and (4) provide an effective basis for organizing discriminated operants and their controlling conditions under a number of headings, some metaphoric like "attachment" (see, e.g., Gewirtz & Pelaez-Nogueras, 1991).

The power and efficiency of the operant-learning paradigm can provide a clear model for the study of human development, if only to provide a basis for determining which of the behavior changes denoting development are, and which are not, susceptible to learning effected by environmental contingencies. In addition, learning operations can put into focus those contextual/environmental factors that can raise or lower the efficacy of stimuli for behavior and, in that way, inflect the course of human behavioral development.

Conventional theorists of development have used complex, sometimes unparsimonious, constructs to order the overlapping developmental areas of cognitive, social, and personality psychology. They have often used such global concepts as behavior "traits" (e.g., introvertive/extrovertive, inhibited/uninhibited) to summarize behavior patterns through lengthy time spans while ignoring environmental-context variables (e.g., Bates, 1980; Kagan, Reznick, & Snidman, 1986). In contrast, a behavior-analytic approach to development calls for a finer-grained analysis of stimulus structure and function, response structure and function, their

interchange at particular moments, and the sequences of *interactions* across succe sive moments of time. A behavior analysis of development interests itself not onl in the principles and processes responsible for the changes observed in behavior, bu also in the different directions, speeds, and contingency arrangements that resu from the organism's behavior-environment interactions.

The laws governing infant development should in no way differ either in gener flavor or detail from the laws governing other psychological sectors in whic behavior change provides the dependent variable. In behavior analysis, the ter "development" is an abstraction for systematic sequential changes among response and stimulus functions for an individual, specifically between behavior and enviror mental contingencies in interaction. More particularly, "development" refers t those progressive, orderly changes in the organization of stimulus-behavior rel tions. In this frame, it is noted that much of what looks like spontaneous develo ment might depend on teaching practices arranged in an order by a society or cultur (Baer & Rosales-Ruiz, this Volume).

To understand the behavior-change processes denoting development, analyse are required for: (1) changes in the complexity of the controlling environmen including the origins and changes in discriminative and reinforcing stimuli fc infant/child behavior; (2) early experiences as potential determinants of late behavior systems; and (3) contextual variables that affect the functional relation among stimuli and responses.

Analyzing Changes in the Controlling Environment

By focusing on the environmental events, namely those providing discrimin tive and reinforcing stimuli that have a functional relation to behavior, a function approach to development can indicate ways in which environment is capable c shaping the changing capacities of the infant and child and thus maximize o optimize development of behavior classes in such important traditional areas as th cognitive, the emotional, and the social. Likewise, behavior analysis can describe th way in which the organism affects its environment (for instance, its mother' behavior), taking into account the ever-changing interaction between the two.

Behavior changes often can be accounted for by the increasing complexity c the stimulus patterns that acquire control over behavior. For example, upon hearin a sound, an infant may initially orient its head in the sound's general direction (i which its mother is usually found), but eventually the infant will respond this wa only to particular sounds appearing at certain times and/or in conjunction with variety of other stimuli. Thus, the discriminative stimulus for the infant head turning response has changed, while the unitary head-turning response it control remains unchanged. And, systematic increases in the behavioral complexity of more experienced child (one more advanced developmentally or operating at "higher stage") may be due primarily to systematic increases in the complexity o stimulus-control features of the environment. In this way, the developmental leve ofia child's response systems is determined, in part, by the range or complexity o

the functional stimuli experienced (cf., e.g., Vince, 1961). An illustration of this type of analysis is the work of Etzel (this Volume) on the hierarchies of elements in the learning of complex visual-auditory stimuli in the development of conceptual behavior.

In addition, an analysis is necessary of the origins and changes in reinforcing stimuli as a function of the role those stimuli play in behavior. At successive points in development, it remains an empirical question which of the myriad potential stimuli function as unconditioned or conditioned reinforcers for infant behavior. It appears that a very large variety of events can function as positive reinforcers of behavior. These include sensory stimuli provided through diverse tactile, olfactory, taste, auditory and visual receptors, including those consumables that are thought to meet organismic needs (food, water). Further, a variety of contingent removals of aversive events such as of those conditions that produce pain, cold, and wetness, those that are very bright or very loud, and those that involve strong cutaneous stimulation, can function as negative reinforcers of diverse responses in early life. Moreover, some of these events can support the occurrence of avoidance or escape responses. Whether physical (occurring naturally, like thunder or rain), chemical (acting at a distance, like odor), or organismic (biological, like those associated with puberty) in nature, occurring alone or in combination, such stimulus events are directly involved in the processes of behavioral development.

As the child's behavior repertoire increases and comes under more differentiated stimulus control, some of these potential reinforcing stimuli may drop out functionally to be superseded by others, or their capacity to function as discriminative or reinforcing stimuli may change. The nature of the event patterns constituting the reinforcing properties of certain stimuli may change, sometimes drastically, as the child moves from one capacity "level" to a more advanced one. For example, the social-reinforcing stimulus of attention produced by the parent may be superseded in salience for the child's responses by that of verbal or facial-cue-provided approval from the parent for successively more complex or mature child performances. This can occur in restricted settings in which the parent's approval mediates the delivery of most of the important reinforcing stimuli for the child. Thus, a developmental analysis would benefit from an examination of changes in the efficacy of reinforcing stimuli for different child behaviors in the context of changes in the receptor and effector capacities of the child due to sequences of early experiences.

Analyzing Early Experiences as Determinants of Later Behavior Systems

Development results from the changing organization of behaviors in the individual's repertory into new ones. Let us define relevant experience as environmental contingencies for particular behaviors. The assumption that later experience builds upon the results of early experience does not apply uniquely to the young child. It may hold for *any* time segment in the life of an individual. There are several

reasons why early experience may influence the development of behavior systems later in the life course:

First, some structural biological systems underlying behavior systems appear to require stimulus input to become or remain functional. Physiological development depends also on the interaction between the individual's physiological systems and its environment. For example, a physically-developed eye may not be functional until it has been exposed to the light (Hinde, 1966). There is a valid place for diverse research strategies and tactics directed to the biological substrate of molar receptor and effector functions, and to coordinating such variables with molar behavior. Because changes in physiological systems and in behavior systems occur both in early and in later segments of the life span, the principles governing early behavioral development should be no different from the principles governing later behavioral development. Further, while certain kinds of stimulation may be required early in life to make functional certain physiological systems, routine stimulation may also be required throughout life to maintain the functioning of these and other systems.

Second, many behavior systems of an individual depend directly upon the previous acquisition of component response systems during infancy. There is a dependence of later-developing skills on those acquired earlier. For example, all forms of ambulatory behavior require the earlier acquisition of the ability to stand while maintaining balance. Also, to be able to divide in arithmetic, a child must learn first how to add, subtract, and multiply. An infant in the first phase of life has had relatively little cumulative commerce with the environment. Thus the context for the impact of experience on the younger child's behavioral development will be different from that of a later phase of development in which s/he has had both more cumulative experience and the necessary skills for new learning.

Third, certain more advanced, later-appearing behavior systems should be established better when supported by behavior systems learned and maintained in early life (such as involve eye contact, visual following/orienting, smiling, and vocalizing). Subsequently, these behaviors can become the elements that comprise the basis of diverse response complexes and sequences. The individual's behavior changes continuously due to experiential and organismic factors, and therefore learning processes may vary throughout the life span. Later development, with all its complexities, is necessarily related to these early experiences and existing behavior. These processes underpin the notion of continuity or consistency of environmental input over time (that is addressed in a later section).

Analyzing the Contextual Determinants of Behavioral Development

Contextual setting factors inflect various antecedent and concurrent stimuli affecting behavior (e.g., as would inhibitory or facilitory processes). They also affect the interplay between stimuli and response functions. Indeed, the probability of learning at any given moment, even within a narrow segment of the life span, may vary with any of the contextual setting factors that are operating. Various researchers have dealt with these variables under different headings, for instance: "third

variables" (Skinner, 1931), "setting factors" (Kantor, 1946), "setting events" (Bijou & Baer, 1961; Bijou, this Volume), "state" and "potentiating" variables (Goldiamond & Dyrud, 1967), "historical context" and "current context" (Morris 1988; 1992); "contextual determinants" (Gewirtz, 1972), "establishing operations" (Michael, 1982), and "initial and boundary conditions" (Marr, 1993).

Rather than take context as a source of variation and hold it constant–which has been a frequent operation within behavior analysis–Morris (1988) has proposed that historical and contemporaneous context should be a subject matter for experimental analysis. Knowledge of phylogenic history (i.e., species-typic boundaries and preparedness in biological structure/vulnerability and behavioral function) and ontogenic historical causation (individual-typic boundaries and preparedness in biological and behavioral form and function, and variability in both) is fundamental for a complete understanding of behavior. The *structure* of the current context involves the biological organism (i.e., the child's anatomy and physiology), the environment (physical ecology), and the changes and variability in both. The *function* of the current context potentiates or actualizes the functions of stimuli and responses for behavior. The function of stimuli for responses involves the analysis of variables such as deprivation, fatigue, and drug effects–conditions that alter functional relations within the three-term contingency (Morris, in press).

Problems with Maturation, Critical/Sensitive Periods, and Demographic and Chronological-Age Variables

Age: The "Empty" Variable

It was noted earlier that a salient aspect of traditional developmental psychology is that many researchers have oriented primarily to identifying those behavioral changes in the child that vary with gross changes in its chronological age, and have termed their area of interest "developmental." As a descriptive, classificatory, or summary variable, with large enough time-segment units, the age of an individual in fact can index average levels or sets of responses to be found in groups of individuals who share age, and in that way could provide summary information. Thus, researchers may sometimes find it practical to use age units as efficient proxies for individual repertoires containing particular behaviors or skills that are preconditions for individuals serving as subjects in a study. Further, there are times when chronological age can order changes in behavioral development reasonably well in *preliminary* analyses under process theories (Gewirtz, 1992), as when:

(a) cultural rules dictate rigidity that certain contingencies for specific behaviors be provided at particular age points;

(b) age groups representing wide life-span segments may appear to be associated with very different portions of an independent-variable dimension so that using such groups in early work could constitute a tactic to increase the range of instances along the independent-variable dimension, thereby facilitating finding functional relations in which the independent variables could, in principle, account for increased dependent-variable variance;

(c) a phenomenon of interest may seem to occur differentially in a particular life-span segment, and work with individuals in that segment would hold the promise of leading to the identification of the underlying process(es) operating across life-span segments; and/or

(d) stimuli provided by, or associated with, gross segments of the life span function as cues for the behavior of others (e.g., in some societies the aged are venerated and/or the very young thought charming).

In this frame, Skinner (1953) has made useful observations about the uses of chronological age as independent variables:

> When changes in behavior extend over long periods, we speak of the independent variable as the age of the organism. A response may appear at a given age and later disappear. The increase in probability as a function of age is often spoken of as maturation. We achieve some degree of prediction by discovering these developmental schedules...[But] individual differences may be great; we cannot predict accurately when an individual will engage in certain kinds of sexual behavior by establishing the average age onset in a population. Usually, therefore, practical problems of this kind are not solved by appeal to schedules of maturation...chronological age may be of little value in determining readiness. The presence or absence of the relevant behavior may have to be determined by direct observation of each child (p. 156).

Principles based on the simple passage of time, i.e., chronological age, inevitably must be weak in accounting for development, as simple reflections of the reality that such process theories as we have had in psychology that are oriented to process (e.g., Freud, 1905/1938; Piaget, 1936/1952, 1983; Werner, 1948), in addition to that of Skinner (1938, 1953), have had no place for age as such. (An exception is the stimulus value of gender for Freud and of gross life-span segment category membership for some others.) The lack of focus by such process theories on chronological age results from the fact that, by its nature, chronological age is unable to provide the conceptual leverage required for detailing the processes that can account for behavior, behavioral development, and/or individual differences in behavior. For instance, whichever process theory is employed, identifying the underlying process variables would require a detailed analysis of the sequential features of environment-behavior (organism) interaction (i.e., relevant experience). This point would hold even for tests of genetic hypotheses, for the effects of genotype must be manifested in environmental contexts.

Age does not provide the relevant information, as the paucity of its usage by process theories attests. To detail this point, *age-as-time* can be seen as an *empty variable* insofar as it constitutes merely the "space" in which features of the environment and of the genome can interact with the individual's behavior, with the resulting process variables operating to produce their effects in differential behavior outcomes (phenotypes). Thus, age as such has no explanatory value for the behavior of an individual (Baer, 1970; Gewirtz, 1969, 1978; Schaie & Hertzog, 1985).

This point can be illustrated in two ways. *First*, let us examine those studies in which operant-conditioning procedures have been employed with target responses for which age norms have been available in the developmental literature. Typically, the behavior criterion levels for such target responses are reached many months *earlier* than the normative age levels for those behavioral skills found in that literature. For example, in the work of Gewirtz & Pelaez-Nogueras (1991, 1992a), the operant training of infant protests during maternal departures and separations was implemented by mothers orienting and otherwise responding contingent on those protests. As a result of such positive reinforcement, six-month-old infants exhibited cued-protest rates as high as, or higher than, rates that Schaffer and Emerson (1964) identified in infants at 11 to 12 months. The same phenomenon was observed in an experiment on infant social referencing (Pelaez-Nogueras, 1992). Infant referencing behavior attained criterion levels at 4 months of age, many months earlier than the age-norm levels found in the child-development literature.

And, *second*, let us consider how parents have received precious little help from the way age serves as "cause" in the popular and professional literature for parents on the management of their children's problem behaviors. Age-associated behavior problems tend to be listed in that literature with the advice that the child will "grow out of them," meaning that, with time, the problem behaviors will be reversed. Typically, in that literature little or no account is taken of how caregiver responding can cause, i.e., shape and maintain, children's problem behaviors, such as in the case of attachment and infant separation protests (Gewirtz & Pelaez-Nogueras, 1987, 1992a, 1993).

These examples flesh out the point that it is not chronological age/time as such but the *processes* that can occur within time, wherein environmental variables affect the orderly, progressive, and increasingly complex behavior changes that imply development. We have contrasted this view with the traditional notion in developmental psychology that it is the behavior changes associated with conventionally-employed age units that comprise the content of child development. A case in point is the publication on the development of children's thinking by Bjorkland (1989). He declared that: "all children go through development in approximately the same way at approximately the same time" (p. 4). It is seen that traditional developmental theorists like Bjorkland deemphasize not only behavior consequences but even intrasubject and intersubject variation.

Demographic Variables Other than Age

In the same frame, non-age *demographic-variable* categories have been, and can be, employed as causal variables in analyses of development. Almost identical arguments to those that have been applied to the hollow-variable character of chronological age would impeach the use of such demographic categories as independent, process variables in the analysis of organismic development. For instance, let us assume that a process theory is the basis of an empirical analysis. A problem is posed when, instead of direct assessments of putative causal variables

(that typically would involve cumulative features of behavior-environment interchange), demographic categories are employed as independent-variable proxies. Then, ad hoc speculative assumptions are advanced about the implications of those demographic categories for the proximal causes, in advance of doing the research as well as in *ad hoc* explanation of the research results, to compensate for the failure directly to assess those putative causes.

No matter how sophisticated the statistical designs used in such studies carried out under the aegis of a process theory, when demographic categories are employed as independent variables scientific resources and opportunities are squandered. Finally, reports based on demographic "treatment" variables do not qualify as adequate and proper and should be labeled as the *essays* that they are (Gewirtz, 1992, October).

Maturation

Traditional theorists have stressed the study of sequential, often rapid, behavior changes comprising infant development because they assume a unique dependence of those changes upon gross changes in body structure, while often failing to note that gross biological changes can also occur during other life-span segments (e.g., Munn, 1965). Typically, those traditional theorists do not assess, much less have theories about, the biological changes to which they have attributed causal power over the overt behavior changes. Thus, when topographically-complete behavior or even a primitive approximation of a response appears *suddenly* in the child's repertory, with or without an identified stimulus basis, that change is often attributed to a process termed "maturation." Maturation is seen as the innately-determined unfolding with age-as-time of a gradual plan of development based on *unindexed* biology and (seemingly) independent of experience.

Indeed, some behavioral changes in the infant may appear to the untrained observer to be so rapid as to seem unlearned. Such sudden appearances of response in the infant repertoire that seem not obviously to have been taught or learned are often attributed to maturation as cause (and given as evidence against environmental factors playing a role or of the behaviors in question having a learned basis). But the sudden appearance of "novel" behavior may often be due to very rapid learning processes or to other factors underlying the behavior change, like a rapid increase or decrease in the child's stimulus threshold ("capacity"). These and other bases for change are often unnoticed by the observer. The premature labeling of effects unexplainable under a given posture as due to maturation is unwarranted because it explains little and may obscure much. The introduction of the maturation concept to account for behavior variations not readily explained may preclude the search for causal explanations in the principles and processes responsible for the observed change. The specification of the interrelation between stimulus and response functions in context is often omitted, especially when *un*accompanied by a systematic focus on environmental contingencies that may affect the behavior.

Critical Periods

A similar age-qua-time problem presents itself when the concepts critical period and sensitive period are invoked to justify age-related learning/training or intervention. A critical period refers to a time span in the individual's early life during which the capacity to acquire certain behavior systems is assumed irreversibly lost if relevant experience (i.e., stimulation) is not provided. It has been assumed also that, during critical and sensitive periods, relatively large or rapidly-occurring behavioral effects can be produced by *less* environmental stimulation or fewer stimuli than would be required to produce such effects in other time segments, if such effects could be produced at all in those time segments. These time segments are often specified imprecisely ("around six months") or broadly ("the last quarter of the first year"). For instance, the attachment process starts "around 6 months" (Schaffer & Emerson, 1964); there have been casually-documented notions that infants cannot acquire attachments to an adult after "about 9 mos." if they had not acquired one earlier, and/or that they display an "8-mos. anxiety" (e.g., Spitz, 1950); and responses denoting the infant social-referencing process begin "at 8 to 9 months of age" (Campos, Barrett, Lamb, Goldsmith & Stenberg, 1983).

Researchers who employ conceptions like maturation, or critical period or sensitive period may attend only casually to potential experiential learning factors. A critical period may reflect merely the failure of researchers to note the appearance of the behavior outside the age limits within which it earlier appeared. One reason may be that such age-linked notions depend on the samples of individuals and conditions that just happen to be surveyed, and may index merely sampling limitations. Another reason may be the lack of systematic longitudinal observations of the developing response within each individual subject across lengthy time spans.

The important message is that *any* age-defined concept is limited because it ignores the underlying process variables that require a detailed analysis of the sequential features of environment-behavior (organism) interaction. Once the processes through which cumulative experience can affect behavior systems are analyzed, we expect that age-linked critical and sensitive periods would lose even the modest precision that, at first glance, their time limits might suggest. Finally, the specification of environmental contingencies and contextual variables that either prevent the acquisition of a behavior system or give it the appearance of "irreversibility" (an issue discussed earlier) would impeach further the utility of a critical- or sensitive-period concept.

Some Issues in Development

Continuity vs. Discontinuity in Behavioral Development

Cognitive-developmental theorists such as Piaget (e.g., 1952, 1983), have conceived development to be discontinuous, an emergent, unfolding process. In contrast, a strong assumption underlying behavior-analytic approaches to development is that, with discriminative and reinforcing-stimulus continuity, there will be behavioral continuity (subject to topographic changes in behavior resulting from skill development). Behavioral continuity should be the case even while there may be times when topographic changes in responses due to such factors as skill enhancement may interact with ongoing contingencies to produce what, at first glance, may give the appearance of discontinuous changes. As in fields like embryology, large changes may occur relatively rapidly but it is always possible to demonstrate the continuity of the process, say of caterpillar to butterfly. Apart from this point, continuity or discontinuity of behavior should be detected depending on the metric of the units of observation employed. The more gross or large the units of observation, the more likely would be a finding of behavior discontinuity; the more fine or small the observation units, the more likely would be a finding of behavior continuity (Gewirtz, 1979, July).

In the context of behavior analysis, therefore, it is not constructive to make much of the issue of whether developmental change should be characterized as continuous or discontinuous. Where continuity refers to different levels of development being regulated or resulting from the same fundamental behavioral principles or contingencies, it is expected that there be continuity across behavioral development. In passing, it is noted that Morris (1988) has viewed behavioral development as a discontinuous process, but only in the technical sense that the behavioral structure of functional relationships undergoes qualitative (novel, discontinuous) reorganization with *each* interaction.

Qualitative vs. Quantitative Behavior Change

An issue overlapping the issue of the continuity versus discontinuity of behavior is that of quantitative versus qualitative behavior change. The distinction between qualitative and quantitative changes is often difficult to detect because it is also at least in part a function of the metric employed. To talk about qualitative changes, there must be clear criteria of what is meant by changes in "kind" or "type" (Marr, personal communication, March 17, 1992). An observer may not be able to detect step-by-step changes in quantity and topography of response and, thus, any observation made of a suddenly-appearing "new behavior" may lead the observer to conclude that a novel response has emerged, when in reality that "new" response is just one step forward in a continuous sequence of responses linked to one another. It is often difficult, and for many purposes irrelevant, to specify if this change has been qualitative or quantitative, as shaping and chaining procedures may be responsible to a large degree for apparent quantitative changes, and also for so-called "qualitative changes" in behavior. Because the child's behaviors are continually being shaped as the child's changing capacities permit, discrete behaviors become linked and organized to form complex, even elaborate, developmental systems.

We now summarize the two preceding themes of continuity vs. discontinuity and of qualitative vs. quantitative behavior change. In traditional developmental psychology, whether behavior patterns are found to be continuous or discontinuous across time, should depend on the metric of observation used. The more micro

analytic the observation and time units, the more likely a continuity conclusion; and the more macro analytic those units, the more likely a discontinuity conclusion. Thus when development is studied by comparing behavior patterns at distant time points, one may note only *qualitative* behavior changes; on the other hand, if the unit (metric) of observation is sufficiently detailed in time to permit a fine-grained analysis of the functional relation of the behavior unit and its discriminative and reinforcing controlling stimuli, one may detect only *quantitative* behavior changes.

Behavior Irreversibility in Life Settings

A major source of variation in development among individuals results from differences in their reinforcement histories of their behaviors that led to the organization of different behavior systems. More advanced developmental systems can be maintained by the same or similar stimuli that maintained the earlier acquired responses. That is one reason why behavior(s) (systems/patterns) acquired early in life may become pervasive and may often appear "permanent" and "irreversible."

The problem is that the assumption that behavior changes are "irreversible" is implicit in the traditional concepts of development. This notion is, of course, incompatible with routine behavior-change findings in such areas as learning, memory, and perception. Further, behaviors that often appear irreversible should eventually extinguish if the contingencies maintaining them were removed. Thus, the "strength" of a behavior is due characteristically *not* to its "irreversibility,' but rather to the *locking in* of the environmental contingencies that maintain the individual's behavior. The result is that, to the untrained observer, from the earliest acquisition point onward these maintaining contingencies might not even appear to be operating. Further, in this locking-in process, the appearance of irreversibility of some behavior systems could result simply from the transfer of stimulus control from the initial sets of maintaining stimuli to different sets of stimuli. To the untrained observer, this transfer of stimulus control might not appear to be operating (Etzel & Gewirtz, 1967; Gewirtz, 1967).

A Note on Piaget's Approach to Development, Environment, and Predictability

Piaget's approach is clearly the basis of Bjorkland's (1989) conceptualization of development:

> Development refers to changes in structure or function over time...has its roots in biology, and its course is relatively predictable...[and] changes between stages of development are said to be *qualitative*...of type or kind...[and not] *quantitative*...of amount or speed. Shifts from one stage to another are theorized to occur abruptly, reflecting *discontinuity* rather than *continuity* in development...Stages require that children's abilities be highly integrated within a stage (p. 14).

Piaget's (1936/1952, 1964, 1983) constructivist theory has not often been classified with environmental-control (like learning) theories, and Bjorkland very likely would not see it as one. Yet, Piaget's theory can be seen as an environmentally-

oriented developmental theory. This grouping is possible even while Piaget characterized attempts to focus environmental manipulations for behavior (via training operations) with the goal of speeding up development as "the American disease." Piaget's comment was directed to demonstrations that conservation and similar tasks can be conditioned rapidly, earlier than when they would appear naturally. Even so, what is involved in such demonstrations are pockets of development/behavior change rather than the across-the-board change in an array of diverse various behaviors called for by Piaget's stage approach to development.

Independent of his stage approach, Piaget provided principles underlying developmental change and emphasized the hierarchical order in which behavior skills are organized. Using "structural"-environmental interaction concepts like *assimilation* and *accommodation* to inflect his theory's mental "structures" (that he termed "schemas"), Piaget has provided rough ways of organizing behavior changes denoting development to be the outcome of interactions between behavior and the environment. Thus, in an important sense Piaget's approach did take environmental factors into account. However, the approach was only loosely addressed to environmentally-induced behavior change. In this frame, his emergentist-constructivist approach can not deal with the prediction and control that a routine learning analysis handles readily with its focus on behavior and maintaining antecedent and consequent stimuli in context.

Thus, Piaget's general theory can not effectively predict behavior at any given point. At the same time, his stage approach cannot predict individual behavior change at all. But it can specify at which stage the individual's behavior patterns can be said to be. And his emergentist stage theory cannot predict, for instance, whether or not a child said to be in the sensory-motor stage would progress to the preoperational stage of cognitive development, or whether or not the child in the latter stage would progress to the concrete operational stage. Even so, Piaget's approach may provide useful information, such as which cognitive-developmental skills the child has acquired. And, in the ways discussed, it can be classified as an environmentally-oriented theory.

A Note on Werner's Approach to Development

To compare the behavior-analytic heuristic approach with that of Heinz Werner (1926, 1957; see also Glick, 1992) will be instructive. In Werner's approach, *development* is not an area of study but a way of studying phenomena. Development is comprised of a set of issues or questions that researchers raise about the phenomena they study. Thus, instead of targeting, as such, cognitive, language, or other development in humans (as routine developmental analyses have done), Werner would observe children's behavior in context and ask systematically if a separable and differentiated cognitive, language, or other "function" (Werner's term) existed (i.e., characterized child behavior patterns in environmental contexts). Werner's interest extended also to the levels of differentiation of particular functions from other functions, their independence, and the levels of intrafunctional organi-

zation at varying levels of interfunctional organization. Thus, for Werner *development* was not simply a history of a particular function at different levels of organization, and certainly did not involve a search for relationships between age levels and the "functions" on which he focused.

As a way of studying developmental phenomena, Werner's approach has differed dramatically from the routine approaches to development, in particular those that have defined relevant developmental changes to be those that are associated with gross age changes. This fundamental conceptual feature of Werner's approach has led also to his theory sometimes being put beyond the pale as "nondevelopmental" (as has sometimes also been the fate of the behavior-analytic approach to development). Like Werner's nontraditional approach to development, behavior analysis also approaches development differently. That way is to study developmental phenomena objectively via learning paradigms.

Summary

A functional behavioral approach to development has been emphasized here with a systematic focus upon antecedent and consequent stimuli that control behavior, contextual factors, and behavior-interchange sequences. These concepts with their underpinnings in well-established principles of behavior provide an efficient basis for organizing information in life settings about behavioral development (cognitive and social), and for interventions. The case was made that human behavior and development have shown themselves to be amenable to an operant-learning analysis, and that operant analysis has made it possible to move beyond the level of simple description of behavior to the level of identifying key processes that account for much of development. Further, operant analysis can be used to determine which behaviors denoting development could, and which could not, be susceptible to change via learning operations as well as to examine the learning basis, if any, of behaviors identified in descriptive accounts of child behavioral development. In this context, the laws characterizing or governing development should in no way be different either in general flavor or detail from the laws governing other psychological areas in which behavior change constitutes the dependent variable.

In behavior analysis, the term "development" refers to progressive, orderly changes in the organization of environment-behavior relations in the context of gross environmental and organismic changes. A functional analysis of infant behavior focuses on the many variables likely to be directly responsible for behavior change patterns denoting development. Thus, to understand behavioral development, analyses are required for: 1) changes in the complexity of the controlling environment (including the origins and changes in reinforcing stimuli for behavior); 2) early experiences as potential determinants of later behavior systems; and 3) the contextual variables involved, and their interplay in interactions among stimulus and response functions.

Because many studies have shown that operant procedures could produce rapid behavior changes in the child, they have become—for behavioral and nonbehavioral researchers alike—the preferred methods for studying processes that, otherwise, have been inaccessible by the traditional methodologies of nonbehavioral psychology. In this manner, the use of operant procedures and derivative methodologies has progressed enormously in the last four decades leading to an impressive advance in our knowledge of child behavior.

We have noted that the traditional and the behavioral approaches to development may differ more as value systems about what must be included or excluded than in terms of scientific issues. Hence, the pessimistic view is that these approaches may never be reconciled. The optimistic view is that traditional approaches to development would someday appreciate the power of a behavior-analytic approach to development and reconcile that focus with their own approaches to development.

References

Baer, D. M. (1970). An age-irrelevant concept of development. *Merrill-Palmer Quarterly of Behavior and Development, 16,* 238-246.

Baer, D. M., & Rosales-Ruiz, J. (In press). A behavior-analytic view of development. In S. W. Bijou & E. Ribes (Eds.), *New directions in behavioral development.* Guadalajara, Mexico: Editorial Universidad de Guadalajara.

Bates, J. E. (1980). The concept of difficult temperament. *Merrill-Palmer Quarterly, 26,* 299-319.

Bijou, S. W. (1976). *Child Development: The basic stage of early childhood.* Englewood Cliffs, NJ: Prentice Hall.

Bijou, S. W. (1979). Some clarifications on the meaning of a behavior analysis of child development. *Psychological Record, 29,* 3-13.

Bijou, S. W. (In press). The role of setting factors in the behavior analysis of development. In S. W. Bijou & E. Ribes (Eds.), *New directions in behavioral development.* Guadalajara, Mexico: Editorial Universidad de Guadalajara.

Bijou, S. W., & Baer, D. M. (1961). *Child development: Vol I. A systematic and empirical theory.* New York: Appleton-Century-
Crofts.

Bijou, S. W., & Baer, D. M. (1965). *Child development: Vol 2. Universal stage of infancy.* New York: Appleton-Century-Crofts.

Bijou, S. W., & Baer, D. M. (1978). *Behavior analysis of child development.* Englewood Cliffs, NJ: Prentice-Hall.

Bjorkland, D.F. (1989). *Children's thinking: Developmental function and individual differences.* Pacific Grove, CA: Brooks/Cole Publishing Co.

Campos, J. J., Barrett, K. C., Lamb, M. E., Goldsmith, H. H., & Stenberg, C. (1983). Socio-emotional development. In M. M. Haith & J. J. Campos (Eds.), *Handbook of child psychology: Vol. 2. Infancy and developmental psychobiology* (pp. 783-916). New York: Wiley.

Etzel, B. C. (In press). The development of conceptual behavior: Hierarchies of elements in learning complex visual-auditory stimuli. In E. Ribes & S. W. Bijou (Eds.), *New directions in behavioral development*. Guadalajara, Mexico: Editorial Universidad de Guadalajara.

Etzel, B. C., & Gewirtz, J. L. (1967). Experimental modification of caretaker-maintained high-rate operant crying in a 6- and a 20-week-old infant (*Infans tyrannotearus*): Extinction of crying with reinforcement of eye contact and smiling. *Journal of Experimental Child Psychology, 5*, 303-317.

Freud, S. (1938). Three contributions to the theory of sex. In A.A. Brill (Trans.). *The basic writings of Sigmund Freud* (pp. 553-629). NY: Modern Library, 1938. (Original published in 1905.)

Gewirtz, J. L. (1956). A program of research on the dimensions and antecedents of emotional dependence. *Child Development, 27*, 205-221.

Gewirtz, J.L. (1961). A learning analysis of the effects of normal stimulation privation and deprivation on the acquisition of social motivation and attachment. In B. M. Foss (Ed.), *Determinants of infant behavior* (pp. 213-299). London: Methuen (New York: Wiley).

Gewirtz, J. L. (1969). Mechanisms of social learning: Some roles of stimulation and behavior in early human development. In D. A. Goslin (Ed.), *Handbook of socialization theory and research* (pp. 57-212). Chicago: Rand-McNally.

Gewirtz, J. L. (1972). Some contextual determinants of stimulus potency. In R. D. Parke (Ed.), *Recent trends in social learning theory* (pp. 7-33). New York: Academic Press.

Gewirtz, J. L. (1978). Social learning in early human development. In A. C. Catania & T. Brigham (Eds.), *Handbook of applied behavior-research: Social and instructional processes* (pp. 105-141). New York: Irvington Press.

Gewirtz, J. L. (1979, July). *Continuity vs. discontinuity in development*. Paper presented at the biennial meeting of the International Society for Behavioral Development, Lund, Sweden.

Gewirtz, J. L. (1991). Social influence on child and parent via stimulation and operant-learning mechanisms. In M. Lewis & S. Feinman (Eds.), *Social influences and socialization in infancy* (pp. 137-163). NY: Plenum.

Gewirtz, J. L. (1992, October). Essays masquerading as proper research designs: On the uses of demographic independent variables in process analyses in psychology [summary]. *Proceedings of the First International Congress of Behaviorism and the Sciences of Behavior, 1*, 173-174. Guadalajara, Mexico: Universidad de Guadalajara.

Gewirtz, J. L., & Pelaez-Nogueras, M. (1987). Social-conditioning theory applied to metaphors like "attachment": The conditioning of infant separation protests by mothers. *Revista Mexicana de Analisis de la Conducta, 13*, 87-103.

Gewirtz, J. L., & Pelaez-Nogueras, M. (1991). The attachment metaphor and the conditioning of infant separation protests. In J. L. Gewirtz & W. M. Kurtines (Eds.), *Intersections with attachment* (pp. 123-144). Hillsdale, NJ: Erlbaum.

Gewirtz, J. L., & Pelaez-Nogueras, M. (1992a). Infants' separation difficulties and distress due to misplaced maternal contingencies. In T. Field, P. McCabe, & N. Schneiderman (Eds.), *Stress and coping in infancy and childhood* (pp. 1946). Hillsdale, NJ: Erlbaum.

Gewirtz, J. L., & Pelaez-Nogueras, M. (1992b). Infant social referencing as a learned process. In S. Feinman (Ed.), *Social referencing and the social construction of reality in infancy* (pp. 151-173). New York: Plenum Publishing Co.

Gewirtz, J. L. & Pelaez-Nogueras, M. (1992c). B. F. Skinner's legacy to human infant behavior and development. *American Psychologist, 47*, 1411-1422.

Gewirtz, J. L., & Pelaez-Nogueras, M. (1993). Leaving without tears: Parents inadvertently train their children to protest separation. *The Brown University Child and Adolescent Behavior Letter.*

Glick, J. A. (1992). Werner's relevance to contemporary developmental psychology. *Developmental Psychology, 28*, 558-565.

Goldiamond, I., & Dyrud, J. (1967). Behavioral analysis for psychotherapy. In J. Schlien (Ed.), *Research in psychotherapy* (Vol. 3, pp. 58-89). Washington, DC: American Psychological Association.

Hinde, R. A. (1966). *Animal behavior: A synthesis of ethology and comparative psychology*. New York: McGraw-Hill.

Kagan, J., Reznick, J. S., & Snidman, N. (1986). Temperamental inhibition in early childhood. In R. Plomin & J. Dunn (Eds.), *The study of temperament: Changes, continuities, and challenges*. Hillsdale, NJ: Erlbaum.

Kantor, J. R. (1946). The aim and progress of psychology. *American Scientist, 34*, 251-263.

Keller, F. S., & Schoenfeld, W. N. (1950). *Principles of Psychology*, New York: Appleton-Century-Crofts.

Marr, M. J. (1993) Contextualistic mechanism or mechanistic contextualism?: The straw machine as tar baby. *The Behavior Analyst, 16*, 59-65.

Michael, J. L. (1982). Distinguishing between discriminative and motivational functions of stimuli. *Journal of Experimental Analysis of Behavior, 37*, 149-155.

Morris, E. K. (1988). Contextualism: The world view of behavior analysis. *Journal of Experimental Child Psychology, 46*, 289-323.

Morris, E. K. (1992). The aim, progress, and evolution of behavior analysis. *The Behavior Analyst, 15*, 3-29.

Morris, E. K. (In press). Mechanism and contextualism in behavior analysis: Just some observations. *The Behavior Analyst.*

Munn, N. L. (1965). *The evolution and growth of human behavior* (2nd Ed.). New York: Houghton Mifflin.

Pelaez-Nogueras, M. (1992). *Infant learning to reference maternal emotional cues*. Unpublished doctoral dissertation, Florida International University, Miami.

Piaget, J. (1952). *The origins of intelligence in children*. (2nd. Ed.). New York: International University Press, 1952. (Original published in 1936).

Piaget, J. (1964). Cognitive development in children: Development and learning. *Journal of Research in Science Teaching, 2*, 176-186.
Piaget, J. (1983). Piaget's theory. In P. Mussen (Ed.), *Handbook of child psychology* (Vol 1, pp. 103-128). New York: Wiley.
Schaffer, H. R., & Emerson, P. E. (1964). The development of social attachments in infancy. *Monographs of the Society for Research in Child Development, 29*, (3, Serial No. 94).
Schaie, K. W., & Hertzog, C. (1985). Measurements in the psychology of adulthood and aging. In J. E. Birren & K. W. Schaie (Eds.). *Handbook of the psychology of aging* (2nd Ed.).
91). NY: Van Nostrand.
Schlinger, H. D. (1992). Theory in behavior analysis. *American Psychologist, 47*, 1396-1410.
Skinner, B. F (1931). The concept of the reflex in the description of behavior. *Journal of Genetic Psychology, 5*, 427-458.
Skinner, B. F. (1935). The generic nature of the concepts of stimulus and response. *Journal of General Psychology, 12*, 40-65.
Skinner, B.F. (1938). *The behavior of organisms*. New York: Appleton-Century-Crofts.
Skinner, B.F. (1945). The operational analysis of psychological terms. *Psychological Review, 52*, 270-277.
Skinner, B.F. (1953). *Science and human behavior*. New York: Macmillan.
Spitz, R. A. (1950). Anxiety in infancy: A study of its manifestations in the first year of life. *International Journal of Psychoanalysis, 21*, 138-143.
Vince, M. A. (1961). Developmental changes in learning capacity. In W. H. Thorpe & O. L. Zangwill (Eds.), *Current problems in animal behavior*, (pp. 225-247). Cambridge: Cambridge University Press.
Werner, H. (1926). *Comparative psychology of mental development* (2nd ed. 1948). New York: International Universities Press.
Werner, H. (1957). The concept of development from a comparative and organismic point of view. In D.B. Harris (Ed.), *The concept of development*. Minneapolis: University of Minnesota Press.

Chapter 3

Some Thoughts on the Nature of a Theory of Behavior Development and Its Application

Emilio Ribes
University of Guadalajara[1]

Although behavior analysts have dealt with developmental problems, it is difficult to say that there is a theory about the development of behavior. The only significant effort, that by Bijou and Baer (1961, 1965) in the sixties, consisted of a hermeneutic exercise combining categories formulated by Kantor (1924-1926) with the available knowledge about the "principles", or better said, the procedures related to the change of behavior. The absence of systematic thinking on the issue of the ontogenic evolution of behavior and the formation of individuality has been evident. It is surprising that a theory such as Skinner's (1953), based on operant conditioning and devoted to the analysis of behavioral change, never formally addressed the problems of the development of behavior in its own right. Although Skinner in *Verbal Behavior* (1957) presented the first-order verbal operants in a sequence suggesting a developmental course, including the concept of the minimal-unit repertoire, he never explicitly formulated an evolutive relationship among them.

As I have mentioned in my earlier writings (Ribes, 1985; 1986a), the operant conditioning theory has been accepted as a non-hierarchical taxonomy of behavioral processes. Two basic processes make up the classification of behavior: those related to the procedures of both respondent and operant conditioning (Skinner, 1938). Although it has been recognized that emitted behavior derives from respondent sources (Skinner, 1937; Segal, 1972), both respondent and operant conditioning framed processes supposedly take place in a common empirical domain, sharing the same logical geography regarding the conceptual levels of the theory. Operant and respondent behaviors are considered to be not totally incompatible, so their simultaneous occurrence is thought to take place in the form of an additive or multiplicative algebraic interaction (Estes & Skinner, 1941; Hearst, Besley & Farthing, 1970; Davis & Hurwitz, 1977).

In any case, from a developmental point of view, the relationship between respondent and operant behavior has been analyzed in two ways: (a) Respondent behavior is seen as the raw material from which operant behavior is shaped and