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CHAPTER 1

Theories of Human Development: Contemporary Perspectives

RICHARD M. LERNER

The editor of the third edition of this *Handbook of Child Psychology,* Paul Mussen, presaged what today is abundantly clear about the contemporary nature of theories of human development. Mussen (1970, p. vii) said that "the major contemporary empirical and theoretical emphases in the field of developmental psychology . . . seem to be on *explanations* of the psychological changes that occur, the mechanisms and processes accounting for growth and development." He thus alerted developmentalists to a burgeoning interest not in structure, function, or content per se, but in change, in the processes through which change occurs, and thus in the means through which structures transform and functions evolve over the course of human life.

Today, Mussen's vision has been crystallized. The cutting edge of contemporary developmental theory is represented by conceptions of process—how structures function and how functions are structured over time. Thus, as reflected in this volume, most contemporary theories of human development are not tied necessarily to a particular content domain—although particular empirical issues or substantive foci (e.g., motor development, successful aging, wisdom, extraordinary cognitive achievements, language acquisition, the self, psychological complexity, or concept formation) may lend themselves readily as exemplary sample cases of the processes depicted in a given theory.

Furthermore, the chapters in this volume illustrate that the power of contemporary developmental theories lies in their ability not to be limited by (or, perhaps better, be confounded by an inextricable association with) a unidimensional portrayal of the developing person (e.g., the person seen from the vantage point of only cognitions, or emotions, or stimulus–response connections; see Piaget, 1970; Freud, 1949; and Bijou & Baer, 1961, respectively). Thus, in contemporary developmental theories, the person is not biologized, psychologized, or sociologized. Rather, the individual is "systemized"—that is, his or her development is embedded within an integrated matrix of variables derived from multiple levels of organization, and development is

conceptualized as deriving from the dynamic relations among the variables within this multitiered matrix.

The theories represented in this volume use the polarities that engaged developmental theory in the past (e.g., nature–nurture, individual–society, biology–culture; Lerner, 1976, 1986), but not to "split" depictions of developmental processes along conceptually implausible and empirically counterfactual lines (Gollin, 1981; Overton, this volume), or to force counterproductive choices between false opposites; rather, these issues are used to gain insight into the integrations that exist among the multiple levels of organization involved in human development.[1] These contemporary theories are certainly more complex than their one-sided predecessors; however, they are also more nuanced, more flexible, more balanced, and less susceptible to extravagant, or even absurd, claims (for instance, that "nature," split from "nurture," can shape the course of human development; that there is a gene for altruism, militarism, intelligence, and even television watching; or that when the social context is demonstrated to affect development, the influence can be reduced to a genetic one; e.g., Hamburger, 1957; Lorenz, 1966; Plomin, 1986; Plomin, Corley, DeFries, & Faulker, 1990; Rowe, 1994; Rushton, 1987, 1988).

These mechanistic and atomistic views of the past have been replaced by theoretical models that stress the dynamic synthesis of multiple levels of analysis, a perspective having its roots in systems theories of biological development (Cairns, this volume; Gottlieb, 1992; Kuo, 1930, 1967, 1976; Schneirla, 1956, 1957). In other words, development, understood as a property of systemic change in the multiple and integrated levels of organization (ranging from biology to culture and history) comprising human life and its ecology, or, in other words, a *developmental systems perspective,* is an overarching conceptual frame associated with contemporary theoretical models in the field of human development.

Accordingly, the power of contemporary theories lies in the multilevel and, hence, multidimensional design criteria they impose on concepts (and research) pertinent to any content area about, or dimension of, the person. As illustrated by the above depiction of the multilevel, changing matrix representing the system involved in development, this power of a developmental systems perspective is constituted by four interrelated, and in fact "fused" (Tobach & Greenberg, 1984), assumptive components found in contemporary theories of human development: (a) change and relative plasticity; (b) relationism and the integration of levels of organization; (c) historical embeddedness and temporality; and (d) the limits of generalizability, diversity, and individual differences.

Although the four assumptive components frame contemporary theories of human development, each has a long and rich tradition in the history of the field (Cairns, this volume). For instance, Cairns describes James Mark Baldwin's (1897) interest in studying development-in-context, and thus in integrated, multilevel, and hence interdisciplinary scholarship. These interests were shared as well by Lightner Witmer, the founder in 1896 of the first psychological clinic in the United States (Cairns, this volume; Lerner, 1977). Cairns describes the conception of developmental processes—involving reciprocal interaction, bidirectionality, plasticity, and biobehavioral organization (all quite modern emphases)—as integral in the thinking of the founders of the field of human development. For instance, Wilhelm Stern (1914; see Kreppner, 1994) stressed the holism that is associated with a developmental systems perspective about these features of developmental processes. Other contributors to the foundations and early progress of the field of human development (e.g., John Dewey, 1916; Kurt Lewin, 1935, 1954; and John B. Watson, 1928) stressed the importance of linking child development research with application and child advocacy—a theme of very contemporary relevance (Zigler & Finn-Stevenson, 1992), and one to which I will return later.

Although, as noted, the concepts involved in each of the four thematic components of contemporary theories are interrelated, for purposes of explication I will treat each concept successively. The combined import of these four conceptual components has important implications for research and for application—for policies and programs—in human development. These implications, which will be presented after all of the dimensions have been discussed, allow the field of human development to contribute, through its theory-based research about the changing person–context system, good science and good service to

[1] I am indebted to William Damon for suggesting the points raised in this paragraph.

the diverse constituencies interested in enhancing the world's human and social capital (Hamburg, 1992).

CHANGE AND RELATIVE PLASTICITY

Contemporary theories stress that the focus of developmental understanding must be on (systematic) change (chapters by Brandtstädter; Bronfenbrenner & Morris; Csikszentmihalyi & Rathunde; Fischer & Bidell; Gardner; Gottlieb, Wahlsten, & Lickliter; Magnusson & Stattin; Overton; Thelen & Smith; and Wapner & Demick, this volume; Ford & Lerner, 1992; Sameroff, 1983). This focus is required because of the belief that the potential for change exists across (a) the life span and (b) the multiple levels of organization comprising the ecology of human development (e.g., chapters by Baltes, Lindenberger, & Staudinger; Bronfenbrenner & Morris; Elder; and Shweder et al., this volume; Baltes, 1987). Although it is also assumed that systematic change is not limitless (e.g., it is constrained by both past developments and by contemporary ecological, or contextual, conditions), contemporary theories stress that *relative plasticity* exists across life (chapters by Baltes et al.; Brandtstädter; Keil; Overton; and Spelke & Newport, this volume; Lerner, 1984).

Relative plasticity has important implications for understanding the range of intraindividual variation that can exist over ontogeny (Fisher, Jackson, & Villarruel, this volume) and, in turn, for applying developmental science. For instance, the presence of relative plasticity legitimates a proactive search across the life span for characteristics of people and of their contexts that, together, can influence the design of policies and programs promoting positive development (Birkel, Lerner, & Smyer, 1989; Fisher & Lerner, 1994; Lerner & Hood, 1986). For example, the plasticity of intellectual development, which is a feature of a systems view of mental functioning (see the chapters by Fischer & Bidell; Gardner; and Keil, this volume), provides legitimation for educational policies and school- and community-based programs aimed at enhancing cognitive and social cognitive development (Dryfoos, 1994; Villarruel & Lerner, 1994); such implications for the design of policies and programs stand in marked contrast to those associated with mechanistic, genetic reductionistic theories that suggest that genetic inheritance constrains intellectual development among particular minority and/or low-income groups (Herrnstein, 1973; Herrnstein & Murray, 1994; Jensen, 1969, 1980; Rushton, 1987, 1988).

Features of Plasticity in Human Development

T. C. Schneirla (1956, 1957), the renowned comparative psychologist, emphasized that behavioral differences among species could best be identified through analysis of their respective ontogenies. He suggested that species could be differentiated along a "stereotypy–plasticity continuum," a theoretical metric comparing the level of capacity for systematic changes, for behavioral variability, or simply, for plasticity, attained over the course of animals' life spans. The location of a species closer to the plasticity end of the continuum was associated with the *eventual* development in ontogeny of more complex behavioral repertoires and, according to Hebb (1949, 1980), with higher ratios of brain association fibers to sensory fibers (i.e., with higher A/S ratios).

Both Schneirla and Hebb stressed, however, that species capable of higher levels of eventual plasticity spend a comparatively greater proportion of their ontogenies developing this capacity than do species whose final level of development is marked by lower levels of plasticity and, thus, greater degrees of behavioral stereotypes (see discussions of neoteny by Csikszentmihalyi & Rathunde, this volume; Gould, 1977; Lerner, 1984). The key point of the Schneirla/Hebb position is, then, that plasticity is a developmental phenomenon.

Schneirla and his colleagues (e.g., Tobach, 1981; Tobach & Schneirla, 1968) argued that development involved neither a separate additive nor even a simple interactive interrelation of hereditary and environmental influences. Rather, a dynamic interaction (Lerner, 1978, 1986), a "fusion" (1986; Tobach & Greenberg, 1984), or a systemic synthesis across the levels of organization incorporating hereditary and environmental influences (Ford & Lerner, 1992), characterized the process of development. In other words, a developmental systems (Ford & Lerner, 1992; Gottlieb, 1992) conception of developmental process—for instance, as found in theoretical perspectives such as "developmental contextualism" (Lerner, 1986, 1991, 1996)—has been associated with animal comparative and human

developmental theory and research built on the tradition initiated by Schneirla.

From the perspective of this tradition, plasticity is a feature of an animal's functioning that occurs as a consequence of the history of dynamic interactions, or fusions, between the individual's organismic characteristics and the specific experiences it encounters over the course of its life. Within this view of the developmental character of plasticity, interspecies differences in plasticity arise in relation to differences among species in organismic characteristics as these characteristics influence *and are influenced by* the sorts of prototypical experiences they encounter in their "normative" ecological niche. Similarly, intraspecies, interindividual differences in plasticity arise in relation to differences among animals' organismic characteristics (e.g., their specific genotypes) as these characteristics influence and are influenced by their unique experiential history.

Accordingly, from the perspective articulated by Schneirla, Hebb, and others (e.g., Gottlieb, 1992; Lerner, 1984, 1991; Tobach, 1981; Tobach & Greenberg, 1984), the study of plasticity—whether directed to an analysis of inter- or intraspecies differences—always involves scrutiny of the history of dynamic organism-context interactions or, in more general terms, of the fused or systemic relations between nature and nurture. Thus, plasticity is not a product of nature (e.g., of genes in general or, more specifically, of a purported genetic program) or of nurture (e.g., a specific learning regimen, reinforcement program, or sequence of stimulation). Rather, the level of plasticity attained by an animal over the course of its life is an outcome of the *temporally changing and dynamic relation* of nature and nurture (Elder, this volume; Ford & Lerner, 1992; Lerner, 1984, 1991). Plasticity is, then, a feature of the process of development.

Other views of plasticity exist. For example, Brauth, Hall, and Dooling (1991) see plasticity as based on genetic programs that code for developmental processes but are themselves not involved in, or influenced by, development. Brauth et al.'s view is not dissimilar from that of Wilson (1975), who considered plasticity as being a fundamental outcome of a particular genetic complement or genetic structure (rather than, for instance, seeing genes themselves as plastic entities; Lerner, 1984). In the views of Brauth et al. or of Wilson, nurture (environment or experience) plays a secondary role in the chain of influences eventuating in plasticity. Nurture facilitates or inhibits the unfolding of the genetic program, but it does not interact, or fuse, with the genes themselves. Nurture thus cannot influence the quality of the purported program.

This position is represented in the contention of Brauth et al. (1991) that "proximate causal sequences are the immediate cause–effect sequences by which information in the genotype is 'read out' during development in the presence of environmental stimuli" (p. 1); in their assertion of "the fact that the genetic program's code for developmental processes is contingent on appropriate environmental stimulation" (p. 3); and in their belief that "the course of the individual development [sic] is determined by a set of complex interactions between environmental stimuli and genetic programs. In terms of this conceptualization, individual variations arise from epigenetic processes whose courses are both constrained by and facilitated by genetic mechanisms (i.e., they are canalized)" (p. 164). Accordingly, the experience an animal encounters is in essence only the "releaser" of an "instinct to learn" (p. 2), of "innate predispositions" (p. 8), or of "innate preferences" (p. 8) caused by genetic programs that, in turn, "result from differential reproductive success of individuals carrying particular phenotypes (i.e., from natural selection)" (p. 3).

The distinctions between the Brauth et al. (1991) genetic program conception of plasticity and the developmental systems view of this feature of development are perhaps most pronounced in the treatment afforded the topic of epigenesis in the respective conceptions. Both conceptions hold that epigenesis is involved in the development across ontogeny of the set of (increasingly more complex) behaviors that characterizes the level of plasticity prototypic of a species or of an individual over the course of its life. However, within the former (genetic determinist) conception, epigenesis is construed as a program that unfolds over the course of life; although both "biological and environmental signals" (p. 3) are believed to release components of the epigenetic program, epigenesis is seen as a genetically controlled means for maintaining *continuity* in development.

To illustrate, in discussing what they regard as three fundamental questions in developmental psychobiology, Brauth et al. (1991) indicate that the first question is: "Is there *continuity* in development, i.e., what is the nature of the epigenetic programs unfolding at each phase of development?" (p. 3). As I noted above, Brauth et al. underscore

their view that epigenesis is genetically determined by maintaining that behavioral variation arises from epigenetic processes that are constrained and facilitated by genetic mechanisms.

The view of epigenesis found within a developmental systems conception (e.g., see Gottlieb et al., this volume; Gottlieb, 1970, 1983, 1992; Lerner, 1984) is quite different. Descriptively, epigenesis refers to emergent—that is, qualitatively *discontinuous*—features of development (Lerner, 1986; Werner, 1957). In regard to the explanation of epigenetic phenomena, emphasis is placed on the dynamic interaction, or fusion, of levels of organization, which, as noted above, is an emphasis found throughout the tradition promoted by Schneirla (1956, 1957; see also Tobach, 1981; Tobach & Greenberg, 1984). To illustrate, Gottlieb (1992) offers a conception of epigenesis that stresses the bidirectionality of influences among the levels of organization involved in development. He indicates that individual development involves the emergence of new structural and functional properties and competencies at all levels of analysis (e.g., molecular, subcellular, cellular, organismic) of a developmental system, including the organism–environment relational level. These emergent characteristics derive from *horizontal* coactions involving intralevel relationships (e.g., gene–gene, cell–cell, tissue–tissue, or organism–organism) and from *vertical* coactions involving interlevel relationships (e.g., gene–cytoplasm, cell–tissue, or behavioral activity–nervous system). These horizontal and vertical coactions are reciprocal in that influences occur in any direction: from one "component" to another within a level; from lower-level to higher-level components; and/or from higher-level to lower-level components within the developmental system. From this perspective, the causes of development are the *relationships* among components, and not the components themselves (Gottlieb, 1992; Lerner, 1991).

For example, the emergence of menarche is a result of vertical coactions involving biology, culture, physical features of the ecology, and the socioeconomic resources (related, for instance, to available technology, nutrition, and medical care) of the society within which the young female is embedded. For instance, among youth of African ancestry living in Cuba, the median age of menarche is 12.4 years, whereas the median age of menarche for girls of corresponding ancestry living in Uganda, in South Africa, and in New Guinea is 13.4 years, 15.0 years, and 18.8 years, respectively (Katchadourian, 1977). These differences have been associated with variation in the nutritional and medical resources available to young girls in the nations studied; better nutrition and medical care are linked to a lower age of menarche. Similarly, differences in age of menarche within a nation are often seen when youth from urban areas are compared with those from poor rural areas; those from the urban settings have lower ages of menarche as a consequence of their advantaged socioeconomic situation. For example, in Romania, the average age of menarche is 13.5 years in towns and 14.6 in villages. Corresponding urban–rural differences have been found in nations of the former Soviet Union (where contrasts are 13.0 years and 14.3 years, respectively) and in India (where contrasts are 12.8 and 14.2 years, respectively) (Tanner, 1970, 1991). In Hong Kong, the average age of menarche of girls from rich, from average-income, and from poor families is 12.5 years, 12.8 years, and 13.3 years, respectively (Tanner, 1970, 1991).

The distinction between the developmental systems view of plasticity and the genetic determination/genetic program conception of this feature of development is clearly not just a matter of semantics or of emphasis. To the contrary, the distinction pertains to important logical and empirical issues. In regard to the logical issues, the linear and mechanistic view of the genetic determination/programming of plasticity is unfalsifiable. The genetic program that purportedly causes the plasticity of behavior is indexed only by the behavior involved in the manifestation of plasticity. The presence of the behavior is taken as evidence of the genetic program, and variation in the behavior is taken as an indication of the degree of "appropriate environmental stimulation" (Brauth et al., 1991, p. 3), and *not* as information pertinent to the assumption of the presence of a causal genetic program. Thus, although behavior is the only evidence used to index this viewpoint, there is no behavioral evidence that can lead to the rejection of the belief in the presence of a genetic program for plasticity.

In regard to the empirical issues, there is abundant evidence within the field of molecular genetics that the "fact" of a genetic program, as proposed by Brauth et al. (1991), is, in actuality, a counterfactual assertion. Indeed, molecular genetics provides evidence that the entire view of genetic activity represented by genetic determinists is mistaken.

For example, molecular geneticist Mae-Wan Ho (1984, p. 285) has indicated that:

> Forever exorcised from our collective consciousness is any remaining illusion of development as a genetic programme involving the readout of the DNA "master" tape by the cellular "slave" machinery. On the contrary, it is the cellular machinery which imposes control over the genes. . . . The classical view of the ultraconservative genome—the unmoved mover of development—is completely turned around. Not only is there no master tape to be read out automatically, but the "tape" itself can get variously chopped, rearranged, transposed, and amplified in different cells at different times.

Similarly, molecular and cell biologist R. C. Strohman (1993, p. 150) notes that:

> Many experimental biologists outside the biomedical–industrial complex are just now coming (back) to grips with the facts of epigenesis, with the profound mystery that developmental biology is, with the poverty of gene programs as an explanatory device, and with a crisis defined by the realization that an increasingly deficient theory of developmental genetics is the only theory currently available. The question remains: If biologists are starting to learn this lesson, will the psychologists be far behind?

Some psychologists have incorporated this "lesson" into their theory and research (e.g., Gottlieb, 1992; Tobach, 1981; Tobach & Greenberg, 1984), and, as a consequence, have reached conclusions about the systems nature of development in general, and of the processes involved in plasticity in particular. I have noted Gottlieb's earlier (1992) views in this regard, and I have pointed to developmental contextual theory as an instance of this systems perspective applied to an understanding of the nature of plasticity in human behavior and development (e.g., Lerner, 1984, 1991, 1995, 1996).

In essence, the "genetic program" view of plasticity represented by Brauth et al. (1991) and by other advocates of a genetic primacy perspective—for instance, behavior geneticists (Plomin, 1986; Plomin et al., 1990; Rowe, 1994) or human sociobiologists (Belsky, Steinberg, & Draper, 1991; Freedman, 1979; MacDonald, 1994; Rushton, 1987, 1988)—is quite distinct from the "developmental process/systems" view forwarded by, among others, Schneirla, Hebb, Tobach, Gottlieb, and Greenberg. Moreover, the genetic program view is not supported by the current literature in molecular genetics (Ho, 1984; Strohman, 1993a, 1993b). Indeed, as Gottlieb (1992) has observed: "The ultimate aim of dissolving the nature–nurture dichotomy will be achieved only through the establishment of a fully developmental theory of the phenotype from gene to organism" (p. vii).

Implications of Plasticity for Continuity–Discontinuity in Development

Given such a potential for plasticity, a basic feature of the system of processes involved in human development is that both constancy and change—both continuity and discontinuity—may exist across life. The presence of—or better, the potentiality for—at least some plasticity means that the key way of casting the issue of continuity–discontinuity of development is not a matter of deciding what exists for a given process or function; instead, the issue should be cast in terms of determining the patterns of interactions among levels of the developmental system that may promote continuity and/or discontinuity for a particular process or function at a given point in ontogeny and/or history. The same process may exhibit either continuity or discontinuity with earlier life periods, and/or may exhibit some features of both continuity and discontinuity, depending on the particular dynamic interaction that exists among levels at a given point in time. Thus, neither continuity nor discontinuity is absolute. Both are probabilistically present features of change, and the actualization of either is dependent on prevailing developmental conditions within the organism as well as its context.

Simmons and Blyth (1987) and their colleagues illustrate the possibility of either continuity or discontinuity in females' self-esteem across early adolescence. Whether continuity or discontinuity in self-esteem occurs depends on the confluence of other organismic and contextual changes experienced by the females. For instance, discontinuity (in the direction of decrement) of self-esteem is most likely when the young adolescent female is experiencing simultaneously the organismic changes associated with menarche and the contextual alterations associated with the transition from elementary school to junior high school.

The developmental literature suggesting these ideas about plasticity and the relativity of continuity and discontinuity has, to a great extent, been associated with the life-span view of human development (chapters by Baltes et al. and Elder, this volume; Baltes, 1987; Brim & Kagan, 1980;

Elder, 1974; Featherman, 1983; Lerner, 1984, 1986). Within this perspective, the context for development is seen not merely as a simple stimulus environment, but rather as an "ecological environment . . . conceived topologically as a nested arrangement of concentric structures, each contained within the next" (Bronfenbrenner, 1979, p. 22; see also Bronfenbrenner & Morris, this volume) and including variables from biological, psychological, physical, and sociocultural levels, all changing interdependently across history (Riegel, 1975, 1976a, 1976b).

The life-span perspective is linked, then, to a concern with issues about the relations between evolution and ontogeny, about the role the developing person plays in his or her own development, about human plasticity, and therefore about life course continuity and discontinuity (Baltes, 1987; Lerner & Busch-Rossnagel, 1981; Scarr & McCartney, 1983; Tobach, 1981). These issues are linked by the idea that reciprocal relations (i.e., dynamic interactions; Lerner, 1978) between individuals and the multiple contexts within which they live characterize human development (Bronfenbrenner, 1979; see also Bronfenbrenner & Morris, this volume). In other words, all the issues raised by this perspective derive from a common appreciation of the basic role of the necessary link between an organism's development and its changing, multilevel context. The functional significance of this changing organism–context relation requires adoption of a developmental systems perspective—or, more specifically, of a probabilistic epigenetic conception (Gottlieb, 1970; Schneirla, 1957) or a developmental contextual view (Lerner, 1986, 1991, 1996)—of an individual's development.

RELATIONISM AND THE INTEGRATION OF LEVELS OF ORGANIZATION

Contemporary theories stress that the bases for change, and for both plasticity and constraints in development, lie in the relations that exist among the multiple levels of organization that comprise the substance of human life (see chapters in this volume by Baltes et al.; Brandtstädter; Bronfenbrenner & Morris; Cairns; Csikszentmihalyi & Rathunde; Elder; Fischer & Bidell; Fisher et al.; Gardner; Gottlieb et al.; Magnusson & Stattin; Overton; Shweder et al.; Thelen & Smith; Valsiner; and Wapner & Demick; see also Ford & Lerner, 1992; Schneirla, 1957; Tobach, 1981). These levels range from the inner biological, through the individual/psychological and the proximal social relational (e.g., involving dyads, peer groups, and nuclear families), to the sociocultural level (including key macro-institutions such as educational, public policy, governmental, and economic systems) and the natural and designed physical ecologies of human development (Bronfenbrenner, 1979; Bronfenbrenner & Morris, this volume; Riegel, 1975). These tiers are structurally and functionally integrated, thus requiring a systems view of the levels involved in human development (Ford & Lerner, 1992; Sameroff, 1983; Smith & Thelen, 1993; Thelen & Smith, 1994; Wapner, 1993). As noted earlier, developmental contextualism is one instance of such a viewpoint (Lerner, 1986, 1991, 1995, 1996).

Such a developmental systems perspective promotes a *relational* unit of analysis as a requisite for developmental analysis (see chapters in this volume by Brandtstädter; Bronfenbrenner & Morris; Csikszentmihalyi & Rathunde; Elder; Fisher et al.; Gottlieb et al.; Magnusson & Stattin; see also Lerner, 1991). Variables associated with any level of organization exist (are structured) in relation to variables from other levels; the qualitative and quantitative dimensions of the function of any variable are shaped as well by the relations that variable has with variables from other levels. Unilevel units of analysis (or the components of, or elements in, a relation) are not an adequate target of developmental analysis; rather, the relation itself—the interlevel linkage—should be the focus of such analysis (Fisher et al., this volume; Lerner, 1991; Riegel, 1975).

Relationism and integration have a clear implication for unilevel theories of development. At best, such theories are severely limited and inevitably provide a nonveridical depiction of development, due to their focus on what are essentially main effects embedded in higher-order interactions (e.g., see Walsten, 1990); at worst, such theories are neither valid nor useful. Accordingly, biogenic theories (e.g., genetic reductionistic conceptions such as behavioral genetics or sociobiology; Freedman, 1979; Plomin, 1986; Rowe, 1994; Wilson, 1975), psychogenic theories (e.g., behavioristic or functional analysis models; Baer, 1970, 1976; Bijou, 1976; Bijou & Baer, 1961, Skinner, 1938), or sociogenic theories (e.g., "social mold" conceptions of socialization; Homans, 1961; see Hartup, 1978, for a review) do not provide adequate theoretical frames for understanding human development).

Thus, neither nature theories nor nurture theories provide adequate conceptual frames for understanding human development (Hirsch, 1970; Lewontin, 1992). For instance, theories that stress critical periods of development (e.g., Ainsworth, Blehar, Waters, & Well, 1978; Bowlby, 1969; Erikson, 1959, 1968; Lorenz, 1965, 1966)—that is, periods of ontogeny constrained by biology (e.g., by genetics or by maturation)—are seen from the perspective of theories that stress relationism and integration as conceptually flawed (and empirically counterfactual).

Many nature–nurture interaction theories also fall short in this regard; they still treat variables of nature and nurture as separable entities, and they view their connection in manners analogous to the interaction term in an analysis of variance (e.g., Bijou, 1976; Erikson, 1959; Plomin, 1986; see also Gollin, 1981; Hebb, 1970; Walsten, 1990). The theories represented in this volume (a) move beyond the simplistic division of sources of development into nature-related and nurture-related variables or processes, and (b) see the multiple levels of organization that exist within the ecology of human development as part of an inextricably fused developmental system.

Relationism, Integration, and the Role of Timing in Human Development

Because of the mutual embeddedness of organism and context, a given organismic attribute will have different implications for developmental outcomes in the milieu of different contextual conditions; the organism attribute is given its functional meaning only by virtue of its relation to a specific context. If the context changes significantly, as it may over time, then the same organism attribute will have a different import for development. In turn, the same contextual condition will lead to alternative developments as different organisms interact with it.

To state this position in somewhat stronger terms, a given organismic attribute only has meaning for psychological development by virtue of its timing of interaction—that is, its relation to a particular set of time-bound, contextual conditions (Elder, this volume; Lerner, Jacobson, & Perkins, 1992). For example, the biological import of menarche per se, and its implications for changes in the young girl's sexual behaviors, will vary in relation to the time, within an individual's ontogeny, when menarche occurs. Menarche may have a detrimental influence on the girl's resistance to engaging in problem behaviors (e.g., unsafe sex or delinquency) if it occurs at a time early in the girl's adolescence, and especially if, at this time, the girl is still thinking in "concrete operational" (Piaget, 1950, 1970) terms and is embedded in a social and/or school setting where older, postpubertal females and males are in attendance (e.g., Caspi, Lynam, Moffitt, & Silva, 1993; Stattin & Magnusson, 1990). If menarche occurs at a later time in the girl's life—for example, when she is in the "formal operational" (Piaget, 1950, 1970) period of cognitive development—such problem behaviors may be less likely to occur, especially if she has a social and/or school setting composed in the main of same-age males and females (Stattin & Magnusson, 1990).

The import of any set of contextual conditions for psychosocial behavior and development can only be understood by specifying the context's relation to the specific developmental features of the organisms within it. Reversing the above example of the import of the timing of menarche for problem behaviors, it is possible to argue that knowing the age status of the peer group during adolescence will not alone be sufficient for understanding the incidence of problem behaviors in adolescent girls; menarche status and timing, in interaction with the age constitution of the peer group, all need to be considered to attain such understanding.

This central role for the timing of organism–context interactions in the determination of the nature and outcomes of development is, of course, the probabilistic component of probabilistic epigenesis (Gottlieb, 1970, 1983, 1992; Gottlieb et al., this volume; Kuo, 1967, 1976; Scarr, 1982; Scarr & McCartney, 1983; Tobach, 1981). Accordingly, one must consider the meaning of such probabilism for the ways in which individuals can, through influencing their context, produce their own development (cf. Brandtstädter, this volume). More generally, one should consider how the probabilistic—that is, interindividually differentially timed—interactions between organismic characteristics and contextual variables form a process of developmental change involving an active, self-constructing, unique life course for each person. I will discuss these issues below, when I consider the role of biology and context in providing a basis of individual differences in human development. However, it is useful to consider first how the concepts of relationism and integration afford understanding of the role in human development of fusions among levels of analysis.

The Fusion of Levels in Human Development

Within a developmental systems perspective, no single level of organization is seen as the primary or the ultimate causal influence on behavior and development. Instead, a field, or a configural view of developmental causality, is maintained (Ford, 1987; Ford & Lerner, 1992; Overton, this volume), and variables from different levels (e.g., heredity and environment) are seen as coequal forces in the determination of behavior.

Indeed, the domains—heredity (genes) and environment—are seen to be completely integrated in life (Gollin, 1981). This fusion of heredity and environment—of nature and nurture—means that they are mutually permissive and mutually constraining in influencing behavior. Biology may "permit" more or less of a given behavior, and/or may promote one or another quite different behavior; what occurs depends on the environmental circumstances within which people exist and, more superordinately, on the timing of the interaction between these environmental circumstances and the biological characteristics of the people in the setting (Anastasi, 1958; Lehrman, 1953, 1970; Schneirla, 1956, 1957; Tobach & Schneirla, 1968).

To illustrate, in one set of circumstances, a girl may have genes that are associated with beginning her menstrual cycle quite early—say, at about 10 years of age; yet, as noted earlier, the nutritional and health care she receives will influence whether her cycle begins at this time, later, or perhaps even earlier (Katchadourian, 1977). The environment may "promote" more or less of a particular behavior, and/or may afford one or another characteristic, depending on the specific biological characteristics of the people living in the environment (Tanner, 1991). Excellent nutritional and health care may maximize the possible height of members of groups of people who are of hereditarily shorter stature than the average person (e.g., members of pygmy tribes); however, no known diet or medical intervention will increase the typically occurring height of members of this group to the levels found, say, in groups having hereditarily tall stature (Katchadourian, 1977).

Thus, genes and environment always constrain each other, but their mutual influence on each other means that these constraints are flexible, not absolute. The human genome constrains humans' ability to see through the skull of another person in order to inspect the brain for lesions or tumors; however, this same genome—by participating in the development of humans' cognitive system, ingenuity, and industriousness—contributes to an ability to peer into the brains of others through the invention and implementation of X-ray and CAT-scan machines.

The developmental systems perspective is consistent, then, with geneticist R. C. Lewontin's (1981) views about the issue of constraints:

> It is trivially true that material conditions of one level constrain organization at higher levels in principle. But that is not the same as saying that such constraints are quantitatively nontrivial. Although every object in the universe has a gravitational interaction with every other object, no matter how distant, I do not, in fact, need to adjust my body's motion to the movement of individuals in the next room. The question is not whether the nature of the human genotype is relevant to social organization, but whether the former constrains the latter in a nontrivial way, or whether the two levels are effectively decoupled. It is the claim of vulgar sociobiology that some kinds of human social organization are either impossible, or that they can be maintained only at the expense of constant psychic and political stress, which will inevitably lead to undesirable side effects because the nature of the human genome dictates a "natural" social organization. Appeals to abstract dependencies (in principle) of one level or another do not speak to the concrete issue of whether society is genetically constrained in an important way . . . in fact, constraints at one level may be destroyed by higher level activity. No humans can fly by flapping their arms because of anatomical and physiological constraints that reflect the human genome. But humans do fly, by using machines that are the product of social organization and that could not exist without very complex social interaction and evolution. As another example, the memory capacity of a single individual is limited, but social organization, through written records and the complex institutions associated with them, makes all knowledge recoverable for each individual. Far from being constrained by lower-level limitations, culture transcends them and feeds back to lower levels to relieve the constraints. Social organization, and human culture in particular, are best understood as negating constraints rather than being limited by them. (p. 244)

In short, then, the fusion of heredity and environment, as conceived of within a perspective emphasizing developmental systems, means there is a resulting mutuality of influence between these two levels of organization; in addition, there is a mutuality of flexibility in the constraints they

impose on behavior and development. This fusion means there is relative plasticity in human behavior and development. However, the range of behaviors that can occur in an individual's life is certainly not infinite or limitless (Lerner, 1984). Females cannot, as a group, begin their menstrual cycle (that is, experience menarche) at 5 years of age; and pygmies, as a group, cannot have an average adult height of 6 feet. However, the concept of relative plasticity means that the number of distinct characteristics any one individual could show is quite large, given the fusion of heredity and environment. Girls' menarche can begin, within normal limits, at anytime between the ninth and seventeenth years (Katchadourian, 1977; Tanner, 1991), the average height of any group of adults can vary widely, and the intelligence, personality, or motivation of people can show an enormous degree of variation (Plomin, 1986).

Given the character of relative plasticity, then, extensive variability exists among people because (a) genotypes and environments vary and (b) no two people in the world have the same fusion of genes and environments across their lives (Lerner, 1988; Lerner & Tubman, 1989). Even if two individuals have the same genotype [as is the case for monozygotic (MZ) twins] and experience the same array of people and events, any variation in the timing of these experiences could lead to differences between the pair. In other words, individual differences between people—in their genes, in their contexts, and in the timing of interrelation between genes and contexts—provide the bases of variability in human development (Elder, this volume).

Even MZ twins do not share the same environments across life. Environments differ in their physical, interpersonal, community, and cultural characteristics. Although identical twins have the same genotype, their respective genes are not likely to be fused with identical environments across their entire life spans. Each twin meets different people, may have different teachers, and may fall in love with and marry a different type of person. Even for identical twins, behavior and development will be different.

Simply stated, there are multiple levels of the environment or context of life, and differences exist within each level. For example, within the physical environment are differences in noise level, pollution, climate, and terrain. As discussed in more detail below, genotypes are at least equally variable, and they too exist in an intraorganism milieu that has potentially changing "physical environmental" characteristics—for example, involving the products of cellular metabolism (Gottlieb, 1991). The fusion of these two sources of human behavior and development means that, in effect, each person is distinct. The magnitude of individual differences among people underscores the gross errors one makes when characterizing entire groups of people—racial, religious, or gender groups—as homogeneous and undifferentiated in significant ways.

In short, integrated interlevel changes comprise the process of developmental change within a developmental systems perspective. If the course of human development is the product of the processes involved in the "fusions" (or "dynamic interactions"; Lerner, 1978, 1979, 1984) among integrative levels, then the processes of development are more plastic than often previously believed (cf. Brim & Kagan, 1980).

HISTORICAL EMBEDDEDNESS AND TEMPORALITY

The relational units of analysis that are of concern in contemporary theories are understood as change units (see chapters by Brandtstädter; Bronfenbrenner & Morris; Magnusson & Stattin; and Thelen & Smith, this volume; Lerner, 1991). The change component of these units derives from the idea that all of the levels of organization involved in human development are embedded in history; that is, they are integrated with historical change (chapters by Baltes et al.; Cairns; Elder; Overton; Shweder et al.; and Valsiner, this volume; Elder, 1980; Elder, Modell, & Parke, 1993). Relationism and integration mean that no level of organization functions as a consequence of its own isolated activity (chapters by Brandtstädter; Gottlieb et al.; Thelen & Smith; and Wapner & Demick, this volume; Gottlieb, 1992; Tobach, 1981; Tobach & Schneirla, 1968). Each level functions as a consequence of its fusion (its structural integration) with other levels (Gottlieb et al., this volume; Tobach & Greenberg, 1984). History—change occurring over time—is incessant and continuous, and it is a level of organization that is fused with all other levels. This linkage means that change is a necessary, an inevitable, feature of variables from all levels of organization (chapters by Baltes et al.; Brandtstädter; Overton; and Wapner & Demick, this volume; Baltes, 1987; Lerner, 1984); in addition, this linkage means that the structure, as well as the function, of variables changes over time.

An illustration of the temporality of developmental change occurs in regard to secular trends in child and adolescent physical and physiological maturation (Garn, 1980; Katchadourian, 1977; Tanner, 1991). Since 1900, children of preschool age have been taller (an average of 1.0 centimeter) and heavier (an average of 0.5 kilogram) in each successive decade (Katchadourian, 1977). Changes in height and weight occurring during the adolescent growth spurt have involved gains of 2.5 centimeters and 2.5 kilograms, respectively (Falkner, 1972; Katchadourian, 1977). In addition, there has been a historical trend toward a younger average age of menarche. Among European samples of young girls, there was an average decrease of about four months in age, per decade, from about 1840 to about 1950 (Tanner, 1962, 1991). This rate seems to have slowed down, but has not stopped (Marshall & Tanner, 1986; Tanner, 1991). Within American samples, however, the trend toward a younger age of menarche seems to have stopped in about 1940. Since that time, the expected (mean) age of menarche among European and American samples has been 12.5 years. In Japan, a dramatic secular trend has been evidenced. From the immediate post-World War II years until about 1975, the average age of menarche accelerated by 11 months per decade (Marshall & Tanner, 1986). These temporal changes in the biological maturation of youth have been linked to historical improvements in health and nutrition in the respective nations, and variation has been associated with socioeconomic and technological changes in their societies. Biological structure and function and societal structure and function are linked systemically across history.

Indeed, at the biological level of organization, one prime set of such structural changes is subsumed under the concept of evolution (chapters by Cairns; Gardner; Gottlieb et al.; Keil; and Overton, this volume; Gould, 1977; Lewontin, 1981; Lewontin, Rose, & Kamin, 1984); of course, the concept of evolution can be applied also to functional changes (Darwin, 1872; Gottlieb, 1992). At more macro levels of organization, many of the historically linked changes in social and cultural institutions or products are evaluated in the context of discussions of the concept of progress (Nisbet, 1980).

The continuity of change that constitutes history can lead to both intraindividual (or, more generally, intralevel) continuity or discontinuity in development—depending on the rate, scope, and particular substantive component of the developmental system by which change is measured (chapters by Baltes et al., and Elder, this volume; Brim & Kagan, 1980; Lerner, 1986, 1988; Lerner & Tubman, 1989). Thus, continuity at one level of analysis may be coupled with discontinuity at another level; quantitative continuity or discontinuity may be coupled with qualitative continuity or discontinuity within and across levels; and continuity or discontinuity can exist in regard to both the processes involved in (or the "explanations" of) developmental change and in the features, depictions, or outcomes (i.e., the "descriptions") of these processes (Cairns & Hood, 1983; Lerner, 1986).

These patterns of within-person change pertinent to continuity and discontinuity can result in either constancy or variation in the rates at which different individuals develop in regard to a particular substantive domain of development. Thus, any pattern of intraindividual change can be combined with any instance of interindividual differences in within-person change (i.e., with any pattern of stability or instability; Lerner, 1986; Lerner & Tubman, 1989). In other words, continuity–discontinuity is a dimension of intraindividual change and is distinct from, and independent of, stability–instability—which involves between-person change, and is, therefore, a group (not an individual) concept (Baltes & Nesselroade, 1973; Lerner, 1976, 1986).

In sum, because historical change is continuous, temporality is infused in all levels of organization (Elder, this volume; Elder, Modell, & Parke, 1993). Accordingly, the temporality involved in contemporary theories of human development necessitates change-sensitive measures of structure and function *and* change-sensitive (i.e., longitudinal) designs (chapters by Bronfenbrenner & Morris; Fischer et al.; and Overton, this volume; Baltes, Reese, & Nesselroade, 1977; Brim & Kagan, 1980). The key question vis-à-vis temporality in such research is not whether change occurs, but whether the changes that do occur make a difference for a given developmental outcome (Lerner, Skinner, & Sorell, 1980).

Given that the study of these changes will involve appraisal of both quantitative and qualitative features of change, which may occur at multiple levels of organization, there is a need to use both quantitative and qualitative data collection and analysis methods—methods associated with the range of disciplines having specialized expertise at the multiple levels of organization at which either quantitative or qualitative change can occur (Shweder et al., this volume). In

essence, then, the concepts of historical embeddedness and temporality indicate that, to address adequately the relational, integrated, embedded, and temporal changes involved in human life, a program of developmental research must involve multiple occasions, methods, levels, variables, and cohorts (Baltes, 1987; Lerner, 1986, 1991; Schaie & Strother, 1968).

Temporality, Basic Process, and Application in Human Development

A developmental systems perspective—and the implications it suggests for research, through concepts such as temporality—may seem descriptively cumbersome, inelegant (if not untestable) in regard to explanations of individual and group (e.g., family) behavior and development, and, as a consequence, of little use in the formulation of interventions (policies or programs) aimed at enhancing individual and social life. In response to such criticism, I would argue that, in the face of the profound historical changes in the lives of children and their families that have occurred across this century (e.g., see Elder et al., 1993; Hernandez, 1993), it would seem, at best, implausible to maintain that the nature of the human life course has been unaffected by this history. For example, it is not plausible to assert that: (a) the historical changes that have resulted in an average age of menarche of 12.5 years in America—that is, an age when girls, although they may be capable of sexual reproduction, typically do not have the cognitive or behavioral capacity to assume the responsibilities that may accrue from sexual relations—are not related to (b) historical increases in the United States in rates of engagement in high-risk sexual behaviors, teenage pregnancy, childbearing, and one-parent teenage families (Dryfoos, 1990; Hernandez, 1993; Lerner, 1995). Accordingly, it would seem necessary to adopt some sort of developmental systems perspective in order to incorporate the impact of such historical changes, and the contemporary diversity they have created, into the matrix of covariation considered in developmental explanations and the interventions that should, at least ideally, be derived from them (Lerner & Miller, 1993).

Yet, it would be traditional in developmental psychology to assert that the historical variation and contemporary diversity of human (individual and group) development were irrelevant for understanding *basic* processes. Indeed, within developmental psychology, the conventional view of basic process, whether involving cognition, emotion, personality, or social behavior, is that it is a function generalizable across time and place. I believe, however, that data such as those presented by Elder et al. (1993) and Hernandez (1993)—which document the profound impact of historical change on individual and family life over the course of just the past two centuries—constitute a serious challenge to the ontological presuppositions that have grounded this view of basic process and of developmental psychology's theory and research about people's ontogenies.

Can learning, cognition, and emotional life—and the brain and neuroendocrine systems underlying these functions—be argued to occur invariantly in the context of the differing economic, nutritional, and medical resource environments, and the systems of work, school, and family relationships, that have occurred over the course of the past century and that, today, are involved in the diverse social contexts (e.g., families) of America and the world? Can developmental psychology, with a historical record of minimal attention to history (Elder et al., 1993), context (Bronfenbrenner, 1979), and diversity (Graham, 1992; Lerner, 1991), contend that the atemporal and acontextual study of the individual is an appropriate or adequate focus of its inquiry?

I believe the answer to both of these questions is "No," and, quite simply, the traditional view of basic process found in developmental psychology (i.e., the prototypic view for much of the past 50 to 60 years) cannot be defended in the face of the historical and contextual variation characterizing American individuals and families across the past century. Indeed, without adequate tests of, and evidence for, its presuppositions about the irrelevance of temporality, context, and diversity for its view of basic process, the field of developmental psychology fails in even an attempt to represent veridically the course of human life (Cairns, this volume).

By weaving historical change and contextual specificities into the matrix of causal covariation that shapes human developmental trajectories, I believe that a developmental systems perspective can reconstitute the core process of human development, from a reductionistic and individualistic process to a synthetic, or multilevel integrated, one. That is, a developmental systems perspective stresses temporality and relationality and the field, or configural, view of causality noted above (Ford & Lerner, 1992; Overton,

this volume). Through the seemingly simple step of integrating historical change, contextual variation, and individual developmental change, a developmental systems perspective provides a paradigmatic departure from the psychogenic, biogenic, or reductionistic environmentalist models of causality that have undergirded the theories of child development that have been prevalent during most of the 20th century (Gottlieb, 1992; Lerner, 1986, 1991). These theories typify a reductionism and a contextual insensitivity that occur because developmental psychologists are traditionally focused on psychogenic views of the course of human development (Dannefer, 1984; Meyer, 1988).

Such a psychogenic, or exclusively individualistic perspective, has led numerous developmental psychologists, and perhaps especially those who study cognitive functioning, to take the a priori position that any phenomenon of individual behavior and development that interacts with the context is not a basic psychological process; this same orientation has resulted in the contention that information about temporal or interindividual variation is not relevant to the understanding of basic process. Accordingly, the several "revolutions" that have occurred over the past 150 years in the nature of the family context of American children's development (e.g., involving decreases in family size; changes in maternal and paternal employment patterns; a different set of structures—for instance, single-parent units—characterizing American families; and the spread of youth poverty; Hernandez, 1993) have not been seen by the psychogenicists populating developmental psychology as relevant to the nature or study of basic process.

However, the historical changes and contextual variation that characterize America's children and families challenge this position, not only by presenting ontologically revolutionary ideas to developmental psychologists, but as well by promoting epistemological revisions among those who have studied child development through unidisciplinary lenses. As noted by Cahan, Mechling, Sutton-Smith, and White (1993, p. 210), "if childhood is not everywhere and everyplace the same—and the anthropologists and social historians have been amply demonstrating to us that it is not—then the meaning and object of all forms of psychological research have to be reconsidered." Accordingly, a multiplicity of qualitative and quantitative methods—associated with the several disciplines that have demonstrated this temporal and relational specificity of child development—must be used to construct the knowledge of the multiple levels of organization that are involved in the system linking children and contexts (Shweder et al., this volume). Use of these methods in relation to contextually sensitive theory affords an empirically richer focus on classic issues in the study of personality (e.g., regarding individual differences) and of cognition (e.g., regarding learning) that have concerned developmental psychologists across the 20th century (e.g., see chapters in this volume by Cairns; Magnusson & Stattin; and Spelke & Newport).

In short, I believe that a developmental systems view of the historical and developmental ecology of individual and family life helps reduce the incidence of what Elder et al. (1993, p. 6) term the "blindness to social history and context" prevalent in much of psychology—and even sociology—a blindness that, to paraphrase Elder et al. (p. 7) has envisioned the child as embedded in the atemporal and acontextual realm of abstract developmental theory. This is, to say the least, a curious conceptual stance for a field seemingly focused on change.

THE LIMITS OF GENERALIZABILITY, DIVERSITY, AND INDIVIDUAL DIFFERENCES

The temporality of the changing relations among levels of organization means that changes that are seen within one historical period (or time of measurement), and/or with one set of instances of variables from the multiple levels of the ecology of human development, may not be seen at other points in time (chapters by Bronfenbrenner & Morris; Cairns; Elder; and Valsiner, this volume; Baltes et al., 1977; Bronfenbrenner, 1979). What is seen in one data set may be only an instance of what does or what could exist. Accordingly, contemporary theories focus on diversity—of people, of relations, of settings, and of times of measurement (chapters by Baltes et al.; Brandtstädter; Bronfenbrenner & Morris; Fischer & Bidell; Fisher et al.; Overton; and Wapner & Demick, this volume; Lerner, 1991, 1995, 1996).

Individual differences within and across all levels of organization are seen as having core, substantive significance in the understanding of human development (Baltes et al., this volume; Lerner, 1991, 1995, 1996). Diversity is the exemplary illustration of the presence of relative plasticity in human development (Fisher et al., this volume;

Lerner, 1984). Diversity is also the best existing evidence of the potential for change in the states and conditions of human life (Brim & Kagan, 1980).

Moreover, the individual structural and functional characteristics of a person constitute an important source of his or her development (chapters by Brandtstädter and by Csikszentmihalyi & Rathunde, this volume; Brandtstädter, 1985; Lerner, 1982; Lerner & Busch-Rossnagel, 1981). The individuality of each person promotes variation in the fusions he or she has with the levels of organization within which he or she is embedded. For instance, the distinct actions or physical features of a person promote differential actions (or reactions) in others toward him or her (Lerner, 1987). These differential actions, which constitute feedback to the person, shape, at least in part, further change in the person's characteristics of individuality (Lerner & Lerner, 1989; Schneirla, 1957).

For example, the changing match, congruence, or goodness-of-fit between the developmental characteristics of the person and of his or her context provides a basis for consonance or dissonance in the ecological milieu of the person. The dynamic nature of this interaction constitutes a source of variation in positive and negative outcomes of developmental change (chapters by Baltes et al., and by Fischer & Bidell, this volume; Chess & Thomas, 1984; Lerner & Lerner, 1983; Thomas & Chess, 1977; Thomas, Chess, Birch, Hertzig, & Korn, 1963).

Several studies of American adolescents report that pubertal maturation alters negatively the nature of the social interactions between youth and their parents; for example, at the height of pubertal change more conflict and greater emotional distance are seen (e.g., Hill, Holmbeck, Marlow, Green, & Lynch, 1985a, 1985b; Holmbeck & Hill, 1991; Steinberg, 1987, 1990; Steinberg & Hill, 1978). However, these findings have been derived in large part from research with homogeneous European American samples of adolescents and their families (Brooks-Gunn & Reiter, 1990). Accordingly, when diversity is introduced into the database used for understanding the links between pubertal change and adolescent–parent relationships, a much more complicated—and richer and more interesting—pattern is evident. Among samples of Latino (primarily, Mexican American) boys and their families, pubertal maturation brings adolescents *closer* to their parents (Molina & Chassin, 1996). Puberty among these Latino youths is associated with greater parental social support and less intergenerational conflict than is the case either for correspondingly mature European American samples (where the completely opposite effect of puberty on family relations is seen) or for Latino youths prior to or after their maturation.

In essence, then, racial/ethnic, cultural, and developmental diversity must be understood systemically in order to appreciate the nature and variation that exist within and across time in human behavior and development. In other words, individual differences arise inevitably from the action of the developmental system; in turn, they move the system in manners that elaborate diversity further. It is useful to discuss in more detail the nature and import of individuality in human development.

Bases of Individual Differences in Human Development

The fusion of levels of organization—involving levels associated with the individual (e.g., his or her genetic inheritance) and with the context (e.g., the social and institutional world within which the person develops)—provides the field of relationships causing structural and functional development. Variations in the timing of the intermeshing of changes associated with one or more components of this field are, in turn, the cause of interindividual differences in structural and functional development (Elder, this volume; Lerner, et al., 1992). Such individual differences are promoted further by the fact that, across the life span, no two people have precisely the same elements in their "causal fields" (Ford & Lerner, 1992; Lerner, 1988; Lerner & Foch, 1987; Lerner & Tubman, 1989; Overton, this volume). Indeed, humans' genetic endowment provides a basis of the uniqueness of each human life and gives substance to the claim that all humans have an individually unique causal field of biology-context relations across their lives.

For example, estimates of the number of gene pairs in humans typically range between 10,000 and 100,000. If one considers how much genotype variability can be produced by the reshuffling process of meiosis (the division that forms the sex cells—sperm and ova) occurring with 100,000 gene pairs, then the potential for variability is so enormous that "it is next to impossible that there have ever been two individuals with the same combination of genes" (McClearn, 1981, p. 19).

Indeed, a conservative estimate is that there are over 7×10^{17} (or over 70 trillion) potential human genotypes. Geneticists have estimated that each human has the capacity to generate any one of $10^{3,000}$ different eggs or sperm; by

comparison, their estimate of the number of sperm of all men who have ever lived is only 10^{24}. Thus, considering $10^{3,000}$ eggs possibly being generated by an individual woman and $10^{3,000}$ sperm possibly being generated by an individual man, the likelihood of anyone ever—in the past, present, or future—having the same genotype as anyone else (except when multiple identical births occur, of course) becomes dismissibly small (McClearn, 1981, p. 19).

A given human's genetic individuality may be seen to be even greater if we recognize that genetic does not mean congenital. The "total genome is not functioning at fertilization, or at birth, or at any other time of life" (McClearn, 1981, p. 26). Therefore, the expression of any individual human genotype is a developmental phenomenon, influenced in regard to the turning on and/or off of genes by the internal and the external components of the individual's history of genotype–environment fusions. McClearn (1981, p. 26) gives, as an illustration:

> the differential production of certain kinds of hemoglobin during various phases of development. For example, production of the beta chain accelerates at the time of birth and peaks after a few months, whereas production of the alpha chain rises prenatally and maintains a high level.

A still further indication of the possible variability among humans is the nature of genes' molecular structure: It is estimated that 6 billion nucleotide bases comprise the DNA of the human genome (McClearn, 1981). The vast number of these distinct chemicals provides an enormous "population" within which mutation (permanent alterations in genetic material) can occur.

This enormous genetic variability among humans is all the more striking because, in the determination of behavior, it is fused with environments that have at least equal variation (e.g., see Bronfenbrenner, 1979; Bronfenbrenner & Morris, this volume; Willems, 1973). As I noted earlier, not only do people have individually distinct genotypes, but no two people (including MZ twins) share the same historical array of events, contexts, and social encounters across their lives. As suggested by Lerner (1988; Lerner & Tubman, 1989), not only does each person have a "biological genotype" (to use a redundancy) but each person has, as well, a "social genotype" (to use an oxymoron). Across life, these two domains of individuality change interdependently, and this integration means that, in the determination of behavior and development, heredity and environment do not function separately. In addition, they do not merely interact; *interaction* connotes two independent entities that merely multiply in their effects on behavior (Gollin, 1981; Tobach, 1981). *Fusion* implies a reciprocal relation between components of an intermeshed system. Such interactions are termed dynamic.

As Gottlieb (1991, p. 5) explains, the most significant feature of this dynamic, systems view "is the explicit recognition that the genes are an integral part of the system and that their activity (i.e., genetic expression) is affected by events at other levels of the system, including the environment of the organism." Genes must dynamically interact with the environment if they are to be involved in the development of any physical or behavioral characteristic of a person. In this regard, Gottlieb (1991, p. 24) indicates that "Genetic activity does not by itself produce finished traits such as blue eyes, arms, legs, or neurons. The problem of anatomical and physiological differentiation remains unsolved, but it is unanimously recognized as requiring influences above the strictly cellular level (i.e., cell-to-cell interactions, positional influences, and so forth). . . . Thus, the concept of the genetic determination of traits is truly outmoded."

In sum, the influence of genes depends thoroughly on where they exist in space (within the developing person) and in developmental time (i.e., when, in the life of the person, they coact with the environment). Accordingly, it is important to understand that dynamic interactions between biology (organism, genes, or heredity) and context (the multiple levels of the human development) provide a basis for the relative plasticity of behavior and development.

These dynamic interactions create, and promote a focus in developmental scholarship on, individual differences—of people and of settings—*and* on changes in both of these types of differences and in the relations between them (i.e., in person–context relations). Understanding and study of these temporal dimensions of dynamic interactions are critical not only for theoretical precision but also for advancing research and application in human development. This assertion leads to some concluding comments.

CONCLUSIONS AND IMPLICATIONS

I have argued that the major assumptive dimensions of contemporary theories of human development—systematic change and relative plasticity, relationism and integration,

embeddedness and temporality, and generalizability limits and diversity—are very much intertwined facets of a common theoretical core. They form the corpus of a superordinate developmental systems view of human development (chapters by Bronfenbrenner & Morris; Fischer & Bidell; Gardner; Gottlieb et al.; Magnusson & Stattin; Thelen & Smith; and Wapner & Demick, this volume; Ford & Lerner, 1992). As is the case with the several defining features of the life-span developmental perspective, which—according to Baltes (1987)—need to be considered as an integrated whole, the assumptive dimensions of contemporary developmental theories need to be appreciated simultaneously. Such appreciation is required to understand the breadth, scope, and implications for research and application of this "family" of concepts involved in contemporary theories.

Implications for Research

A developmental systems perspective involves the study of active people providing a source, across the life span, of their individual developmental trajectories; this development occurs through the dynamic interactions people experience with the specific characteristics of the changing contexts within which they are embedded (Brandtstädter, this volume). This stress on the dynamic relation between the individual and his or her context results in the recognition that a synthesis of perspectives from multiple disciplines is needed to understand the multilevel (e.g., person, family, and community) integrations involved in human development. In addition, to understand the basic process of human development—the process of change involved in the relations between individuals and contexts—both descriptive and explanatory research must be conducted within the actual ecology of people's lives.

In the case of explanatory studies, such investigations, by their very nature, constitute intervention research. The role of the developmental researcher conducting explanatory research is to understand the ways in which variations in person–context relations account for the character of human developmental trajectories, life paths that are enacted in the "natural laboratory" of the "real world." Therefore, to gain understanding of how theoretically relevant variations in person–context relations may influence developmental trajectories, the researcher may introduce policies and/or programs as, if you will, "experimental manipulations" of the proximal and/or distal natural ecology; evaluations of the outcomes of such interventions become, then, a means to bring data to bear on theoretical issues pertinent to person–context relations and, more specifically, on the plasticity in human development that may exist, or that may be capitalized on, to enhance human life (Csikszentmihalyi & Rathunde, this volume; Lerner, 1984). In other words, a key theoretical issue for explanatory research in human development is the extent to which changes—in the multiple, fused levels of organization comprising human life—can alter the structure and/or function of behavior and development.

Life itself is, of course, an intervention. The accumulation of the specific roles and events a person experiences across the life span—involving normative age-graded events, normative history-graded events, and nonnormative events (Baltes et al., this volume; Baltes, Reese, & Lipsitt, 1980)—alters each person's developmental trajectory in a manner that would not have occurred had another set of roles and events been experienced. The interindividual differences in intraindividual change that exist as a consequence of these naturally occurring interventions attest to the magnitude of the systematic changes in structure and function—the plasticity—that characterize human life.

Explanatory research is necessary, however, to understand what variables, from what levels of organization, are involved in particular instances of plasticity that have been seen to exist. In addition, such research is necessary to determine what instances of plasticity may be created by science or society. In other words, explanatory research is needed to ascertain the extent of human plasticity or the limits of plasticity (Baltes, 1987; Baltes et al., this volume; Lerner, 1984). From a developmental systems perspective, the conduct of such research may lead the scientist to alter the natural ecology of the person or group he or she is studying. Such research may involve proximal and/or distal variations in the context of human development (Lerner & Ryff, 1978); in any case, these manipulations constitute theoretically guided alterations of the roles and events a person or group experiences at, or over, a portion of the life span.

These alterations are indeed, then, interventions—planned attempts to alter the system of person–context relations that constitute the basic process of change; they are conducted in order to ascertain the specific bases of, or to test the limits of, particular instances of human plasticity

(Baltes, 1987; Baltes & Baltes, 1980; Baltes et al., this volume). These interventions are a researcher's attempt to substitute designed person–context relations for naturally occurring ones in an effort to understand the process of changing person–context relations that provides the basis of human development. In short, basic research in human development is intervention research (Lerner et al., 1994).

Accordingly, the cutting edge of theory and research in human development lies in the application of the conceptual and methodological expertise of human development scientists to the natural ontogenetic laboratory of the real world. Multilevel—and hence, multivariate—and longitudinal research methods must be used by scholars from multiple disciplines to derive, from theoretical models of person–context relations, programs of "applied research"; these endeavors must involve the design, delivery, and evaluation of interventions aimed at enhancing—through scientist-introduced variation—the course of human development (Birkel, Lerner, & Smyer, 1989).

Relationism and contextualization have brought to the fore of scientific, intervention, and policy concerns some issues that are pertinent to the functional import of diverse instances of person–context interactions. Examples are studies of the effects of maternal employment, of marital disruption, or of single-parent families, on infant, child, and young adolescent development; the importance of quality day care, of variation in school structure and function, and of neighborhood resources and programs for the immediate and long-term development in children of healthy physical, psychological, and social characteristics; and the effects of peer group norms and behaviors, of risk behaviors, and of economic resources on the healthy development of children and youth.

As a result of greater study of the actual contexts within which children and parents live, behavioral and social scientists have shown increasing appreciation of the diversity of patterns of individual and family development that exist, and that comprise the range of human structural and functional characteristics. Such diversity—involving racial, ethnic, gender, national, and cultural variation—has, to the detriment of the knowledge base in human development, not been a prime concern of empirical analysis (Fisher et al., this volume; Hagen, Paul, Gibb, & Wolters, 1990).

Yet, for several reasons, this diversity must become a key focus of concern in the study of human development. Diversity of people and their settings means that one cannot assume that general rules of development either exist for, or apply in the same way to, all children and families (Fisher & Brennan, 1992; Fisher & Tryon, 1990; Lerner, 1988; Lerner & Tubman, 1989). This is not to say that general features of human development do not exist, or that descriptive research documenting such characteristics is not an important component of past, present, and future scholarship. However, the lawful individuality of human behavior and development means that one should not make a priori assumptions that characteristics identified in one group, or even in several groups, exist or function in the same way in another group. Moreover, even when common characteristics are identified in diverse groups, we cannot be certain that the individual or unique attributes of each group—even if they account for only a small proportion of the variance in the respective groups' functioning—are not of prime import for understanding the distinctive nature of the groups' development *or* for planning key components of policies or programs (i.e., for planning "services") designed for the groups.

A new research agenda is necessary—an agenda that focuses on diversity and context while at the same time attending to commonalities of individual development, family changes, and the mutual influences between the two. In other words, diversity should be placed at the fore of our research agenda. Then, with a knowledge of individuality, we can determine empirically the parameters of commonality, of interindividual generalizability. We should no longer make a priori assumptions about the existence of generic developmental laws or the primacy of such laws, even if they are found to exist, in providing the key information about the life of a given person or group.

Integrated multidisciplinary and developmental research devoted to the study of diversity and context must be moved to the fore of scholarly concern. In addition, however, scholars involved in such research must have at least two other concerns, deriving from the view that basic, explanatory research in human development is, in its essence, intervention research.

Implications for Policies and Programs

The integrative research promoted by a developmental systems view of human development should be synthesized with two other foci. Research in human development that is concerned with one or even a few instances of individual

and contextual diversity cannot be assumed to be useful for understanding the life course of all people. Similarly, policies and programs derived from such research, or associated with it in the context of a researcher's tests of ideas pertinent to human plasticity, cannot hope to be applicable, or equally appropriate and useful, in all contexts or for all individuals. Therefore, developmental and individual differences-oriented policy development and program (intervention) design and delivery must be integrated fully with the new research base for which I am calling.

Because of the variation in settings within which people live, studying development in a standard (for example, a "controlled") environment does not provide information pertinent to the actual (ecologically valid) developing relations between individually distinct people and their specific contexts (for example, their particular families, schools, or communities). This point underscores the need to conduct research in real-world settings (Bronfenbrenner, 1974; Zigler & Finn-Stevenson, 1992) and highlights these ideas: (a) policies and programs constitute natural experiments, that is, planned interventions for people and institutions; and (b) the evaluation of such activities becomes a central focus in the developmental systems research agenda I have described (Cairns, this volume; Lerner, 1995; Lerner, Ostrom, & Freel, 1995; Ostrom, Lerner, & Freel, 1995).

In this view, policy and program endeavors do not constitute secondary work, or derivative applications, conducted after research evidence has been compiled. Quite to the contrary, policy development and implementation, and program design and delivery, become integral components of the present vision for research; the evaluation component of such policy and intervention work provides critical feedback about the adequacy of the conceptual frame from which this research agenda should derive (Zigler & Finn-Stevenson, 1992).

To be successful, this developmental, individual-differences, and contextual view of research, policy, and programs for human development requires more than collaboration across disciplines: Multiprofessional collaboration is essential. Colleagues in the research, policy, and intervention communities must plan and implement their activities in a synthesized manner in order to successfully develop and extend this vision. All components of this collaboration must be understood as equally valuable—indeed, as equally essential. The collaborative activities of colleagues in university outreach, in service design and delivery, in policy development and analysis, and in academic research are vital to the success of this new agenda for science and service for children, youth, and their various contexts—their families, schools, and communities. Moreover, such collaborative activities must involve the communities within which such work is undertaken (Lerner & Miller, 1993; Lerner, Miller, & Ostrom, 1995; Miller & Lerner, 1994).

In other words, to enhance ecological validity, and to provide empowerment and increased capacity among the people we are trying both to understand and to serve with our synthetic research and intervention activities, we must work with the community to codefine the nature of our research and program design, and our delivery and evaluation endeavors. In short, we must find ways to apply our scientific expertise to collaborate with, and promote the life chances of, the people participating in our developmental scholarship. Such steps will provide needed vitality for the future progress of the field of human development.

Enhancing Applied Developmental Science across the Life Span

The future scholarly and societal significance of our field lies in application of developmental science, that is, in building a scientific enterprise that works to help envision, enact, and sustain effective policies and programs promoting the positive development of people across the life span (Zigler & Finn-Stevenson, 1992). Such a focus of the scholarship of our field is, on the one hand, a logical and—if judged by the above noted trends in the theoretical foci of our field—an inevitable outcome of the growth and progress we have experienced as a scientific community (Cairns, this volume; Zigler & Finn-Stevenson, 1992). On the other hand, the four key sets of conceptual themes involved in contemporary theories in our field lead us to embrace a focus (a) on ecologically embedded research, (b) on testing our notions of person–context relational systems, and (c) on relative plasticity, in order to appraise whether theoretically predicated changes in the nature and course of the relations children have with the proximal and distal features of their context can alter in salutary ways the trajectories of their development. In other words, the concepts of development embraced in our field lead us to test our theories through intervention/action research. Simply, I believe that within the field of scholarship about

human development, basic research and applied research are synthetic, indivisible endeavors.

A developmental systems perspective leads us to recognize that, if we are to have an adequate and sufficient science of child development, we must integratively study individual and contextual levels of organization in a relational and temporal manner (Bronfenbrenner, 1974; Zigler & Finn-Stevenson, 1992). Anything less will not constitute adequate science. And if we are to serve America's children and families through our science, if we are to help develop successful policies and programs through our scholarly efforts, then we must accept nothing less than the integrative temporal and relational model of the child that is embodied in the developmental systems perspective forwarded in contemporary theories of human development.

Through its research, our field has an opportunity to serve both scholarship and the communities, families, and people of our world. By integrating policies and programs sensitive to the diversity of our communities and our people, by combining the assets of our scholarly and research traditions with the strengths of our people, we can improve on the often-cited idea of Kurt Lewin (1943), that there is nothing as practical as a good theory. We can, through the application of our science to serve our world's citizens, actualize the idea that there is nothing of greater value to society than a science devoted to using its scholarship to improve the life chances of all people.

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