

CONCEPTS AND THEORIES OF HUMAN DEVELOPMENT

Richard M. Lerner, Rachel M. Hershberg, Lacey J. Hilliard, and Sara K. Johnson

Developmental science seeks to describe, explain, and optimize intraindividual (within-person) change and interindividual (between-person) differences in intraindividual change across the life span (Baltes, Reese, & Nesselroade, 1977; Lerner, 2012; Lerner, Lerner, Bowers, & Geldhof, 2015).¹ However, the meaning of the term *development* continues to engage scholars in philosophical and theoretical debate (e.g., Ford & Lerner, 1992; Harris, 1957; Lerner, 2002, 2006; Overton, 2013, 2015; Overton & Müller, 2013). The existence of the debate is itself indicative of a key feature of the meaning of the term: development is not an empirical concept. If it were, inspection of a set of data would indicate to any observer whether development was present. However, different scientists can look at the same data set and disagree about whether development has occurred.

In this chapter, we discuss the concept of development as it has been and currently is used within human developmental science. We review both the philosophical foundations and historical roots of the concept and explain how the use of the concept within contemporary, cutting-edge theoretical models of human development finds its basis in this philosophical and historical record. We then define the current theoretical approach that frames the field of developmental science and the empirical work conducted therein—models derived from a relational developmental systems (RDS) metamodel (Overton, 2015)—and we discuss concepts associated with the RDS metamodel (e.g., embodiment and epigenesis) and briefly describe several examples of theories associated with it. We then describe some key methodological implications of RDS-based models, and, finally, we discuss the application of RDS-based theory and methods to enhance human development and to promote social justice among diverse individuals across the life span.

The Concept of Development

Past concepts of development were predicated on Cartesian philosophical ideas about the character of reality that separated, or “split,” what was regarded as real from what was relegated to the derivative, “unreal,” or epiphenomenal (Overton, 2013, 2015). In human development, major instances of such splitting involved classic debates about nature versus nurture as “the” source of development, continuity versus discontinuity as an appropriate depiction of the character of the human (intraindividual) developmental trajectory, transformational versus variational change as the quality of developmental change, and stability versus instability as

an adequate means to describe interindividual differences in developmental change. Today, most major developmental theories eschew such splits, and instead use concepts drawn from a process-relational paradigm (Overton, 2015) and, in turn, from RDS-based theories/models associated with this paradigm (e.g., Lerner, 2006; Lerner, Agans, DeSouza, & Hershsberg, 2014; Overton, 2013, 2015; Overton & Mueller, 2013). Overton (2015) explained that, compared to a Cartesian worldview, the process-relational paradigm focuses on process, becoming, holism, relational analysis, and the use of multiple perspectives and multiple explanatory forms. Within the process-relational paradigm, the organism is seen as inherently active, self-creating (autopoietic), self-organizing, self-regulating (agentic), nonlinear/complex, and adaptive (Overton, 2015; also see Sokol, Hammond, Keubli, & Sweetman, 2015).

Within the RDS metamodel, the integration of different levels of organization frames understanding of life-span human development (Lerner, 2006; Overton, 2013, 2015). Accordingly, the conceptual emphasis in RDS theories is placed on mutually influential relations between individuals and contexts, represented as individual \leftrightarrow context relations. These relations vary across place and across time (Elder, Shanahan, & Jennings, 2015); this latter level is history (and involves the "arrow of time," or temporality). History is the broadest level within the ecology of human development and imbues all other levels with change. Such change may be stochastic (e.g., nonnormative life or historical events; Baltes, Lindenberger, & Staudinger, 2006) or systematic, and the potential for systematic change constitutes a potential for (at least relative) plasticity across the life span.

RDS-based theories thus depict the basic developmental process as involving relations—or "fusions" (Tobach & Greenberg, 1984)—among variables from the multiple levels of organization that comprise the ecology of human development (e.g., see Bronfenbrenner, 2001, 2005; Bronfenbrenner & Morris, 2006). Accordingly, framed by such conceptions, contemporary developmental science regards the basic process of development as involving the above-noted individual \leftrightarrow context relations, which engage variables among levels of organization ranging from biology through individual and social functioning to societal, cultural, physical, ecological, and, ultimately, historical levels of organization (e.g., Baltes, Lindenberger, & Staudinger, 1998, 2006; Elder et al., 2015; Ford & Lerner, 1992).

This bidirectionality is the reason that Gottlieb and colleagues (e.g., Gottlieb, 1997; Gottlieb, Wahlsten, & Lickliter, 2006) and others (e.g., Overton, 2006) have argued that the concept *coaction* or *transaction* should replace the term *interaction* except when referring to statistics within the general linear model. In this chapter we employ the term *coaction* except when the reference is to linear statistical models, specific theoretical perspectives of others, or quotes from other sources. These reciprocal bidirectional relations regulate (govern) the course of development (its pace, direction, and outcomes). When these "developmental regulations" involve individual \leftrightarrow context relations benefitting both the person and his or her ecology, they may be termed *adaptive* (Brandtstädter, 2006).

The relational character of development means that some degree of change is always possible within the developmental system, as the temporality of history imbues each of the other levels of organization within the developmental system with the potential for change. Temporality means that at least relative *plasticity* (the potential for systematic change) exists within the integrated (fused) developmental system. Such plasticity may be capitalized on to identify or promote individual \leftrightarrow context relations linked to positive human development. As a consequence, contemporary developmental theory transcends another split that has characterized the field of human developmental science—a split between basic science and application (Fisher & Lerner, 1994; Lerner, 2006).

That is, theoretically predicated attempts to change the course of development—the trajectory of individual \leftrightarrow context relations—constitute both tests of the basic, relational process of human development *and* (given ethical mandates to act only to enhance human development) attempts to improve the course of life. These interventions into the life course may be aimed at individuals, families, communities, or the institutions of society, and may involve such actions as instituting community-based programs or enacting broad rules (i.e., social policies) governing the structure or function of such programs (Lerner, 2002, 2006). Thus, from the viewpoint of the RDS metatheory that defines theories at the cutting edge of contemporary developmental science (Overton, 2015; Overton & Müller, 2013), there is no necessary distinction between research on the basic, relational process linking individuals to their multitiered ecological systems and applications aimed at promoting positive individual \leftrightarrow context relations and social justice.

How did developmental science progress from relying on split conceptions of the bases and course of development to applying integrative concepts and models that emphasize the relational character of human development and the synthesis of basic and applied foci? To answer this key question, which in essence tells the story of past and contemporary defining features of human developmental science, we need to consider first what developmental scientists may or may not assume about the nature of their subject matter.

The Assumptions of Developmental Scientists

Scientists begin their study of development with some conception, either implicit or explicit, of what development is (Overton, 2015). Then, when they inspect a given set of data, they determine whether the features of the data fit with their concepts. Thus, debates among scientists about the meaning of development arise because different scientists have different conceptual templates. These conceptual differences exist because different scientists are committed to distinct philosophical and theoretical beliefs about the nature of the world and of human life.

Nevertheless, and despite these philosophical and theoretical differences among scientists, there is some agreement about the minimal features of any concept of development. In its most general sense, development refers to change. But *change* and *development* are not equivalent terms. Whenever development occurs there is change, but not all changes are developmental ones. Changes must be organized for them to be labeled as developmental. That is, change must be patterned, structured, or coherent, as opposed to stochastic (random), to be indicative of development. However, organization alone does not suffice as a definition of developmental change. Change must also be systematic, in the sense that changes within and across observation periods must be interdependent; an alteration in one part of an entity, organism, or structure must be related to alterations in the other parts of the entity, organism, or structure. But organization and systematicity alone also do not suffice to define development. For organized or systematic changes to be developmental ones, they have to have a *successive* character. The idea of successive changes indicates that the changes seen at a later time are at least in part influenced by the changes that occurred at an earlier time, if only to the extent that the range of changes probable at the later time is limited by earlier occurrences.

Despite a relatively high degree of consensus that development is a theoretical concept that, at least, connotes systematic and successive change in an entity, organism, or structure, there is a good deal of disagreement among developmental scientists about what particular ideas—beyond systematic and successive change—need to be added to define development

adequately. These differences in definitions are also associated with theoretical differences that, ultimately, are based on scientists' commitments to different philosophical positions (Kuhn, 1962; Lerner, 2002; Overton, 2015; Pepper, 1942). These philosophical positions involve implicit and explicit assumptions that scientists make regarding the theories, hypotheses, and the methods they use to design their research or to make observations.

The philosophical models of the world used by scientists have a pervasive effect on the scientific positions they adopt. In developmental science, these models specify the basic characteristics of humans, and of reality itself, and thus function either to include or exclude particular features of humans and/or of the world's events in the realm of scientific discourse. Hence, science is relative rather than absolute. Facts are not naturally occurring events awaiting discovery. According to Kuhn (1962), science "seems an attempt to force nature into [a] preformed and relatively inflexible box . . . No part of the aim of normal science is to call forth new sorts of . . . phenomena; indeed those that will not fit the box are often not seen at all. Nor do scientists normally aim to invent new theories, and they are often intolerant of those invented by others" (p. 24). Given Kuhn's view, it is not surprising that he described the process through which a new paradigm transcends a prior one as involving a revolution.

As we explain below, a range of models exists within developmental science. As such, full understanding of human development cannot be obtained from any one theory or method, nor can it be obtained from a cataloging of empirical "facts." The integration of philosophy, theory, method, and research results is required to attain a complete understanding of any instance of scientific scholarship. Within such integration, theory and research are given meaning. They are developed and interpreted within the context of a given philosophical perspective. Thus, it is necessary to understand the various philosophical assumptions on which the study of development can be based and to examine the paradigms, metatheories, or models that are used today in the study of human development.

Conceptual Splits in the History of Developmental Science

Have people always believed that humans develop? Have people always said that infants are different from children and that both are different from adolescents and adults? Have "special" portions of the life span, such as adolescence or the aged years, always been held to exist? Have people always believed that there is such a phenomenon as human development, and if not, when and why did such a belief arise?

Focusing on the Western world, many of the central questions and controversies about human development are quite old, with roots in ancient Greece and the traditions of Western philosophy. In both the 2,000 years of this philosophy and about 150 years of pertinent science, the ideas advanced to explain development have revolved around the same few issues. These issues represent the core concepts in any discussion of development, and differences among philosophers and scientists can be understood by looking at the stances they take in regard to basic conceptual issues. These issues pertain most directly to the *nature-nurture controversy*.

Nature versus Nurture

One can regard the history of developmental science as involving the swinging of a pendulum. This pendulum moved from conceptions of human development stressing nature to conceptions stressing nurture. At this writing, there is a focus on conceptions stressing that

neither extreme is appropriate. Notions such as interactions, process-relationism, fusion, integration, or relational developmental systems are used today to understand how the bases of human development combine to foster systematic change across the life span (Lerner & Benson, 2013; Molenaar, Lerner, & Newell, 2014; Overton, 2015).

In its most extreme form, the nature-nurture controversy pertains to whether behavior and development derive from nature (or in modern terms, heredity, maturation, or genes) or, at the other extreme, whether behavior and development derive from nurture (or in more modern terms, environment, experience, or learning). However, whatever terms are used, the issue raises questions about how biological characteristics (for example, genes) may contribute to development and/or how experiential characteristics (for example, stimulus-response connections, education, or socialization) may play a role in development. Anastasi (1958) noted that the first way that scholars inquired into the nature-nurture problem was to ask, "Which one?" Does nature *or* nurture provide the determining source of behavior? Those who posed the issue in this way were assuming that the independent, isolated action of one *or* the other domain provided the source of a behavior. Once the analysis of development is framed in such a split fashion, it is generally further assumed that some set of empirical investigations will ultimately record a definitive answer to the either/or question. The simple observation that generations of empirical investigations have failed to resolve the either/or question demonstrates the inadequacy of the assumption that research alone will resolve controversies about splits. As a consequence, seeing the world in conceptual splits continues to create controversies (Overton, 2013, 2015).

However, this split way of posing the problem should be rejected because it is illogical. There would be no one in an environment without heredity, and there would be no place to see the effects of heredity without environment. Genes do not exist in a vacuum. They exert their influence on behavior in an environment. At the same time, if there were no genes or heredity, the environment would not have an organism in it to influence. Accordingly, nature and nurture are inextricably tied together, and they never exist independent of the other. As such, Anastasi (1958) argued that *any* theory of development, to be logical and to reflect accurately life situations (to have *ecological validity*), must stress that nature and nurture are always involved in all behavior; both are completely necessary for any organism's existence or for the existence of any behavior.

Some psychologists (e.g., Hebb, 1949; Lehrman, 1953; Schneirla, 1957) had recognized the inappropriateness of the "which one?" question even before Anastasi (1958). Yet, others had asked another question that Anastasi maintained also was inappropriate because it too led to a conceptual dead end. The question was: "Granted that nature and nurture are always involved in any behavior, *how much* of each is needed for a given behavior?" For instance, despite the now decades of evidence from biology and comparative psychology that genes function as fused entities within an integrated organism ↔ context relational system (e.g., see Gottlieb, 1997; Gottlieb, et al., 2006; Lickliter & Honeycutt, 2015), there have been repeated appeals to partition variance associated with genes from variance associated with the context (e.g., Burt, 2011; Dick, 2011; Plomin, 2000; Rowe, 1994; Rushton, 2000; Turkheimer, 2011).

This question also leads to a fruitless end, however, because it too is based on the same split and hence inappropriate underlying assumption. In the case of the "how much?" question, the instantiation of the split assumption may be termed the independent, additive-action assumption. It suggests that the way in which nature and nurture are related to each other is that the contribution of one source is added to the contribution of the other to provide a

basis of behavior. However, the "how much?" question leads to separating out (splitting) the independent, isolated effects of nature and nurture, as in the "which one?" question. That is, the "which one?" question is just a special case of the "how much?" question, implying a split between nature and nurture of 100%/0% (or vice versa).

Thus, a conceptualization of the independent action of either source (in either an isolated or an additive manner) leads to a conceptually vacuous dead end. Two assertions follow directly from the above argument. First, nature and nurture are always completely involved in all behavior. Any method of inquiry into the source of behavioral development that does not take cognizance of this statement and instead seeks to make artificial distinctions between nature and nurture can lead only to conceptual confusion and an empirical blind alley. Second, because independent-action conceptualizations of the contributions of nature and nurture similarly lead to conceptual dead ends, an alternative conceptualization of their contributions, that of *dynamically interactive* or *fused* action, seems more appropriate.

This alternative indicates that both nature and nurture interact dynamically (as components or dimensions of a fused, developmental system) to provide a source of behavioral development. Because both sources are necessarily completely present, and because it is inappropriate to speak of their contributions as adding to each other, then the appropriate questions seem to be: "How do nature and nurture dynamically interact to produce behavioral development? How do the effects of each multiply (or reciprocally interrelate within a fused, developmental system) to provide a source of development?"

This third question, "How?," Anastasi argued, is the appropriate way to formulate the issue, because it recognizes the logical necessity of the material existence of both domains for a living organism (or living system; Ford & Lerner, 1992). This question denies a split between nature and nurture or the contention that one domain is real and the other is pseudo-phenomenal (e.g., as in Rowe, 1994). Instead, there exists a relation in which the full presence of each source is completely intertwined with the other. As such, nature never affects behavior directly; it always acts in the context of internal and external environments. Environment never directly influences behavior either; it will show variation in its effects depending on the heredity-related characteristics of the organism on which it acts.

The fused approach to nature and nurture presented by Anastasi (1958) helps frame other key issues involved in understanding the characteristics of human development. One of these issues is the continuity-discontinuity controversy.

Continuity versus Discontinuity

Virtually any statement about the character of intraindividual development involves, explicitly or implicitly, taking a position in regard to three dimensions of change: (1) descriptive continuity-discontinuity; (2) explanatory continuity-discontinuity; and (3) the quantitative versus the qualitative character of descriptions and explanations—that is, the quantitative-qualitative dimension pertains to both description and explanation.

If behavior seen at one point in the life span can be represented or depicted in the same way as behavior at another point, then descriptive continuity exists. If behavior seen at one point in the life span cannot be represented or depicted in the same way as behavior at another point, then descriptive discontinuity exists. Consider, for instance, recreational behavior studied in adolescence and young adulthood. If the same activity (for instance, bike riding) was the major form of recreational behavior at both points in the life span, then

descriptive continuity would exist. If, as an adolescent, the person rode a bike for recreation but, in adulthood, went hiking, then there would be descriptive discontinuity across these portions of ontogeny.

Changes in the description of behavior across a person's life can occur for many reasons. In fact, even the same change, regardless of whether it is continuous or discontinuous, can be explained by many reasons. If the same explanations are used to account for behavior across a person's life, then this means that behavior is interpreted as involving unchanging laws or rules. In this case there is explanatory continuity. If, however, different explanations are used to account for behavior across a person's life, then there is explanatory discontinuity.

Descriptions or explanations of development can involve quantitative or qualitative changes. Descriptively, quantitative changes involve differences in how much (or how many) of something exists. For example, in adolescence quantitative changes occur in such areas as height and weight because there is an adolescent growth spurt, and these changes may be interpreted as resulting from quantitative increases in the production of growth stimulating hormone. Descriptive qualitative changes involve differences in what exists, in what sort of phenomenon is present. The emergence in adolescence of a drive-state never before present in life—a reproductively mature sexual drive (Freud, 1969)—and the emergence in adolescence of new and abstract thought capabilities not present in younger people—formal operations (Piaget, 1950, 1970)—are instances of changes interpreted as arising from qualitative alterations in the person. It is believed that the person is not just "more of the same;" rather the person is seen as having a *new* quality or characteristic.

Explanations of development can also vary in regard to whether one *accounts* for change by positing quantitative changes (e.g., increases in the amounts of growth stimulating hormone present in the bloodstream) or by positing a new reason for behaviors (e.g., an infant's interactions in his or her social world are predicated on the need to establish a sense of basic trust in the world, whereas an adolescent's social interactions involve the need to establish a sense of identity, or a self-definition). In other words, it is possible to offer an explanatory discontinuous interpretation of development involving *either* quantitative or qualitative change. Figure 1.1 illustrates the various combinations of quantitative and qualitative, descriptive and explanatory, continuity and discontinuity, that can occur intraindividually across ontogeny.

The particular couplings that one posits as involved in human life will depend on the substantive domain of development one is studying (e.g., intelligence, motivation, personality, peer group relationships) and primarily on one's theory of development. Any particular description or explanation of intraindividual change is the result of a particular theoretical view of development. Accordingly, commitment to a theory that focuses only on certain variables or processes will restrict one's view of the variety of changes that may characterize development. Focusing only on "stages of development" (e.g., Freud, 1954; Piaget, 1950) may lead to an emphasis only on qualitative discontinuity in both descriptions and explanations. Focusing only on stimulus-response connections (e.g., Bijou & Baer, 1961) may result in an emphasis on explanatory continuity and descriptive discontinuity (in regard to the number of connections present in a person's behavioral repertoire). Thus, especially in the case of theories that are based on nature-nurture splits, the range of possible intraindividual changes included in a person's development is split into sets associated with a specific theoretical model. In short, theory, not data, is the major lens through which one "observes" continuity or discontinuity in development.

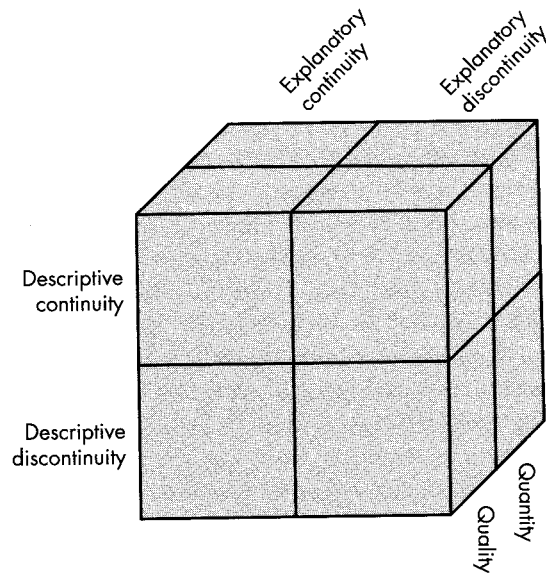


Figure 1.1 The intraindividual change box. Intraindividual change involves three dimensions: descriptive continuity–discontinuity; explanatory continuity–discontinuity; and a quantitative–qualitative dimension (adapted from Lerner, 2002, p. 109).

Stability versus Instability

The stability–instability issue continues to engage the interest of developmental scientists conducting research about different points across the life span (e.g., Bornstein & Bornstein, 2008; Bornstein et al., 2010) and about development in different cultural settings (e.g., Bornstein, 1995; Bornstein et al., 2010). The issue pertains to differences that arise between people within groups as a consequence of within–person change. Thus, two types of alterations involving people are occurring simultaneously. People may be changing across times of observation and, because not all people change in the same way or at the same rate, people's locations relative to others may alter as well. Accordingly, to understand all dimensions of a person's alterations across occasions of observation, both aspects of change (continuity–discontinuity and stability–instability) should be considered simultaneously (e.g., Bornstein et al., 2010). Only through such a joint, simultaneous focus can development across the life span best be portrayed.

As discussed by Bornstein and Bornstein (2008), if a person's position relative to his or her reference group remains the same with development, this is *stability*. That is, "Stability is consistency in the relative standing or rank of individuals in a group on some [characteristic] through time" (Bornstein & Bornstein, 2008, p. 74). If a person's position relative to his or her reference group changes with development, this is *instability*. That is, "Individuals show instability in a given [characteristic] if they do not maintain their relative standing or order in the group through time" (Bornstein & Bornstein, 2008, p. 74). Therefore, the terms *stability* and *instability* describe a person's ranking relative to some reference group. However, whether stability or instability occurs says nothing whatsoever about whether any within–person change took place. A person can change, and this change may still be labeled stability,

if others in the reference group also changed and if the target person remained in the same relative position. By contrast, a person could remain the same from Time 1 to Time 2, yet his or her position relative to the reference group would be termed *instable* if others in the group changed while the target person did not. Hence, the terms *stability* and *instability* describe relative, not absolute, changes.

Any developmental change may be characterized as being either continuous or discontinuous and either stable or instable, and different theories of development proscribe and prescribe the character of the changes that may be involved in human development. Theories that vary in their commitment to nature, to nurture, or to nature–nurture interactional or synthetic ideas may be contrasted in regard to their inclusion of ideas pertinent to qualitative and quantitative, descriptive and explanatory, continuity and discontinuity.

Towards the Healing of Conceptual Splits

We have seen that, throughout the history of developmental science, some scholars took split positions in regard to human development, whereas others favored what Overton (2013) has labeled process–relational conceptions: a set, or family, of theories labeled relational developmental systems models. Process–relational positions aim to "heal" the nature–nurture split (1) by offering categories that describe the biological and the social–cultural as alternative ways of viewing the same whole (e.g., Gottlieb, 1997, 1998; Overton, 2013, 2015; Tobach, 1981) and (2) by suggesting that coaction constitutes a broad–based process of development that itself differentiates into biological and social–cultural manifestations (e.g., Brandstädter, 1998, 2006; Overton, 2006, 2013, 2015).

Prior to Overton's (2013, 2015) discussion of split–versus–relational ideas in philosophy, Overton and Reese (e.g., 1973) focused on the importance of the mechanistic and the organismic world views for theory and method in human development. Historically, these two world views have been central in influencing theories of development. Although many theories of development that adopt split views of nature and nurture are associated with organicism and the mechanistic view, Overton and Reese advanced the understanding of human development significantly by describing the different "families" of theories and methodological traditions associated with mechanistic– and organismic–related theories.

The work of Reese and Overton was seminal in promoting among developmental scientists an interest in exploring the potential role of alternative world hypotheses in shaping theories of development. Reese and Overton (Reese, 1982; Overton, 1984; Overton & Reese, 1973) and Lerner (e.g., 1984; Lerner & Kauffman, 1985) discussed the ways in which a "contextual" world hypothesis (Pepper, 1942) could be used to devise a theory of development. In addition, Riegel (1975) discussed the potential use of a "dialectical" model of development; that is, a conception that regarded developmental change as involving a synthesis of different levels of organization within the ecology of human development—for example, the individual, regarded as a "thesis" and the context, regarded as the antithesis, were united through a process that involved a synthesis between them.

Although Pepper (1942) claimed that it was not philosophically permissible to "mix metaphors" and combine mechanistic, organismic, and contextual world views, many scholars believed it was possible to do just this. Overton (1984) and Lerner and Kauffman (1985) argued that criteria of usefulness should be used to judge theories, even if such theories did mix metaphors. They suggested that useful theories were those that in comparison to other positions accounted for more variance in developmental data sets; led to more novel

discoveries than did ideas associated with other positions; or integrated a broader range of phenomena pertinent to development than was the case with other positions. Both Overton (1984) and Lerner and Kauffman (1985) advanced the idea that a combination of organicism and contextualism could frame a new approach to developmental theory. The conceptual attractiveness of an integration between contextualism and organicism has resulted within contemporary developmental science in an interest in and elaboration of various instantiations of relational developmental systems theories.

Relation Developmental Systems–Based Models: An Overview

As we have noted, the RDS metamodel is derived from a process-relational paradigm (Overton, 2015) and, as a consequence, emphasizes that the basic process of human development involves mutually influential relations between developing individuals and the multiple levels of their complex and changing contexts. As we have indicated as well, these bidirectional individual \leftrightarrow context relations constitute the fundamental unit of analysis in the study of human development from an RDS-based perspective. The emergence of focus in developmental science on RDS-based models reflects that the field has evolved from being one dominated by either psychogenic or biogenic approaches to one that is multidisciplinary and seeks to integrate variables from biological through cultural and historical levels of organization across the life span into a synthetic, coactional system (Elder, 1998; Gottlieb, 1997, 1998; Overton, 2013). Reductionist accounts of development that adhere to a Cartesian dualism, and that accordingly pull apart (split) facets of the integrated developmental system, are rejected by proponents of RDS-based models (e.g., Lerner & Benson, 2013; Mistry & Wu, 2010; Overton, 2013; Overton & Lerner, 2012; Overton & Müller, 2013). Instead, proponents of the RDS metamodel favor an approach to theory that emphasizes the study and integration of different levels of organization as a means to understand life-span human development (Lerner, 2006; Overton & Müller, 2013). Thus, the conceptual emphasis of the post-Cartesian RDS metamodel is on the nature of mutually influential relations between individuals and contexts, represented as individual \leftrightarrow context relations.

As we have noted, all levels of the relational developmental system itself are integrated within models and theories constructed within the RDS-based perspective (Lerner, 2006; Overton, 2013), including a diversity of processes (e.g., biological/physiological, behavioral, and social relationship processes, as well as physical, ecological, cultural, and historical processes [see Bronfenbrenner & Morris, 2006; Lerner, 2002]). We also have noted that the embeddedness of all levels within history imbues temporality into individual \leftrightarrow context relations, meaning there is the potential for plasticity, for organized and systematic change in these relations, across person, time, and place (Elder, 1998; Lerner, 1984, 2002, 2006). The possibility of adaptive developmental relations between individuals and their contexts, and the potential plasticity of human development, are distinctive features of this approach to human development.

These core features of RDS-based theories provide a rationale for making a set of methodological choices that differ in study design, measurement, sampling, and data analytic techniques from selections made by researchers using split, dichotomous, or reductionist Cartesian approaches to developmental science. Moreover, the emphasis on how individuals act in, and contribute to, plastic relations with, their contexts draws attention to individual agency (or intentional self-regulation; Gestsdóttir & Lerner, 2008)—or to individuals as

active producers of their own development (Lerner, 1982; Lerner & Busch-Rossnagel, 1981). This interest in individual agency is best instantiated by person-centered (as compared to variable-centered) approaches to the study of human development (see von Eye, Bergman, & Hsieh, 2015) and thus, as well, to the study of interindividual differences in intraindividual processes (Molenaar & Nesselroade, 2015; Nesselroade & Molenaar, 2010).

In addition, the person-centered focus, as well as the emphases on relative plasticity and on mutually influential person \leftrightarrow context relations, has resulted in the RDS metamodel being used as a frame for more specific understandings about the changing structure of ontogenetic trajectories, and has resulted in the view that developmental science is a nonergodic field (Molenaar & Nesselroade, 2015; Nesselroade & Molenaar, 2010). The ergodic theorem holds that, if data sets are marked by (1) homogeneity across individuals in a three-dimensional matrix that involves persons, variables, and time and (2) stationarity of individuals' scores on variables across time, then findings based on interindividual designs will be equivalent to findings based on intraindividual designs (Molenaar, 2007). Framed by relational developmental systems thinking, however, developmental scientists understand that there is variation both across people within time and within people across time in their trajectories of individual \leftrightarrow context relations (i.e., across time differences). In other words, people differ in their paths across the life span. As such, the assumptions of homogeneity and stationarity of the ergodic theorem are rejected in contemporary developmental science (e.g., Molenaar, 2007). As a consequence of nonergodicity, developmental scientists place greater importance on not only person-centered research but also on change-sensitive methods for their descriptive and explanatory efforts.

The conceptual and associated methodological emphases of scholarship associated with the RDS metamodel, and specifically with the models and theories constructed within this framework (Overton, 2013, 2015), have led developmental scientists within this perspective to draw on research from multiple disciplines (e.g., evolutionary biology, human genetics, developmental science, sociology, and anthropology). Such reference is made in order to better understand the integrated changes across the multiple levels of organization within the ecology of human development. In addition, the reliance of research from multiple disciplines occurs in order to document the logical and empirical shortcomings of split, biological reductionist (genetic or neuronal) models (e.g., sociobiology, evolutionary psychology, or behavioral genetics) and methods (e.g., adoption designs, monozygotic and dizygotic twin research, or heritability analysis). These scholars have used relational developmental systems–based ideas to explain that any facet of individual structure or function (e.g., genes, the brain, personality, cognition, or intelligence) is *embodied*—that is, is fused—with other features of the individual and with the characteristics of his or her proximal and distal ecology, including culture and history (e.g., see Lerner & Benson, 2013).

Embodied Change, Evolution, and Ontogeny

According to the concept of *embodiment*, biological, psychological, and behavioral attributes of the person, in fusion with culture, also have a temporal (historical) parameter (Overton, 2006). As such, embodiment—the fusion among the levels of organization within the relational developmental system itself—has implications across both ontogeny and phylogeny (Ho, 2010; Jablonka & Lamb, 2005). These implications involve the concept of *epigenesis* (the process of qualitative change that emerges across the life span through the integration

of organism and contextual levels of organization; Lerner, 1984, 2002) and, as well, the presence of relative plasticity in phylogeny and ontogeny that occurs because of the embodied acts that lead to change. In other words, relative plasticity characterizes the relations between organisms and contexts (Lerner, 1984) that, across time, create epigenetic processes within and across generations.

Contemporary scholarship about the character of evolution reflects the concept of embodied change, which characterizes the relational developmental system itself. For instance, Bateson and Gluckman (2011) observed that gene expression is fundamentally shaped by variables external to the cell nucleus (where deoxyribonucleic acid, DNA, is located). They stressed, therefore, "A willingness to move between different levels of analysis has become essential for an understanding of development and evolution" (Bateson & Gluckman, 2011, p. 5). Similarly, Keller (2010) explained that it is erroneous either to conceptualize development as involving separate causal influences or to posit that attributes of the person develop as an outcome of the interaction of causal elements. Indeed, she noted that the concept of interaction is itself flawed, in that its use is predicated on the idea that there exist attributes that are at least conceptually separate. Keller explained that the concept of developmental dynamics precludes such separation. She emphasized, "From its very beginning, development depends on the complex orchestration of multiple courses of action that involve interactions among many different kinds of elements—including not only preexisting elements (e.g., molecules) but also new elements (e.g., coding sequences) that are formed out of such interactions, temporal sequences of events, dynamical interactions, etc." (Keller, 2010, pp. 6–7).

Moreover, Pigliucci and Müller (2010), in presenting what they term an "extended synthesis" of evolution, noted that genes are not as much generators of evolutionary change as they are followers in the evolutionary process. They explained that "evolution progresses through the capture of emergent interactions into genetic-epigenetic circuits, which are passed to and elaborated on in subsequent generations" (Pigliucci & Müller, 2010, p. 14). Similarly, West-Eberhard (2003) connected evolution and the presence of relative plasticity across development. She explained that environmental variables are a major basis of adaptive evolutionary change. Consistent with Pigliucci and Müller (2010), she noted that genetic mutation does not provide either the origin or the evolution of novel adaptive characteristics because "genes are followers not leaders, in evolution" (West-Eberhard, 2003, p. 20). In addition, she explained that the relative plasticity of the phenotype can facilitate evolution by providing immediate changes in the organism (West-Eberhard, 2003). Similarly, Gissis and Jablonka (2011) noted that plasticity "is . . . a large topic, but, just as Lamarck anticipated, an understanding of plasticity is now recognized as being fundamental to an understanding of evolution" (p. xiii).

Crystallizing the embodiment of variables from all levels of organization within the relational developmental system that creates epigenetic change across generations, Jablonka and Lamb (2005) presented evidence demonstrating that human evolution involves four inter-related dimensions: genes, epigenetics, behavior, and culture. They explained that contemporary research in molecular biology indicates clearly that current, neo-Darwinian assumptions about the role of genes in evolution are mistaken. This research demonstrates that cells can transmit information to daughter cells through non-DNA, epigenetic means. Therefore, genetic and epigenetic processes constitute two dimensions of evolution. In addition, animals can transmit information across generations through their behavior, which constitutes a third dimension of evolution. In addition, a fourth dimension of evolution is constituted

by culture, in that humans "inherit" from their parents symbols and, in particular, language. As such, Jablonka and Lamb (2005) concluded, "It is therefore quite wrong to think about heredity and evolution solely in terms of the genetic system. Epigenetic, behavioral, and symbolic inheritance also provide variation on which natural selection can act" (p. 1).

Distinct from the use of the term *epigenesis* as a concept referring to the emergence of qualitatively discontinuous characteristics (e.g., developmental stages) across ontogeny (see Gottlieb, 1997, 1998; Lerner, 1984, 2002; Lerner & Benson, 2013), the term *epigenetics* to which Jablonka and Lamb (2005) referred is a process that modifies the information transmitted by DNA (through messenger RNA, or mRNA) across long, even multigenerational time scales (e.g., Meaney, 2010; Misteli, 2013; Slavich & Cole, 2013). Misteli (2013) explained that the term *epi* comes from the Greek and means "over" or "above," and therefore epigenetic effects are effects that are "beyond" the effects of genes. These effects occur because chemicals in the cell either allow or do not allow DNA to be transcribed into mRNA. For example, acetyl groups, when linked with one of the four base chemicals comprising DNA—that is, to cytosine—allow DNA transcription; this process is termed *acetylation*. In turn, when methyl groups are lined to cytosine, then, there is no transcription of DNA into mRNA. This process is termed *methylation*. In short, acetylation processes allow DNA to be transcribed into mRNA (and to therefore play a role in producing proteins) and methylation processes silence DNA transcription.

If DNA is not transcribed into mRNA, then this DNA (this gene, for instance) cannot play a role in the production of proteins for use by the cell. Because this silencing of gene transcription can persist (can remain stable) across generations (Meaney, 2010; Misteli, 2013; Roth, 2012; Slavich & Cole, 2013), epigenetic influences constitute heritable changes caused by processes other than by DNA. Indeed, in a book discussing the transformations of Lamarckian theory that have arisen in relation to the increasingly more active focus on epigenetic processes in the study of both evolution and development (Meaney, 2010), Gissis and Jablonka (2011) noted that a form of inheritance of acquired characteristics does exist in the form of epigenetic inheritance systems.

This system of epigenetic effects involves chemicals within the cell, within the internal milieu of the body, and within the external ecology within which the body is embedded (Misteli, 2013; Roth, 2012; Slavich & Cole, 2013) or embodied, in the terms used by Overton (2013, 2015). For instance, Roth (2012) noted that the genome of infants is modified by epigenetic changes involving experiential and environmental variables. Similarly, Slavich and Cole (2013) discussed evidence that changes in the expression of hundreds of genes occurs as a function of the physical and social environments inhabited by humans, and they noted that "external social conditions, especially our subjective perceptions of these conditions, can influence our most basic internal biological processes—namely, the expression of our genes" (p. 331).

We return in the concluding section of this chapter to the implications of embodiment and epigenetics for promoting health and positive human development. Here we note, however, that the evidence concerning epigenetics, embodied action, and plasticity that today is understood as accounting for the character of evolutionary and developmental change necessarily leads to deep skepticism about the "extreme nature" (Rose & Rose, 2000) of the claims of biological reductionists. For example, according to Rose and Rose (2000), evolutionary psychology (EP) claims that "everything from children's alleged dislike of spinach to our supposed universal preferences for scenery featuring grassland and water derives from [the] mythic human origin in the African savannah" (p. 2). These assertions are predicated

on the basis of the claim that one can explain all facets of human behavior, and therefore society and culture, on the basis of what are characterized as universal features of human nature that had their evolutionary genesis at the time of the emergence of our species, about 100,000 to 600,000 years ago. Rose and Rose (2000, p. 1) noted that EP protagonists maintain that “the ‘architecture of the human mind’ which evolved during the Pleistocene is fixed, and insufficient time has elapsed for any significant subsequent change. In this architecture there have been no major repairs, no extensions, no refurbishments, indeed nothing to suggest that micro or macro contextual changes since prehistory have been accompanied by evolutionary adaption.”

Clearly such assertions within EP are inconsistent with the now quite voluminous evidence in support of the role of epigenetics in the multiple, integrated dimensions of human evolution, discussed above (Bateson, 2015; Coall, Callen, Dickins, & Chisholm, 2015; Gissis & Jablonka, 2011; Gunnar, Doom, & Esposito, 2015; Jablonka & Lamb, 2005; Lickliter & Honeycutt, 2015). Moreover, these claims run counter to research that has importantly focused on the role of the organism’s own active agency, and of culture, in creating change within and across generations.

Despite the abundant examples (see, e.g., Lerner & Benson, 2013; Lickliter & Honeycutt, 2015) suggesting EP scholarship is misguided, EP articles continue to appear in the literature. Examples of the extreme nature of the claims of evolutionary psychologists pointed to by Rose and Rose (2000) occur in writing about what is termed “paternal investment theory” (e.g., Belsky, 2012; Belsky, Steinberg, & Draper, 1991; Draper & Harpending, 1982, 1988). For example, Ellis, Schlomer, Tilley, and Butler (2012) claimed that this theory associates low levels of male parental investment with more aggressive and hypermasculine behavior in male offspring and, in turn, more precocious and risky sexual behavior in female offspring, ideas derived from anthropological writing (Draper & Harpending, 1982, 1988). Ellis and colleagues (2012) explained that the assumption on which parental investment theory is based is that “natural selection has designed boys’ and girls’ brains to detect and encode information about their fathers’ social behavior and role in the family as the basis for calibrating socio-sexual development in gender-specific ways” (p. 329).

What is the process that links this purported evolutionary heritage with the gender differences seen across ontogeny? How did Ellis and colleagues (2012) link their story of human evolution with accounts of human development? Ellis and colleagues (2012) claimed that fathers have a unique influence on their daughters’ sexual behavior because “(a) . . . the quality and quantity of paternal investment is, and presumably always has been, widely variable across and within human societies; (b) this variation recurrently and uniquely influenced the survival and fitness of children during our evolutionary history. . . ; and (c) variability in paternal investment, much more than maternal investment, was diagnostic of the local mating system (degree of monogamy vs. polygyny) and associated levels of male-male competition” (p. 329).

Ellis and colleagues (2012) buttressed point “c” (above) by noting that Draper and Harpending (1982, 1988) emphasized that mating systems in more polygynous cultures are marked by high levels of male intrasexual competition, dominance-striving, and violence, and that, at the same time, they are also marked by low levels of paternal involvement and investment. In turn, Ellis and colleagues (2012) concluded, then, that “female reproductive strategies in this context are biased toward earlier sexual debut, reduced reticence in selecting mates, and devaluation of potential long-term relationships with high-investing males, all of which translate into more RSB [risky sexual behavior]” (p. 329).

In contrast to these EP claims, a process-relational metamodel and concepts associated with the RDS metamodel (Overton, 2015) suggest that transmission across generations is accounted for by the plastic embodied processes of the individual functioning in a reciprocal—that is, bidirectional (\leftrightarrow)—relation with his or her physical and cultural context. Thus, within the RDS metamodel, and in the context of contemporary evolutionary scholarship (e.g., Gissis & Jablonka, 2011; Ho, 2010; Keller, 2010; Lickliter & Honeycutt, 2015; Meaney, 2010), the “Just So” stories (Gould, 1981) of EP are conceptually and empirically flawed. Further, embodiment constitutes the basis for epigenesis within the person’s life span (Gottlieb, 1997, 1998), including qualitative discontinuity across ontogeny in relations among biological, psychological, behavioral, and social-cultural variables. Evidence for the relative plasticity of human development within the integrated levels of the ecology of human development makes biologically reductionist accounts of parenting, offspring development, or sexuality implausible, at best, and entirely fanciful, at worst.

In sum, the RDS metamodel provides an approach to the study of evolutionary and ontogenetic change that capitalizes on the dynamic, mutually influential relations between developing individuals and their complex and changing ecology. These “strands” of theory merged in the 1970s, 1980s, and 1990s and created a focus on models emphasizing that time and place matter in regard to shaping the course of life (Bronfenbrenner, 2005; Elder, 1998; Elder & Shanahan, 2006; Elder et al., 2015), and emphasized that the scientific study of human development needed to assess both the individual and the diversity of people to understand human development. The process-relational paradigm that framed conceptions of the bases of human development was associated with the generation of several relational developmental systems models of human development (Overton, 2013; Overton & Müller, 2013), conceptions that were used to guide the study of individuals, contexts, and their dynamic interrelations across the life span. Table 1.1 presents the defining features of such models. The next section of this chapter provides brief overviews of some examples of RDS-based theories.

Table 1.1 Defining Features of the Relational Developmental Systems Metamodel

Relational Metatheory

Predicated on a philosophical perspective that transcends Cartesian dualism and atomism, theories derived from the relational developmental systems metamodel are framed by a process-relational paradigm for human development. This focus includes an emphasis on process and a rejection of all splits between components of the ecology of human development (e.g., between nature- and nurture-based variables, between continuity and discontinuity, and between stability and instability). Holistic syntheses replace dichotomies as well as reductionist partitions of the developing relational system through the integration of three relational moments of analysis: the identity of opposites, the opposites of identity, and the syntheses of wholes. Deriving from the relational metatheory, relational developmental systems posit the organism as an inherently active, self-creating, self-organizing, and self-regulating nonlinear complex adaptive system, which develops through embodied activities and actions, as they co-act with a lived world of physical and sociocultural objects.

The Integration of Levels of Organization

Relational thinking with the rejection of Cartesian splits is associated with the idea that all levels of organization within the ecology of human development are integrated, or fused. These levels range from the biological and physiological through the cultural and historical.

(Continued)

Table 1.1 Continued

Developmental Regulation across Ontogeny Involves Mutually Influential Individual ↔ Context Relations

As a consequence of the integration of levels, the regulation of development occurs through mutually influential connections among all levels of the developing relational system, ranging from genes and cell physiology through individual mental and behavioral functioning to society, culture, the designed and natural ecology, and, ultimately, history. These mutually influential relations may be represented generically as Level 1 ↔ Level 2 (e.g., Family ↔ Community), and in the case of ontogeny may be represented as individual ↔ context.

Integrated Actions, Individual ↔ Context Relations, Are the Basic Unit of Analysis within Human Development

The character of developmental regulation means that the integration of actions—of the individual on the context and of the multiple levels of the context on the individual (individual ↔ context)—constitutes the fundamental unit of analysis in the study of the basic process of human development.

Temporality and Plasticity in Human Development

As a consequence of the fusion of the historical level of analysis—and therefore temporality—in the levels of organization comprising the ecology of human development, the developing relational system is characterized by the potential for systematic change, by plasticity. Observed trajectories of intraindividual change may vary across time and place as a consequence of such plasticity.

Relative Plasticity

Developmental regulation may both facilitate and constrain opportunities for change. Thus, change in individual ↔ context relations is not limitless, and the magnitude of plasticity (the probability of change in a developmental trajectory occurring in relation to variation in contextual conditions) may vary across the life span and history. Nevertheless, the potential for plasticity at both individual and contextual levels constitutes a fundamental strength of all human development.

Intraindividual Change, Interindividual Differences in Intraindividual Change, and the Fundamental Substantive Significance of Diversity

The combinations of variables across the integrated levels of organization within the developmental system that provide the basis of the developmental process will vary at least in part across individuals and groups. This diversity is systematic and lawfully produced by idiographic, group differential and generic (nomothetic) phenomena. The range of interindividual differences in intraindividual change observed at any point in time is evidence of the plasticity of the developmental system and makes the study of diversity of fundamental substantive significance for the description, explanation, and optimization of human development.

Interdisciplinarity and the Need for Change-Sensitive Methodologies

The integrated levels of organization comprising the developmental system require collaborative analyses by scholars from multiple disciplines. Interdisciplinary knowledge is a central goal. The temporal embeddedness and resulting plasticity of the developing system requires that research designs, methods of observation and measurement, and procedures for data analysis be change- and process-sensitive and able to integrate trajectories of change at multiple levels of analysis.

Optimism, the Application of Developmental Science, and the Promotion of Positive Human Development

The potential for and instantiations of plasticity legitimate an optimistic and proactive search for characteristics of individuals and of their ecologies that, together, can be arrayed to promote positive human development across life. Through the application of developmental science in planned attempts (interventions) to enhance (e.g., through social policies or community-based programs) the character of humans' developmental trajectories, the promotion of positive human development may be achieved by aligning the strengths of individuals (operationalized as the potentials for positive change) and contexts.

Based on Lerner (2006), Lerner et al. (2014), and Overton (2013, 2015)

Examples of Relational Developmental Systems Theories

The features of the RDS metamodel summarized in Table 1.1 indicate that, if we are to have an adequate and sufficient science of human development, we must integratively study individual and contextual levels of organization in a relational and temporal manner (Bronfenbrenner, 1974; Zigler, 1998). All instances of RDS-based theories take this relational, time-sensitive approach. Nevertheless, there are differences in emphasis or focus among various instantiations of the RDS metamodel.

Previous versions of this chapter, contained in prior editions of this book, described in considerable detail instances of the RDS metamodel that have been fundamental to the advancement of developmental science (see, e.g., Lerner, Lewin-Bizan, & Warren, 2010). These theories include Lerner's developmental contextualism (e.g., 2002, 2004; Ford & Lerner, 1992); Baltes's life-span developmental theory (1987; Baltes & Baltes, 1990; Baltes, Lindenberger, & Staudinger, 2006; Freund & Baltes, 2002); Brandtstädter's (1998, 1999, 2006) action theory of human development; Elder's life-course theory (e.g., Elder, 1998; Elder & Shanahan, 2006; Elder et al., 2015); Bronfenbrenner's bioecological theory of developmental processes (e.g., Bronfenbrenner, 1979, 2005; Bronfenbrenner & Morris, 1998, 2006); and Magnusson's holistic person-context interaction theory (1995, 1999; Magnusson & Stattin, 1998, 2006). Although these theories reflect the concepts presented in Table 1.1, it is useful to describe here the defining (distinct) features of these different "family members."

Lerner's Developmental Contextualism

Developmental contextualism is a theoretical approach to the science of, and service to, human development. Building on the integrative ideas found in Schneirla's (1957; Tobach, 1981) thinking, the central idea in developmental contextualism is that changing, reciprocal relations (or dynamic interactions) between individuals and the multiple contexts within which they live comprise the essential process of human development (Lerner & Kauffman, 1985). Accordingly, developmental contextualism stresses that bidirectional relations exist among the multiple levels of organization involved in human life (e.g., biology, psychology, social groups, and culture; Bronfenbrenner, 1979; Bronfenbrenner & Morris, 2006; Lerner, 2006). These dynamic relations provide a framework for the structure of human behavior (Ford & Lerner, 1992). In addition, this system is itself dynamically interactive with historical changes. This temporality provides a change component to human life (Dixon, Lerner, & Hultsch, 1991). In other words, within developmental contextualism a changing configuration of relations constitutes the basis of human life (Ford & Lerner, 1992).

In sum, developmental contextualism reflects the ideas of dynamic interaction, levels of integration, and self-organization associated with other instances of open, living, developmental systems theories of human development. Because individuals act on the context that acts on them, individuals are active producers of their own development (Lerner & Busch-Rossnagel, 1981). Individual ↔ context relations enable individuals to engage in "circular functions" (Schneirla, 1957) that provide a basis for the individual's (for the self's) contribution to the construction of his or her developmental system.

As such, scholarship framed by the model eschews reductionism, unilevel assessments of the individual, and time-insensitive and atemporal analyses of human development. Instead, integrative/holistic, relational, and change-oriented research focused on the individual-in-context is promoted (e.g., Magnusson, 1999; Magnusson & Stattin, 2006).

Such research, necessarily embedded in the actual ecology of human development (Bronfenbrenner & Morris, 2006), has another significant feature—its import for actions (e.g., intervention programs and policies) that may enhance human development and social justice more broadly.

Baltes's Life-Span Developmental Theory

Life-span developmental theory (Baltes, 1987, 1997; Baltes, Lindenberger, & Staudinger, 2006; Baltes, Reese, & Lipsitt, 1980) studies individual development (ontogenesis) from conception into old age. A core assumption of life-span developmental science is that development is not completed at adulthood (maturity) but instead extends across the entire life course and that life-long adaptive processes are involved.

Baltes and colleagues (1998, p. 1041) believed that it was necessary to investigate four dimensions of changing person-context relations: (1) an age-related general reduction in the amount and quality of biology-based resources as individuals move toward old age; (2) the age-correlated increase in the amount and quality of culture needed to generate higher and higher levels of growth; (3) the age-associated biology-based loss in the efficiency with which cultural resources are used; and (4) the relative lack of cultural, "old age-friendly," support structures.

Baltes and colleagues (e.g., Baltes et al., 1998) offered a tripartite model for integrating developmental changes involving the behaviors (actions) of the individual on the context with features of historical change, and thus for synthesizing sociological approaches (e.g., Elder & Shanahan, 2006; Elder et al., 2015) and individual psychological ones (Hetherington & Baltes, 1988) to understand the bases of development. The three components of this model involve (1) normative, age-graded influences; (2) normative, history-graded influences; and (3) nonnormative, life-event influences (Baltes et al., 1980).

In sum, variables from several sources, or dimensions, influence development. As such, life-span developmental theory stresses that human development is *multidimensional* in character. Variables from many dimensions (ranging from biology-related, age-graded events through the normative and the nonnormative events constituting history) are involved in developmental change. The relations among the sources of contextual influence—normative, age-graded; normative, history-graded; and nonnormative, life-event—are seen as *dynamic*—that is, *reciprocal*. They may continually change, and each influence has an effect on the others and is affected by them. In short, life-span developmental theory provides a means to see the integrative relevance of individual action, of the institutional/sociological setting of the life course, and of the broad ecology of human development. Accordingly, we turn now to discuss theories associated with these other domains of the RDS metamodel.

Brandtstädter's Action Theory of Human Development

Brandtstädter (2006) conceptualized actions as a means through which individuals affect their contexts and, through the feedback resulting from such actions, organize their ideas about their contexts and themselves. As a consequence of this understanding, individuals then develop a set of "guides"—that is, motivations (e.g., intentions, goals), or regulators—for or of future actions. To Brandtstädter (2006), the outcome of this reciprocal "action-feedback-self-organization-further action" process is human development. Thus, action constitutes the "engine" of development and, as such, of person-context relations. Indeed,

it is the self—the person who reflects on his or her own intentions, goals, and interests and who understands therefore who he or she is at the moment and who he or she would like to be at some future time—that acts to regulate relations with the context.

Thus, akin to other members of the RDS family, action theory as conceptualized by Brandtstädter (1998, 2006) emphasizes the fused, dynamic relations between individuals and their contexts as constituting the core process of human development. However, as is the case with other members of this theoretical family, Brandtstädter's action theory also has attributes specific to it. One key distinctive feature is the central role given to the intentionality of the individual in moderating exchanges occurring between person and context. A second feature is a focus on the changes in development deriving from these intention-based exchanges.

Brandtstädter's action theory places central emphasis on an individual's intentions in his or her regulatory actions. These actions both reflect and propel development. As such, actions constitute the means through which the active individual, fused with his or her active context, actualizes his or her potential for plasticity in ways that develop, support, and elaborate the self. At the same time, Brandtstädter (1998, 2006) explained that the intentions of the self are limited in the developmental goals that can be actualized due to both individual and contextual constraints on plasticity.

Accordingly, Brandtstädter (1998, 2006) envisioned three dimensions of scholarship that should be pursued to understand the dynamic relations between plasticity and constraints, a relation brought to the fore of conceptual attention by an action theoretical perspective. That is, he recommended that:

in analyzing the ontogeny of intentional self-development, three basic lines of development should be considered: (1) the development of intentional action in general, and of cognitive and representational processes related to intentionality; (2) the formation of beliefs and competencies related to personal control over development; and (3) the development of the self (or self-concept) as a more or less coherent structure of self-referential values, beliefs, and standards that guides and directs self-regulatory processes.

(2006, p. 545)

To understand further the integrations among the levels of the developmental system that comprise the action context for human development, we must consider the social system within which people develop and the historical/contextual focus used to specify the role of the social world within the developmental system. This social system approach to human development, termed life-course theory, was pioneered by Glen H. Elder, Jr. Elder's scholarship has been central in understanding the importance of the life course in influencing the character of human development—that is, the transitions in social situations or institutions involved in people's lives and the shaping of the trajectory of human life by its embeddedness in the institutions of society.

Elder's Life-Course Theory

Elder (1998; Elder & Shanahan, 2006; Elder et al., 2015) saw life-course theory as enabling scholars to move beyond an additive or simple interactional view of the social system within which development unfolds. Life-course theory synthesizes the social systems into the actual

constitution of the structures and functions comprising human development. The means through which this integration is seen to occur in life-course theory is one emphasized as well in life-span developmental theory (Baltes et al., 1998, 2006) and in action theory (Brandstädter, 1998, 2006)—that is, through the selective and intentional regulative actions of individuals, functioning as producers of their own development. Lives are linked through these person ↔ context relations, and, because these social connections exist within in a multilevel, historically embedded system, time and place matter in human development (Elder, Modell, & Parke, 1993; Elder et al., 2015).

Accordingly, Elder indicated that the life course is constructed through the *simultaneous* contribution of actions made by individuals dynamically interacting with other individuals while embedded in a context changing along three temporal dimensions: (1) “life” or “ontogenetic” time (one’s age from birth to death); (2) “family” time (one’s location within the flow of prior and succeeding generations); and (3) “historical” time (the social and cultural system that exists in the world when one is born and the changing circumstances regarding this system that occur during one’s life). The postulation of a dynamic integration between an individual’s regulatory actions and a social system constituted by the people, social institutions, and historical events that vary across these three temporal dimensions provided, for Elder (1998), a means to represent the life course of an individual. As such, Elder’s (1998) theory merges within a given person the micro (ontogenetic, biological, behavioral, and psychological) and macro (social system) levels of organization that are held to be fused within relational developmental systems theory. In short, Elder’s model constitutes a means to integrate an individual’s life into the social system from the moment of his or her birth. Birth provides for his or her immediate membership into (1) a familial flow of generations and (2) a society that exists at a given point in history, with its extant but evolving set of institutions, roles, and socially defined life pathways.

The significance of Elder’s formulation of life-course theory is that he weaves the importance of macro, social system influences into the development of individuals in a manner that is neither disciplinarily “isolationist” (or hegemonist) nor simply additive. Elder’s scholarship is an example of relationism, the multilevel fusions that define a relational developmental systems perspective. He brings the social system to human development, not as a context for development but—in the essence of what is sought in relational developmental systems theory—as part of the very constitutive fabric of human ontogeny. There is at least one other scholar whom Elder and we would agree also integrates person and context seamlessly. Urie Bronfenbrenner, for more than a half-century, provided a vision for—and a theoretical and empirical literature supportive of—the integration of all levels of organization within the ecology of human development (e.g., see Bronfenbrenner, 2005).

Bronfenbrenner’s Bioecological Theory of Developmental Processes

The defining properties of the model that emerged from the scholarship of Bronfenbrenner (1979, 2005; Bronfenbrenner & Morris, 2006) involves four interrelated components: (1) the developmental *process*, involving the fused and dynamic relation of the individual and the context; (2) the *person*, with his or her individual repertoire of biological, cognitive, emotional, and behavioral characteristics; (3) the *context* of human development, conceptualized as the nested levels, or systems, of the ecology of human development he depicted (Bronfenbrenner, 1979); and (4) *time*, conceptualized as involving the multiple dimensions of temporality that we have noted that Elder and Shanahan (2006) explained are part of life-course

theory. Together, these four components of Bronfenbrenner’s formulation of bioecological theory constituted a Process-Person-Context-Time (PPCT) model for conceptualizing the integrated developmental system and for designing research to study the course of human development. Bronfenbrenner believed that just as each of the four components of the PPCT model must be included in any adequate conceptual specification of the dynamic human development system, so too must research appraise all four components of the model to provide data that are adequate for understanding the course of human development.

Bronfenbrenner explained the importance for human ontogeny of the interrelated ecological levels, conceived of as nested systems, involved in human development. Bronfenbrenner described the *microsystem* as the setting within which the individual was behaving at a given moment in his or her life and the *mesosystem* as the set of microsystems constituting the individual’s developmental niche within a given period of development. In addition, the *exosystem* was composed of contexts that, if not directly involving the developing person (e.g., the work place of a child’s parent), had an influence on the person’s behavior and development (e.g., as may occur when the parent has had a stressful day at work and as a result has a reduced capacity to provide quality care to the child). Moreover, the *macrosystem* is the superordinate level of the ecology of human development; it is the level involving culture, macro-institutions (such as the federal government), and public policy. The macrosystem influences the nature of interaction within all other levels of the ecology of human development (yet, we note, this level remains the most elusive and least studied aspect of person ↔ context interactions). Finally, time—the *chronosystem*—cuts through all other components of the ecology of human development. As a consequence, change becomes an integral feature of all systems.

Bronfenbrenner’s bioecological model is in at least two senses a living system (Ford & Lerner, 1992). First, the theory itself depicts the dynamic, developmental relations between an active individual and his or her complex, integrated and changing ecology. In addition, the theory was itself developing throughout Bronfenbrenner’s life. In his final iteration of the theory, Bronfenbrenner (2005) sought to make its features more precise, and, as such, he created a more operational guide for PPCT-relevant research about the dynamic character of the human developmental process.

Spencer’s (2006) Phenomenological Variant of Ecological Systems Theory

Margaret Beale Spencer (2006; Spencer, Swanson, & Harpalani, 2015) has provided a theory that usefully extends Bronfenbrenner’s model to address specifically how sociocultural differences (e.g., being a youth of color versus a youth of European American decent, or being from an affluent setting versus a low-income and high-crime neighborhood setting) can influence young people’s experiences within levels of their developmental context and with different people within the context (e.g., police officers). These experiences are influenced both by individual characteristics (e.g., coping processes) and by how those characteristics are perceived and responded to within the ecological system.

Spencer (2006; Spencer et al., 2015) explained that, because young people have different experiences with features of their contexts, their perceptions of the features of their ecology—what the features signify and what youth believe they can expect from the features in the future—are shaped. The phenomenological experiences of the ecology, then, influence later actions by youth and social interactions with members of their ecology. These behaviors have important implications for understanding risk and resilience among youth of color. As

both Spencer and Bronfenbrenner (2005; Bronfenbrenner & Morris, 2006) point out, this complex interplay between people and their integrated contexts must be examined with a full appreciation for the nestedness of the levels of the ecological system, and the role of diversity and individual perception in person ↔ context interactions and developmental outcomes.

In sum, as has been the case in all of the instances of the RDS metamodel we have discussed in this chapter, and as emphasized more than a half-century ago by Schneirla (1957), the active, developing individual is a central force of his or her own development. This contribution to the process of development is made by a synthesis, an integration, between the active person and his or her active context. We see such individual ↔ context relations emphasized in the final instantiation of developmental system theories we discuss.

Magnusson's Holistic Person-Context Interaction Theory

Magnusson's theoretical formulations and research programs emphasized the fundamental role of context in human behavior and development (e.g., Magnusson, 1995, 1999; Magnusson & Stattin, 1998, 2006). His intellectual vision included a compelling conceptual rationale and substantive basis for internationally contextualized, comparative scholarship (e.g., Magnusson, 1995, 1999) and is built on four conceptual pillars: interactionism, holism, interdisciplinarity, and the longitudinal study of the person.

These themes are shown in Magnusson's theory, which stresses the synthesis, or fusion, of the person-environment system. Magnusson sought to understand the structures and processes involved in the operation of this system and the way in which individuals behave and develop within it. Given this integrative emphasis on person and context, Magnusson (1995) termed his theory a holistic approach.

To Magnusson, the cause of development—the emergence of novel forms across life—was an outcome of the coactions of the components of the dynamic, person-context system. This self-organizational source of developmental change stands in contrast to either the unidirectional, single source (nature or nurture) or the weak or moderate interactional ideas regarding the causes of development.

In what Magnusson termed the modern interactionist perspective, or the holistic interactionist viewpoint, the basis of development lies in two types of interaction: (1) inner interactions, involving bidirectional relationships among biological, psychological, and behavioral characteristics and (2) outer, person-context interactions, involving continual exchanges between the person and his or her environment. Magnusson explained that holistic interaction builds on and extends the ideas of interactionism found in what he terms “classical interactionism” (Magnusson & Stattin, 2006, p. 406).

Holistic interactionism expands on this classic conception of interaction by, first, placing greater emphasis on the dynamic, integrated character of the individual within the overall person-environment system and, second, by stressing both biological and behavioral action components of the system. Accordingly, if the whole person or, better, the person-environment relation characterizes the essence of developmental change, then developmental analysis that assesses single aspects of the system (single variables, for instance) is necessarily incomplete. Only a distorted view of development can be derived from appraising variables divorced from the context of other, simultaneously acting variables (Magnusson & Stattin, 1998, 2006). It is this integration of variables from across the person-environment system that constitutes the core process of human development and, as such, the necessary focus of developmental science.

In sum, when the complexity of the environment is coupled with the multiple dimensions of the person (e.g., his or her biology; mental system; subconscious processes; values, norms, motives, and goals; self-structures and self-perceptions; and behavioral characteristics; Magnusson & Stattin, 1998, 2006), the need for a holistic, integrated theory of the developmental system is apparent. This system must be engaged to understand the course of human development and, as well, to enhance or optimize it. Consistent with our earlier discussions of the implications of plasticity for intervention to enhance the course of human life, Magnusson saw the need to involve all levels of the person and the system to not only design a comprehensive scientific research agenda but also to devise strategies to apply developmental science in ways that integratively promote positive human change. Magnusson's ideas about holistic interaction underscore the integral connection between science and application involved in a relational developmental systems perspective. His views of the scientific and societal utility of such theories, which are consistent with, and buttressed by, the ideas of other scholars whose work is associated with the RDS metamodel (e.g., Baltes et al., 1998, 2006), underscore the importance of transcending the basic science—applied science split and of discussing the integral role that application plays in contemporary theory in human developmental science.

Methodological Implications of Relational Developmental Systems-Based Theories

Faithfully conducting research that reflects the components and evolution of the RDS metamodel, as described earlier, requires that theoretical ideas be actualized through methodological choices related to research design, data collection, and analysis methods. This obligation is characteristic, as Lerner and Overton (2008) noted, of “good science—selecting all features of one's methodology based on the nature of the (theoretically predicated) questions asked” (p. 250). The integrated levels of organization comprising the developmental system require collaborative analyses by scholars from multiple disciplines. Multidisciplinary knowledge—ideally, interdisciplinary knowledge—is sought. The temporal embeddedness and resulting plasticity of the developmental system requires that research designs, methods of observation and measurement, and procedures for data analysis be change-sensitive and able to integrate trajectories of change at multiple levels of analysis. Developmental science needs integrative and relational models, measures, and designs (Molenaar, Lerner, & Newell, 2014).

Examples of the use of such methods within RDS-related research in developmental science, conducted about child and adolescent development, include the scholarship of Bornstein and colleagues (2010) that used an intra-national and cross-national, prospective, and longitudinal design to assess age, gender, region, and country variation in emotional availability in mother-child dyads; of studies by Masten, Narayan, Silverman, and Osofsky (2015) on the individual ↔ context relations involved in resilience among children during times of war and disaster; of studies by Eccles and her colleagues on stage ↔ environment fit in children and adolescents (e.g., Eccles, Wigfield, & Byrnes, 2003); of studies by Damon and his colleagues on the relations between adolescents and adults working together on a community-based youth charter (Damon, 1997, 2004; Damon & Gregory, 2003); of studies by Theokas and Lerner (2006; Urban, Lewin-Bizan, & Lerner, 2010) on the role of developmental assets associated with families, schools, and neighborhoods on positive youth development; and of studies by Leventhal and Brooks-Gunn (2004) and Sampson, Raudenbush, and Earls (1997) on the role of neighborhood characteristics on child and adolescent development.

Despite these important works, it remains the case that many developmental scientists argue for relational theories while simultaneously using data collection and analysis methods that are not consistent with the complexity and nuance that the RDS metamodel implies. Therefore, we describe conceptual and methodological problems that pertain to research derived from the RDS metamodel (see too Molenaar et al., 2014). In particular, we discuss implications related to the assumptions that (1) development involves interrelated changes in a complex, multilevel system; (2) developmental trajectories of all individuals remain relatively plastic across the life span; and (3) examining relations in the presence of such complexity requires multimethod integration.

Development Occurs in a Complex Person-Context System

The RDS approach to developmental science emphasizes the rejection of splits and, thus, an adoption of holism as a fundamental guiding principle. In opposition to a fixed, atomistic reality composed of elements that preserve their identity regardless of context (Overton, 2013, 2015), holism views objects and events as necessarily related to the context in which they are embedded. The whole exists as an organized and self-organizing system of parts, each defined by its relations to other parts and to the whole itself (Overton, 2015). Consistent with the Specificity Principle of Bornstein (e.g., 2006), the key empirical question for developmental scientists interested in describing, explaining, and promoting positive human development in the context of a complex holistic system is therefore composed of five interrelated "what" questions: *What* attributes of *what* individuals, in relation to *what* contextual conditions, and at *what* points in ontogenetic, family, or generational as well as cohort or historical time can be integrated to promote *what* instances of positive human development?

Armed with appropriate RDS-informed research questions, researchers must make methodological decisions that acknowledge (1) that relational developmental systems are embedded (Overton, 2015)—that is, they are characterized by holism; (2) that individuals in part produce (i.e., direct) their own ontogenetic development; and (3) that systematic plasticity is present across the life span. We provide more details concerning each of these ideas.

Focus on the System

Once researchers embrace the concepts underlying the RDS metamodel, the types of questions that they ask must necessarily shift, as exemplified in the multi-component "what" question. A research framework informed by the RDS metamodel must include multiple elements that together account for the plasticity and dynamism that constitute ontogeny. For such research to match the complicated theory from which it derives, researchers must consider the complex and dynamic developmental system of which the developing person is a part as they generate their initial research questions.

Person ↔ Context Relations as Units of Analysis

Development is affected by aspects of the individual and context, but the impact of any given personal or contextual characteristic can only be interpreted as part of a larger person ↔ context system. A specific characteristic may represent positive person ↔ context relations for some individuals in some contexts, but the same characteristic may represent neutral or even negative person ↔ context relations for other individuals or in other contexts (e.g., see

Bornstein, 1995; Masten & Coatsworth, 1998). In other words, person ↔ context relations will vary between individuals (Molenaar, 2007; Tobach & Greenberg, 1984). As such, the goal of RDS-based research is to capture and understand relations among the meaningful adaptive person ↔ context relations (i.e., adaptive developmental regulations) that characterize development across diverse populations.

Accurately capturing the oftentimes idiographic nature of developmental regulations requires that researchers consider the contexts in which their participants are embedded, as well as which interactions with those contexts are adaptive. This problem can be tackled through idiographic research designs and analyses (see below for a more detailed discussion of this issue; see also Molenaar & Nesselroade, 2015; Nesselroade & Molenaar, 2010), or they may alternatively be represented as a statistical interaction between self-reported measures of internal assets and objectively measured indices of contextual resources (e.g., Theokas & Lerner, 2006).

Perhaps more appropriately, researchers can obtain and analyze nomothetic information through surveys that require participants to interpret survey questions idiographically (e.g., Nesselroade et al., 2007). For instance, researchers interested in assessing participants' connection to their communities could obtain more useful information from a Likert-scaled item such as "How involved are you in your community?" than by averaging several Likert-scaled items about community service, connection to a religious group, or participation in school-related organizations. The first question allows flexibility in how participants interpret community involvement, whereas the later set of questions constrains the possible domains in which connection can occur. Asking both types of questions, however, would enable researchers to ascertain empirically the links between the idiographically phrased item and the domain specific items.

Individuals as Active Producers of Their Own Development

Developmental scientists aim to optimize contexts in ways that promote positive development, but they also recognize that individuals must also regulate their behavior in ways that take advantage of available resources. Developmental regulations represent the bidirectional ways individuals influence and are influenced by their contexts (e.g., Lerner, 2002). Individuals' influences on their developmental regulations (i.e., self-regulation) enable them to intentionally influence their own developmental outcomes (Brandtstädter & Lerner, 1999; Lerner, 2002). When individuals intentionally contribute to their development in such a way that successfully aligns their interests, desires, and needs with available contextual resources, their intentional self-regulation is viewed as adaptive (e.g., Baltes, Lindenberger, & Staudinger, 2006; Brandtstädter, 1998, 2006; Gestsdóttir & Lerner, 2008).

Given the focus within the RDS metamodel on individuals as active agents of their development, researchers should also consider research participants as intentional actors within the research process. In turn, researchers should place methodological attention on the development of person-centered measures for assessing developmental phenomena (Hershberg, DeSouza, Warren, Lerner, & Lerner, 2014).

The Temporality of Complex Developmental Processes

Complexity in development implies that the developmental trajectories of all individuals remain relatively plastic across the life span (Lerner, 1984). Research derived from the RDS metamodel accordingly acknowledges the existence of interindividual and intraindividual

variability in development. The acknowledgement of such plasticity may impact research derived from RDS-based models in many ways.

Predicting Developmental Phenomena Requires Change-Sensitive Measurement Tools

Development and its plasticity can only be examined using tools that are themselves sensitive to change. Although not surprising at first glance, this statement suggests that the tools used to study development must be able to detect changes over a period of interest, which potentially excludes many scales designed to display high test-retest stability.

Researchers must also be cognizant that the very structure, or qualitative meaning, of a scale or construct may vary across time and place (Elder, 1998). This possibility underscores the importance of quantitative invariance testing and qualitative exploration of ecological validity across time and place. Factorial invariance of a scale, however, does not necessarily mean that the construct of interest is itself invariant. In other words, the items in a particular scale may be invariant because of the strategy used to build the scale itself, or they may be invariant because the observed invariance truly reflects a property of the underlying construct. Many questionnaires are specifically designed to measure stable attributes, and so change-sensitive items are omitted during scale creation due to a lack of longitudinal reliability. Invariance for a scale that was specifically *designed* to be invariant over time says more about the scale's construction than about the target construct's actual meaning across the life span.

Qualitative research, which often includes interview or narrative data from participants (Denzin & Lincoln, 2005), can also inform the understanding of a construct and/or the development of a quantitative measure for examining a particular construct across large populations of people. Qualitative research can also explore the presence of a construct at different points of development. Qualitative interviews, for example, often require participants to reflect on their current and past life experiences. The retrospective data garnered in this context provide another means through which time effects of particular phenomena can be approximated. For example, when participants are asked to think about how their behavior in high school differed from their behavior in college, information about developmental changes that occurred as a function of person ↔ context relations (such as participants' time-varying relationships with their teachers and peers) is being reported by the people who experienced these changes directly. Asking participants about changes they experienced and why the changes occurred often elicits a close examination of person ↔ context relations that may be hard to measure with quantitative scales, especially when the phenomenon of interest develops in a complex, nonlinear way.

Developmental Trajectories May Be Nonlinear

The trajectory of a plastic developmental system necessarily entails interrelations within and between all levels of the system's integrated structure. Development can involve nonlinear interactions (e.g., quadratic relations, multiplicative interactions) or may even follow nonlinear functional forms. From a quantitative perspective, linear models may be helpful for roughly approximating such complex development; in truth, however, development likely extends beyond additively concatenated relations among variables (Little, 2013). Researchers may therefore benefit from applying statistical techniques that explicitly assume nonlinearity (e.g., Grimm & Ram, 2009).

Time Is a Proxy for Development

Adding another layer of complexity to RDS-derived approaches to development is that development is simultaneously affected by processes that occur on multiple, loosely coupled time scales. Modeling complex developmental trajectories requires that researchers explicitly account for the many ways that time can be manifested in a developmental system. As noted by several authors (e.g., Elder, 1998; Elder et al., 2015; Lerner, Schwartz, & Phelps, 2009; Little, Card, Preacher, & McConnell, 2009; Wohlwill, 1973), the concept of time can mean many different things in relation to an individual's development. Time might represent chronological factors (e.g., age in years), generational changes (e.g., people changing from being members of the youngest generation in their extended family to becoming members of the oldest living generation in their extended family), historical factors (e.g., the Great Depression), idiographic experiential factors (e.g., years in school), nomothetic episodic factors (e.g., months since September 11, 2001), or idiographic episodic factors (e.g., years since the onset of puberty). These instantiations of time are of course all involved in life course changes, and developmental researchers must pay close attention to how they conceptualize, measure, and analyze development as a function of the multiple meanings of time (Wohlwill, 1973).

Disentangling the effects of various instantiations of developmental time requires careful methodological forethought, both in terms of study design and data analysis. For instance, Schaie (1965) and Baltes (1968) discussed multiple study designs that allow researchers to disentangle the integrated effects of chronological time, age, and birth cohort. Among these, the cohort-sequential design (e.g., Baltes, Reese, & Nesselrode, 1977) longitudinally follows participants from multiple birth cohorts and is often heralded as a key method that not only helps researchers make inferences about age-related changes across and between cohorts but also allows them to study developmental change in an accelerated fashion (Collins, 2006). The emphasis of the RDS metamodel on complexity and integration highlights the importance of implementing such sophisticated research designs.

Understanding Complex Development Requires Multimethod Integration

The integrative and iterative nature of relational-developmental science highlights the importance of triangulation, or the "attempt to map out, or explain more fully, the richness and complexity of human behavior by studying it from more than one standpoint" (Cohen, Manion, & Morrison, 2000, p. 254). Although several researchers have drawn attention to the benefits of rigorous mixed-methods research in developmental science (e.g., Yoshikawa, Weisner, Kalil, & Way, 2008), faithful adoption of these techniques has been slow. Moreover, although many studies include the collection of both quantitative and qualitative forms of data, the majority of these studies are dominated by one form of data collection and analysis. Most commonly, qualitative interview data are collected to "supplement" or illustrate substantial quantitative data collection and analyses (i.e., what Greene, 2012, has termed mixed methods "lite").

Although a mixed methods design can be informative, developmental scientists have yet to take full advantage of the array of such designs available to them, several of which call for substantial and rigorous qualitative and quantitative data collection and analyses (Creswell & Plano Clark, 2011). We believe that approaching research from an RDS-based framework requires developmental scientists to embrace a more pragmatic approach by collecting

multiple forms of data while considering the ways data are integrated in the analysis and discussion of findings. Of the multiple mixed-methods designs identified in social science research, a convergent parallel mixed-methods design may hold significant promise for future research in developmental science. Informed by the paradigm of pragmatism (Cresswell & Plano Clark, 2011), this design prevents researchers from becoming "the prisoner of a particular [research] method or technique" and from simply presenting findings derived through different methods alongside each other but discussing them separately (Robson, 1993, p. 291; see also Felizer, 2010).

Truly mixed-method designs require much more than simple triangulation of quantitative and qualitative methods, and we discuss below additional methodological dichotomizations that researchers using the RDS metamodel must fuse if they wish to obtain a broad understanding of any phenomena of interest.

Integrating Idiographic and Nomothetic Perspectives

Since Allport (e.g., 1942) introduced Windelbrandt's terms *idiographic* and *nomothetic* to psychology's vocabulary (see Marciel, 1977, and Holt, 1962, for reviews), researchers and theorists have debated whether the province of psychology is to study common (i.e., nomothetic) characteristics shared by all people or the idiosyncratic (i.e., idiographic) characteristics that make each person unique. Emmerich (1968) added a group differential focus to this discussion. In addition to arguing that each person is like all other people (the nomothetic approach in the Kluckhohn & Murray, 1948, formulation) or that each person is like no other person (the idiographic approach in the Kluckhohn & Murray, 1948, formulation), Emmerich added that each person is like only some other people (in the Kluckhohn & Murray, 1948, formulation). As Holt (1962) commented over fifty years ago, the idiographic versus nomothetic debate is "one of the hardest perennial weeds in psychology's conceptual garden," (p. 376) and indeed it remains a source of considerable discussion to date (e.g., Lamiell, 2009).

Marciel (1977) notes that the implications of this debate extend beyond psychology's conceptual purpose to include the specific methods researchers use to investigate research questions and test hypotheses. From a methodological perspective, RDS-based positions take a middle road (see also Kluckhohn & Murray, 1948) by acknowledging that developmental science requires a synthesis of idiographic, group differential, and nomothetic methods. In practice, unfortunately, such synthesis is rare. Nomothetic analyses have remained the primary tool in the methodological arsenals of developmental scientists (as well as across psychological research in general; Molenaar, 2004, 2007; Molenaar & Nesselroade, 2015; Nesselroade & Molenaar, 2010) from a quantitative perspective.

Data collection methods that support idiographic analyses involve collecting data from fewer individuals but across more occasions (e.g., Nesselroade & Molenaar, 2010). These types of data are commonly collected in several areas of psychological research, although they often are analyzed using nomothetic methods (e.g., growth curve analyses). For example, diary and experience sampling methods often are used in health and mental health research (e.g., Myin-Germeys et al., 2009), personality research (Conner, Tennen, Fleeson, & Barrett, 2009), and the study of relationships (Laurenceau & Bolger, 2005). Similar techniques have been used with adolescent samples (e.g., time use studies such as Larson & Verma, 1999) but are rarely used to study developmental phenomena from an idiographic perspective. These types of data, however, could provide valuable information about development from an

RDS-based perspective. The use of truly idiographic quantitative analysis methods such as dynamic factor analysis (Molenaar & Lo, 2012), the idiographic filter (Nesselroade, Gerstorf, Hardy, & Ram, 2007), and integrations of these techniques (Molenaar & Nesselroade, 2015) could enable researchers to more fully understand the nature of developmental phenomena and how these constructs change across the life span.

Interindividual qualitative analyses can also provide valuable and rich information, but they may fall short of promoting a truly idiographic and nuanced understanding of an individual's experiences of a phenomenon or developmental context. Within the broad range of qualitative data collection and analysis methods, however, are several person-centered techniques that could be used within RDS-informed research. Narrative inquiry, for example, provides one way to examine the experiences of, and stories told by, "particular actors, in particular social places, at particular times" (Abbott, 1992, p. 428). In addition to focusing on the particular, this idiographic approach allows researchers to highlight the diverse ways in which individuals produce their own development. Moreover, such an approach can lead to the possible discovery of developmental phenomena unique to a person or group.

The issue of idiographic versus nomothetic measurement also has implications for researchers' choice of correlational versus experimental research designs. Although both approaches offer some degree of flexibility between idiographic versus nomothetic measurement, experimental designs explicitly control environmental conditions to uncover nomothetic laws of human development. As such, supplementing nomothetic findings with the findings from idiographic studies may require additional integration of experimental and correlational research designs.

From Method and Theory to Application

To enhance the ecological validity of developmental scholarship and, as well, to increase the likelihood that the knowledge gained from research will be used in communities and families to improve the lives of young people, developmental science research methods should be informed not only by colleagues from the multiple disciplines with expertise in the scholarly study of human development but also by the individuals and communities developmental scientists study (Burton, Garrett-Peters, & Eaton, 2009; Lerner, 2002; Villarruel, Perkins, Borden, & Keith, 2003). They, too, are experts about development. Accordingly, research that fails to capitalize on the wisdom of its participants runs the real danger of lacking authenticity, and of erecting unnecessary obstacles to the translation of the scholarship of knowledge generation into the scholarship of knowledge application (Jensen, Hoagwood, & Trickett, 1999).

In short, the possibility of adaptive developmental relations between individuals and their contexts, and the potential plasticity of human development that is a defining feature of ontogenetic change within the dynamic, relational developmental system (Gottlieb et al., 2006; Overton, 2015), are core to development research. These potentialities motivate us to ensure that our science and application are holistic and integrative. Our understanding of human development, framed by the RDS metamodel, provides a rationale for making a set of methodological choices that differ in design, measurement, sampling, and data analytic techniques from selections made by researchers using split or reductionist approaches to developmental science. Moreover, the emphasis in the RDS metamodel on how the individual acts on the context to contribute to plastic relations with the context that regulate adaptive development (Brandstädter, 2006) fosters an interest in person-centered (as compared

to variable-centered) approaches to the ways we study and measure human development (Magnusson & Stattin, 2006; Overton, 2013, 2015; Rathunde & Csikszentmihalyi, 2006).

Furthermore, given that the array of individual and contextual variables involved in these relations constitute a virtually open set (e.g., there may be as many as 70 trillion potential human genotypes, and each may be coupled across life with an even larger number of life-course trajectories of social experiences; Hirsch, 2004), the diversity of development becomes a prime, substantive focus for developmental science (Lerner, 2004; Spencer, 2006; Spencer et al., 2015). Diversity may be conceptualized from a strengths-based perspective, in that the potential plasticity of ontogenetic change constitutes a fundamental strength of all humans (Spencer, 2006). In addition, diversity may be approached with the expectation that positive changes can be promoted across all instances of this diversity as a consequence of health-supportive alignments between people and settings (Benson, Scales, Hamilton, & Sempa, 2006). The presence of such approaches suggests that diversity should be a necessary subject of developmental science inquiry.

The conduct of such scholarship illuminates the character of the basic relational process of human development and, as well, provides information about how to promote positive human development in real-world settings of the ecology of everyday life (Bronfenbrenner, 2005). Depending on the levels of analysis involved in the contexts being studied in relation to the developing individuals involved in a given research project, the work of providing information about the promotion of positive development may be termed *intervention research*; such research may be targeted at either the level of community programs or of social policies (Lerner, 2004). Yet, such "applied" work is at the same time the very work that is required to understand the character of (adaptive) developmental regulations. As such, within a relational developmental systems approach to developmental science, there is no split between theoretically predicated research about basic processes and practically important research elucidating how knowledge may be applied to foster programs or policies better able to promote positive development (Lerner, 2002, 2004, 2012).

For instance, Jensen and colleagues (1999) described an example of such research in the arena of community-based programs aimed at enhancing mental health. Termed an *outreach scholarship* model, Jensen and colleagues (1999) explained how researchers and their universities collaborate with community members to go beyond demonstrating what programs could work in the abstract to identifying what mutually beneficial relations between universities and their community can produce programs that are effective in fostering mental health and, as well, are palatable, feasible, durable, affordable, and hence ultimately sustainable in communities.

The outcome of such synthetic basic \leftrightarrow applied scholarship is twofold: positive human development and social justice. At the individual level, scientists can learn how to identify and align the developmental assets of contexts to promote positive human development among diverse individuals. For instance, and again recalling the Bornstein Specificity Principle (2006), we can answer optimizations questions in regard to youth development such as "What contextual resources, for what youth, at what points in their adolescence, result in what features of positive youth development (PYD)?" In answering such a question, we learn at the contextual level the sectors and features of the context (e.g., changes in the macrosystem) that are needed to maximize positive development among diverse youth. For instance, Theokas and Lerner (2006) found that greater access in schools to high-quality teachers (e.g., as operationalized through lower teacher-student ratios) is linked to PYD; however, the opportunity for a youth to be in such a relation with a teacher varies in relation to socioeconomic issues pertaining to access to a given school or school district.

Accordingly, given that developmental science is aimed at optimization of developmental changes, as well as at description and explanation of such change (Baltes, Reese, & Nesselrode, 1977), theoretically predicted changes in the developmental system need to be evaluated in regard to whether opportunities for positive human development are as available to individuals from lower socioeconomic backgrounds as compared to their more affluent counterparts. Identifying means to change the individual \leftrightarrow context relations to enhance the probability that all people, no matter their individual characteristics or contextual circumstances, move toward an equivalent chance to experience positive development is scholarship aimed at promoting social justice. The opportunity within a society for all individuals to be able to maximize their chances to develop in healthy and positive ways is what RDS-based developmental science strives to achieve.

In short, then, enhancing the presence of social justice in society is a necessary goal of a developmental science that is based on relational developmental systems models and relational metatheory; that is concerned, therefore, with learning how to foster adaptive developmental regulations among all individuals and all contexts; and, as such, that is committed to the tripartite scientific mission of description, explanation, and optimization. Consistent with the integration of basic and applied science inherent in the relational developmental systems perspective, the developmental scientist, through her or his research, needs to be as much an agent of social change in the direction of social justice as a scholar seeking to understand the nomothetic and idiographic laws of human development. Indeed, without theory-predicated tests of how to foster social justice for all youth, our research will be inevitably limited in its potential generalizability and ecological validity. Without the promotion of social justice as a key scholarly goal, developmental science is critically incomplete.

Conclusions

Contemporary developmental science—predicated on a relational metatheory and focused on the use of relational developmental systems theories to frame research on dynamic relations between diverse individuals and contexts—constitutes a complex and exciting approach to understanding and promoting positive human development. It offers a means to do good science, informed by philosophically, conceptually, and methodologically useful information from the multiple disciplines with knowledge bases pertinent to the integrated, individual \leftrightarrow context relations that compose human development. Such science is also more difficult to enact than the ill-framed and methodologically flawed research that followed split and reductionist paths taken during the prior historical era (Cairns & Cairns, 2006; Overton, 2006, 2015; Valsiner, 2006). Of course, because developmental science as framed by relational developmental systems models is so complex, it is also more difficult to explain to the "Person in the Street" (Horowitz, 2000).

The richness of the science and the applications that derive from relational developmental systems perspectives, as well as the internal and ecological validity of this work, are reasons for the continuing and arguably still growing attractiveness of this approach. Moreover, this approach underscores the diverse ways in which humans, in dynamic exchanges with their natural and designed ecologies, can create for themselves and others opportunities for health and positive development. As Bronfenbrenner (2005) eloquently put it, it is these relations that make human beings human.

Accordingly, the relational, dynamic, and diversity-sensitive scholarship that now defines excellence in developmental science may both document and extend the power inherent

in each person to be an active agent in his or her own successful and positive development (Brandtstädter, 2006; Lerner, 1982; Lerner & Busch-Rossnagel, 1981; Magnusson & Stattin, 1998, 2006; Rathunde & Csikszentmihalyi, 2006). A relational developmental systems perspective leads us to recognize that, if we are to have an adequate and sufficient science of human development, we must integratively study the embodied individual and his or her contextual levels of organization in a relational and temporal manner (Bronfenbrenner, 1974; Zigler, 1998). Anything less will not constitute adequate science. And if we are to serve individuals, families, and communities in the United States and the world 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 diverse and active individuals embodied in the relational developmental systems perspective.

Through such research, developmental science has an opportunity to combine the assets of our scholarly and research traditions with the strengths of our people. We can improve on the often-cited idea of 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 nothing is of greater value to society than a science that devotes its scholarship to improving the life chances of all people. By understanding and celebrating the strengths of all individuals, and the assets that exist in their families, communities, and cultures to promote positive features of human development, we can have a developmental science that may, in these challenging times, help us, as a scientific body and as members of democratic nations, to ensure liberty and justice for all.

Notes

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1. Optimization at the level of the individual involves maximizing the probability that the person will thrive. Optimization in regard to between-person variation pertains to promoting, for all groups, levels of health and positive development that are not moderated by social, economic, or political disparities associated with (for instance) race, gender, ability status, sexual orientation, religion, or socioeconomic status (Lerner et al., 2014).

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