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INTRODUCTION

Rethinking Developmental Science

Carolyn M. Aldwin
Oregon State University

The articles in this issue are all based on the invited addresses given by the authors at the 2013 biennial meeting of the Society for the Study of Human Development. All of the authors address the unfolding paradigm shift in developmental sciences, from reductionism to relational developmental system theories. This theoretical stance involves the recognition of Individual ⟷ context transactions, with multiple coacting partners existing in dynamic relationships across the life span and life course. The articles address not only theoretical issues, but also methodological advances and their applications. Although acknowledging the importance of new data collection and analytical techniques that permit the testing of more complex theoretical models, the articles demonstrate that well-designed questions from this theoretical perspective can also yield novel findings which are highly relevant to current real-world problems and social policy issues.

This issue of *Research in Human Development* (*RHD*) is special for two reasons. First, it comprises invited addresses from the 2013 biannual meeting of the Society for the Study of Human Development (SSHD), in Fort Lauderdale, Florida. As such, I cannot really take credit for the compilation of this issue—that honor rightfully belongs to Willis (Bill) Overton, who organized the conference as president-elect of the SSHD and invited this group of luminaries in the field of developmental science, and who is providing the commentary to this issue. Nonetheless, it has been a privilege to work with these authors, who have been highly instrumental in spearheading cutting-edge issues in developmental science and who have contributed really terrific articles.

Second, this is my last issue as editor of *RHD.* I started in the summer of 2009, taking over from Erin Phelps, who ably shepherded this journal for several years. It has really been a tremendous amount of fun (and work). *RHD* is an unusual journal in several ways. It is one of the few

Address correspondence to Carolyn M. Aldwin, Human Development and Family Sciences, College of Public Health & Human Sciences, Oregon State University, 424 Waldo Hall, Corvallis, OR 97330. E-mail: Carolyn.Aldwin@oregonstate.edu

journals that is life span, multidisciplinary, and embraces multimethod approaches. Further, we publish only special issues. Thus, we welcome proposals that have articles representing all stages of life, and from several disciplines, including psychological, sociology, philosophy, and biology. The topics of our issues in the past 5 years have ranged from epigenetics and evolutionary biology (Greenberg, 2014; Wanke & Spittle, 2011) and systems science (Urban, Osgood, & Mabry, 2011) to the life course effects of military service (Spiro & Settersten, 2012) and immigrant families (Marks & Abo-Zena, 2013) to wisdom (Trowbridge & Ferrari, 2011) and mindfulness (Frank, Jennings, & Greenberg, 2013). We also have a strong focus on tremendously exciting methods—which are often our most-cited articles—including not only quantitative articles addressing longitudinal methods that treat time in some quite astonishing ways (e.g., Gersdorf, Haupmann, & Ram, 2014; Ram & Gersdorf, 2009) to qualitative issues studying unusual samples in depth, providing remarkable insights (Catania & Dolcini, 2012). Given that this is my last issue, I would like to join my colleagues in reflecting upon the tremendous advances that have been made in the developmental sciences and the challenges still to come.

Living Through a Paradigm Shift

As Antonucci and Webster (this issue) aptly observed, we have the good fortune to be living in the interesting times of a paradigm shift in developmental science. This shift from radical behaviorism that was the dominant paradigm in psychology when I was an undergraduate in the 1970s to today's relational developmental systems paradigm is remarkable. A little reflection on how we got here might prove useful.

In the old radical behaviorism, all behavior could be reduced to environmental contingencies, and thought but the conditioned reflexes of throat muscles. Luckily, I went to Clark University, whose psychology department was the bastion of German organismic developmental theory, with its emphasis on development throughout the life span reflecting qualitative shifts in the relationship among components of a system. The legacy of Heinz Werner lived on through Seymour Wapner and Bernie Kaplan, who challenged the reductionistic behaviorist paradigm that so dominated much of the 20th-century psychology. This school also influenced the Human Development and Family Sciences program at the Pennsylvania State University through K. Warner Schaie and Paul Baltes, who were also instrumental in organizing a year series of seminars and books at West Virginia University that promoted various aspects of developmental theory in the 1970s and 1980s. Urie Bronfenbrenner's ecological systems theory at Cornell University challenged disciplinary boundaries, as did Feyerabend's (1975) denunciation of methodological monism—the idea that one method was the only means of discovery.

There was also a growing emphasis on interdisciplinary education. My graduate program at the University of California at San Francisco in adult development and aging provided immersion into the psychology, sociology, and anthropology of aging and was one of the first in the country to have a graduate group, whose members spanned multiple disciplines and campuses. I also had the good fortune to work with Richard Lazarus, who was one of the originators of the "cognitive revolution" in psychology, reinstating the central roles of thought—and subjectivity—through emphasis on the importance of the stress appraisal processes. He emphasized the importance of transactions—that neither reductionism nor interactionism adequately reflected appraisal

processes, which resulted from a transaction between the person and the environment, which mutually influenced each other. Coping was also influenced by personal preferences and environmental contingencies, and was a fluid, proactive process that changed as a function of changing environmental contexts and appraisals. In health psychology, though, the function of coping with stress was to return an organism to homeostasis. My contribution was to add a developmental perspective to this transactional model, examining coping with stress as either a deviation amplifying or deviation countering process, setting off positive developmental trends, negative spirals, or a return to homeostasis (Aldwin & Stokols, 1988). Thus, it was delightful to see Lerner's work on developmental systems theory (Ford & Lerner, 1992) and Reese and Overton's (1970) classic work on developmental theory, now evolved into relational developmental systems theory (see Lerner, Agans, DeSouza, & Hershberg, this issue; Overton, this issue). Thus, it is not surprising that the contributors to this issue were all involved in some aspects of this paradigm shift.

As Lerner et al. (this issue) so cogently argued, developmental science has been undergoing a remarkable shift from reductionism to a relational developmental perspective, with its emphasis on mutually influencing components in dynamic change patterns over time. This is seen quite dramatically in the shift from the old behavioral genetics, with its failed attempt to reduce psychological processes to an out-of-date Mendelian genetics, to the new emphasis on epigenetics and the recognition that the genes are a dynamic system that change quite rapidly over rather short time scales. An argument can be made that it is not only developmental science that is undergoing this paradigm shift, but that much, if not all, of science is turning from reductionistic models to ones involving systems approaches. Certainly subatomic particles are especially stubborn in their refusal to follow reductionistic strictures. And though molecular genetics is still the dominant paradigm in biology, epigenetics, ecological models, and systems biology are all following this paradigm shift. In public health, systems approaches are also gathering momentum, supported by the emphasis on systems science methods within the National Institutes of Health Office of Behavioral and Social Sciences Research (http://obssr.od.nih.gov/scientific_areas/methodology/systems_science/).

As Lerner et al. (this issue) point out, the emergence of this paradigm is supported by a plethora of new statistical methods. After all, if the only method available is analysis of variance, it is difficult to think outside the box of discrete variables having main effects, and, if one were lucky, interaction effects. For a long time, our theories outstripped the methods, but now there is a variety of statistical models that permit more sophisticated questions to be asked and analyzed. Structural equation modelling allows for the examination of mediating and moderating effects in models with multiple variables, pathways, and outcomes, and longitudinal cross-lagged terms allow for examination of mutual influences over time. Multilevel models permit within-person analyses, examining individual and contextual differences in how variables covary. Group-based multilevel modelling can examine patterns of individual differences in how individuals change over time. In personality theory, for example, Lachman (1988) stated that the question of "Does personality change over time" was far too simplistic, and needed to be replaced by more sophisticated questions such as "Which personality variables change, for whom, and in what circumstances."

However, as Liben's (this issue) and Connidis' (this issue) contributions so aptly show, hypertrophied methods are not necessary to asking sound research questions from a relational developmental perspective. Liben's work emphasizes that development is not an individual process—rather, it occurs within an individual $\longleftrightarrow$ context nexus, resulting from coaction

between constructive and contextual processes. She describes developmental intergroup theory, which "posits the operation of relational processes in which child and context inextricably give and take meaning to and from one another" (p. 274). One of the most troublesome social phenomena is the social prejudice that arises as a function of group membership. This fundamental identity is often the source of outgroup prejudice and is one of the sources of much of the nastier sources of conflict in the world, including prejudice against the Jews, African Americans, and other racial/ethnic minorities, apartheid in South Africa, the Serbian-Bosnian conflict, the Troubles in Northern Ireland, the Israelis and the Palestinians, and centuries-old conflict between Shia and Sunni Muslims. Developmental processes are involved in the development and in the maintenance and modification of stereotypes and prejudices. Understanding this process is crucial to the development of effective intervention programs, as Liben so ably documented with regard to gender stereotyping. How these types of programs might be enacted in adulthood, though, is an open question. The model is purposively a general one, applicable to a wide range of topics, and theoretically at least, should be applicable to adults as well.

Connidis (this issue) did take a life course perspective. As she noted, most of the work in the relational developmental area focuses on individuals and their immediate contexts, but, as such, this perspective is also applicable to bridging the micro- and macrodivide. In particular, understanding individuals as actors within a larger relational system allows one to transcend the zero-sum perspective that pervades much of social policy. For example, it is widely assumed that the "greedy old geezer" lobby protects its own social programs at the expense of children's programs. However, from a life course relational perspective, it can be that older generations devote a considerable amount of their resources to younger generations, and young adult financial stability and opportunities can result in supporting older generations. Thus, understanding how family, intergenerational, and public policy systems coact can inform more productive social policy and programs.

Antonucci and Webster (this issue), also celebrate this paradigm shift to a relational developmental systems perspective. They not only cite the growing spread of systems theory perspectives, but also celebrate the plethora of new types of data collection, from functional magnetic resonance imaging (fMRI) that allows us to examine how different parts of the brain work together to better ways of tracking eye movements to study attention as the interplay between the person and the environment. New computerized data collection techniques allow for data collection in real time (e.g., ecological momentary assessment) to the use of the Internet to examine "big data." We now have the capabilities of multiple perspectives, data collection, and analytical techniques to really examine issues from cells to society. The impact of stress on development is a great example. Stress and stress-reducing processes exist at the cellular levels, affect mental and physical health, transact with the immediate environment, and are strongly influenced by social policy. At the genetic level, stress hormones can result in the methylation and down regulation of genes that regulate the stress process, perhaps leading to greater vulnerability in adulthood (Miller, Chen, & Parker, 2011).

Antonucci and Webster (this issue) also caution that the flowering of conceptual and methodological opportunity also creates inherent dangers—it is simply not possible for any one person to span all of cells to society research, nor to be equally facile with all of the new data collection and analytical techniques. Thus, *pace* Liben, it is likely that we will see the continuation of ingroups and outgroups within academia, as witnessed by the battles between molecular geneticists and ecologists within biology, or the disciplinary differences in preferred statistical methods.

One new developmental perspective that is not well represented in this issue involves purposive development. In the old radical behaviorism, agency was simply absent, with operant and/or classical conditioning being the dominant process. This gradually gave way to behavior as a function of gene–environment interactions, which still neglected agency. One of the most positive aspects of relational developmental system theories is their emphasis on agency and coaction—that individuals actively construct the meaning of their environment, as well as their transactions with the environment, and thus construct themselves as well. With this coconstruction comes the opportunity for change and development. However, how agency develops is not addressed well by this system.

We have argued elsewhere (Aldwin, 2007) that adult development is purposive—that is, that individuals can make conscious decisions to change aspects of themselves. In Brandstädter, Wentura, and Rothermund's (1999) theory, this is accomplished by setting goals and striving towards those goals. Stress also forms a context for adult development—that major stressors can challenge individual's assumption systems, including their assumptions about themselves, and can afford the opportunity for better insight into ourselves and our relationships with others (Aldwin, 2007). Having a minor heart attack, for example, can prompt changes in health behavior habits. Going through one's third divorce may require serious consideration about how one relates to others. We have also argued that development in adulthood changes as much through loss of negative aspects of the self as through acquisition of more positive aspects (Levenson, Aldwin, & Cupertino, 2001).

Thus, agency—or what Baumeister (2008) termed "free will"—must reflect developmental processes, in which individuation from contextual influences occurs, allowing for the deployment of free will. Levenson and Crumpler (1996) argued that Habermas' (1971) emancipatory knowledge-constitutive interest is the goal of adult development—that is, increasing freedom from biological and social conditioning. Thus, it is not that classical and operant conditioning processes are invalid—they do indeed demonstrably exist—but that individuals cannot make conscious choices if they are not aware of what influences them—what McKee and Barber (1999) called "seeing through illusion."

Not surprisingly, this "seeing through illusion" is also a major element of the development of wisdom. While there is currently no one accepted definition of wisdom, one such published in *RHD* held that:

> Wisdom is a practice that reflects the developmental process by which individuals increase in self-knowledge, self-integration, nonattachment, self-transcendence, and compassion, as well as a deeper understanding of life. This practice involves better self-regulation and ethical choices, resulting in greater good for oneself and others. (Aldwin, 2009, p. 3)

Lerner et al. (this issue) argue that the ultimate goal of relational developmental systems theories is to optimize human development and to promote social justice, defined as "providing opportunities for all individuals to optimize their chances of positive, healthy development" (p. 258), enhancing the lives of all individuals and groups. As such, developmental science provides an

> intellectual "tool box," the means to work to promote a better life for all people, to give diverse individuals the requisite chances needed to maximize their aspirations and actions aimed at being active producers of their positive development, and to promote a more socially just world. (p. 266)

As admirable as this goal is, and as much as I agree with it, von Neumann-Morgenstern's theorem cautions that it is not possible to maximize all variables in an equation at once—that choices must be made as to which variable (or person or group) to maximize at any given time. By hiring one individual to hopefully improve the functioning of an organization, one is by definition not providing the other candidates with that same opportunity. Global warming is good in the short term for some species of beetles which no longer experience population die offs over the winter, but terrible for the forests that sustain them. Thus, social justice requires the exercise of wisdom, which involves the self-transcendence of one's own immediate needs in service of the greater good, and the perspicacity to see the multiple possible outcomes of any given action, as well as compassion for the suffering of others.

Examples of this on a grand scale include Nelson Mandela, Dr. Martin Luther King, Gandhi, Desmond Tutu, Mother Teresa, and the Dalai Lama. For example, Mandela could have promoted the dominance of his own ethnic group over others in South Africa, as unfortunately the leaders in the fledgling democracies in Africa and the Middle East appear to be doing today. However, he saw the wisdom of forgiveness and had compassion for the fears of the all of the groups in his country, and worked toward unification.

Wisdom is also a coconstruction between the individual and the environment. Few develop wisdom in the absence of role models, and the importance of wisdom does not lie so much in the individual's well-being, but in the well-being of the community. As Antonucci and Webster (this issue) noted, abusive parenting can be transmitted across generations, but positive parenting—even adoptive parenting—can also be transmitted. Thus, research is needed to examine whether wisdom is also transmitted intergenerationally, and if the presence of wise individuals results in greater community well-being.

One offshoot of this paradigm shift toward relational developmental systems is the idea of conscious evolution—that we as a species have the capacity to consciously influence the course of evolution (e.g., Laszlo, 2007). That is, the choices that we make influence not only our own development and that of our community, but the well-being of other species as well. We can engage in policies that will result in massive environmental change, and rapid dying off of many species, or we can expand our understanding of morality to include aspects of our ecology. Templeton and Eccles' (2008) work on "expanding circle morality" also reflects these concerns. Thus, with this understanding of human plasticity and developmental capacity, and the fundamental interrelationship of all things, comes the moral imperative to act in an ethical manner towards all beings. In Tibetan Buddhism, humans are the "eyes of the world"—that part of the world which is conscious and thus can lead to self-knowledge and intrinsic freedom for all (Longchenpa, 2000)—a lofty and probably unrealizable goal, but one with great implications for moral and human development.

In a small way, editing *RHD* has allowed me the opportunity to contribute to this paradigm shift in developmental theory, for which I am grateful. The incoming editors are Richard Settersten and Megan McClelland, who are also eminent scholars with broad interdisciplinary backgrounds. I look forward very much to seeing the further evolution of *RHD*.

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