Overton, W. F. (2006). Developmental psychology: Philosophy, concepts, methodology. In R. M. Lerner (Ed.) *Theoretical models of human development*. Volume 1 of the Handbook of child psychology (pp. 18-88). (6th ed.), Editor-in-Chief: William Damon; Richard M. Lerner. New York: Wiley.

CHAPTER 2

Developmental Psychology: Philosophy, Concepts, Methodology

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Throughout its history, psychology and its sub disciplines, including developmental psychology, have been captives of numerous fundamental contradictory positions. These basic dichotomies, called *antinomies,* include subject-object, mind-body, nature-nurture, biology-culture, intrapsychic-interpersonal, structure-function, stability-change, continuity-discontinuity, observation-reason, universal-particular, ideas-matter, unity-diversity, and individual-society. While often explicitly denying the relevance of philosophy to its operations, psychology has implicitly used the philosophical assumptions of a seventeenth-century ontological dualism, a nineteenth-century epistemological empiricism, and an early twentieth-century neopositivism, to build a standard orthodox approach to the resolution of the antinomies. This approach elevates one concept of the pair to a privileged position, builds a research program on this concept, and then strives to demonstrate observationally that the nonprivileged concept can be denied or marginalized. This standard approach to the antinomies has never been successful because it ultimately represents merely an attempt to suppress one concept, and one research program's suppressed concept becomes another program's privileged base. In the nature-nurture battles, for example, while virtually all combatants these days acknowledge some type of interaction, it is a rare program that promotes nature and nurture as co-equal reciprocally determined complementary processes (Overton, 2004a).

This chapter explores how basic conceptual assumptions have historically shaped, and how they continue to shape, proposed solutions to empirical problems including, very fundamentally, the antinomy problem. The focus

of the chapter is on development. We look at the impact various conceptual models have on our very understanding of the concept of development and, as a consequence, on the theories and methods designed to empirically explore development across several series, including *phylogenesis* (development of the species—evolution), *embryogenesis* (development of the embryo), *ontogenesis* (development of the individual across the life span), *microgenesis* (development across short time spans), *orthogenesis* (normal development), and *pathogenesis* (development of pathology, here psychopathology). My thesis is that historically two broad abstract metatheories, often termed *worldviews,* have constituted the basic conceptual contexts within which alternative ideas about the nature and operations of empirical science, psychology, and especially developmental psychology, have emerged and grown. *Split metatheory,* based on a view of the world as decomposable into a foundation of fixed pure forms, has yielded the antinomies, and associated concepts such as foundationalism, elementarism, atomism, reductionism. *Relational metatheory,* emerging from a view of the world as a series of active, ever-changing forms replaces the antinomies with a fluid dynamic holism and associated concepts such as *self-organization, system,* and *the synthesis of wholes.*

Because the focus of the chapter is a conceptual analysis of development—its concepts, theories, and metatheories—a discussion of the place of concepts in any empirical science, along with a discussion of the nature and functioning of those fundamental conceptual systems called *metatheories,* represent a necessary preamble. Wittgenstein (1958) once remarked that "in psychology there are empirical methods and conceptual confusions" (p. xiv). To avoid validating such a pessimistic judgment, it is essential that psychology, or any empirical science, focus some significant portion of its energy on the clarification of concepts that are central to its theories and methods. Conceptual clarification and the exploration of conceptual foundations have traditionally been the principle provinces of philosophy, and therein lies the rub. Within the psychological community, philosophical thought—and, as a consequence, any focus on conceptual clarification—has tended to be assigned the role of the anti-science. As Robert Hogan (2001) commented, "Our training and core practices concern research methods; the discipline is . . . deeply skeptical of philosophy. We emphasize methods for the verification of hypotheses and minimize the analysis of the concepts entailed by the hypotheses" (p. 27). However, Hogan also raises a warning flag as he goes on to note that "all the empiricism in the world can't salvage a bad idea" (p. 27). Broadly, the marginalization of all things philosophical, and, hence, the marginalization of any extended examination of conceptual foundations, has rested on a forced dichotomy, which locates philosophy in a space of reason and reflection split off from observation and experimentation, and psychology in a space of observation and experimentation split off from reason and reflection.

This marginalization of conceptual foundations in contemporary psychology is ironically itself the product of the acceptance of some basic ontological and epistemological—hence philosophical—assumptions. These assumptions begin with the idea of splitting reason from observation, and follow with the epistemological notion that knowledge and, indeed, reason itself originates in observation and only observation. These assumptions then lead to a particular definition of scientific method as entailing observation, causation, and induction-deduction, and only observation, causation, and induction-deduction. Morris R. Cohen (1931), a philosopher, captured the spirit of this conceptual splitting long ago when he criticized its "anti-rationalism . . . bent on minimizing the role of reason in science" and pointed out that the motto of this approach is the split "Don't think [reason]; find out [observe]" (p. 76).

Over the past 50 or so years, many powerful arguments have been mounted against this split between reason and observation and the subsequent denial of reflection. Some of these arguments are discussed later in this chapter. Indeed, enough arguments have emerged that the attitude itself has often been declared dead, as in the claim that the methodology called *neopositivism* is dead. Yet, like the mythical Hydra, new forms of this split continue to appear and exert a contextual shaping effect. The split is often found in the disparagement of reason itself, as in some contemporary versions of so-called postmodern thought. Sometimes, the split is found in explicit and implicit attacks on theory, as in a particular rhetoric that states that all theories must be induced directly from observations (i.e., must be "data based" or "data driven"). It is also found in a dogmatic retort given to any reflective critique—"that's just philosophy." Often, it is found in the celebration of the analytic over the synthetic, as when analytic methods of observation are presented as the only acceptable tools for expanding our knowledge domain, with the consequence that theory is often reduced to method, as when flow charts illustrating possible relations among empirical variables are offered as

guiding theories. Frequently, it is found in the valuing of the instrumental over the expressive, as when behavior is understood *only* in the context of the success or failure of adjustment to some external criteria and *never* as an index or expression of an embodied self-organizing system that constitutes the psychological subject.

In whatever of these or other multiple forms it appears, the significant point is that the split between reason and observation, along with the subsequent marginalization of reason and reflection, is itself the direct consequence of a conceptual position favoring a particular approach to knowledge building. This conceptual position operates as a foundation for building other concepts, theories, and methods. The position is not in itself a given in any self-evident or directly observational fashion, but simply a specific claim, and, as with any claim or argument, reasons must be presented to support the value of the claim. These reasons and the claim itself require reflection and clarification before they can be rationally accepted as valid or rejected as invalid. It is just possible that the split between reason and observations is part of a very bad foundation for our discipline, but this cannot be decided without further exploring conceptual issues. To paraphrase Hogan, all the observation in the world can't salvage conceptual confusions.

METATHEORY

In scientific discussions, the basic concepts to be explored in this chapter are often termed *metatheoretical.* Metatheories transcend (i.e., "meta") theories in the sense that they define the context in which theoretical concepts are constructed, just as a foundation defines the context in which a house can be constructed. Further, metatheory functions not only to ground, constrain, and sustain theoretical concepts but also functions to do the same thing with observational methods of investigation. When specifically discussing background ideas that ground methods, these are here termed *metamethods. Methodology* would also be an appropriate term here if this were understood in its broad sense as a set of principles that guide empirical inquiry (Asendorpf & Valsiner, 1992) and not as particular methods themselves.

The primary function of metatheory—including metamethod—is to provide a rich source of concepts out of which theories and methods grow. Metatheory also provides guidelines that help to avoid conceptual confusions and what may ultimately be unproductive ideas and methods.

Any discussion of metatheory requires a constant reminder of the importance of maintaining distinctions between various levels of analysis or discourse (Figure 2.1). Theories and methods refer directly to the empirical world, while metatheories and metamethods refer to the theories and methods themselves. The most concrete and circumscribed level of analysis or discourse is the *observational level.* This is one's current commonsense level of conceptualizing—not pristine, interpretation free "seeing"—the nature of objects and events in the world. For example, one might describe the developmental changes in some domain as smooth and continuous, abrupt and discontinuous, or some combination of both. Regardless of which characterization is chosen, or whether this characterization is treated as a narrow observation or a broad inductive inference, the assertion functions at the observational level of dealing with the world.

Although the observational, commonsense, or folk level of analysis has a sense of immediacy and concreteness, we can and do focus our attention on this common-

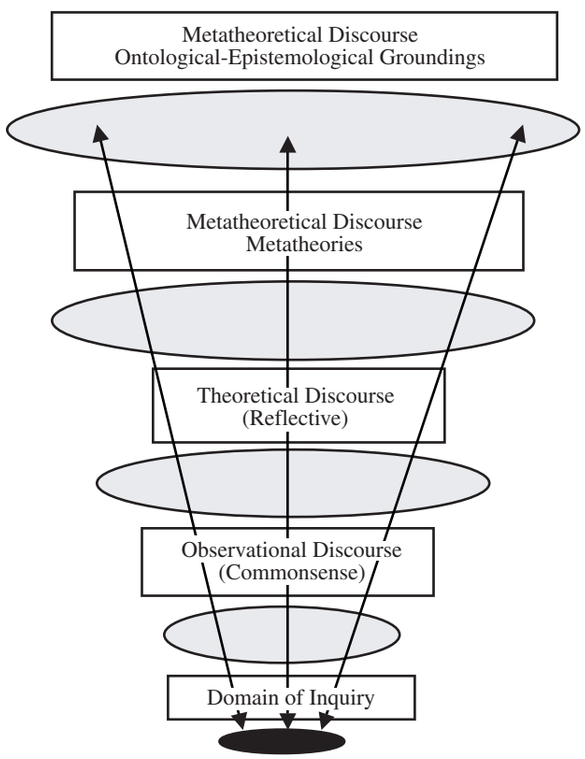


Figure 2.1 Levels of discourse in understanding a domain of inquiry.

sense understanding and we do think about it. In so doing, we have moved to a *reflective level* of analysis, and here the first critical differentiation is the *theoretical level* of discourse. Here, thought is about organizing and reformulating observational understandings in a broader and more abstract field. At the theoretical level, concepts are *about* the observational level and these range from informal hunches to highly refined theories about the nature of things, including human behavior and change. Classical developmental theories such as Piaget's, Vygotsky's, and Werner's, for example, contain theoretical principles (e.g., stages) that hypothesize that ultimately a combination of continuous and discontinuous changes will best define human development. Skinnerian and social learning theories alternatively have hypothesized that all change is best represented as strictly continuous.

Beyond the theoretical level, the next level of reflective thought is the *metatheoretical level* of analysis. Here, thought is about basic concepts that impact on both the theoretical and observational level. A *metatheory* itself is a set of rules, principles, or a story (narrative), that both describes and prescribes what is acceptable and unacceptable as theory—the means of conceptual exploration of any scientific domain. For example, in the metatheory termed "atomism" only continuous change is possible and thus only theories committed to strict continuity are formulated. A *metamethod* is also a set of rules, principles, or a story, but this story describes and prescribes the nature of acceptable methods—the means of observational exploration—in a scientific discipline. When metatheoretical ideas—including metamethod—are tightly interrelated and form a coherent set of concepts, the set is often termed a *model* or *paradigm.* These coherent sets can themselves form a hierarchy in terms of increasing generality of application. Thus, a model that contains the basic concepts from which a theory of memory will be constructed is a relatively low level model because it applies only to memory. Models such as "developmental systems" (e.g., Lerner, 2002) or "equilibrium models" (see Valsiner 1998a) apply to a number of domains including social, cognitive, and emotional domains and function at a higher level in the hierarchy. The hierarchical dimension of any given set of metatheoretical ideas also forms a coherently interrelated system of ideas, and the model operating at the pinnacle of this hierarchy is termed a *worldview* (Overton, 1984). Worldviews are composed of coherent sets of *epistemological* (i.e., issues of knowing) and *ontological* (i.e., issues of reality) principles. In this chapter, much of the discussion concerns ideas that have a very high range of application.

Metatheories and metamethods are closely interrelated and intertwined. For example, when considering the very nature of development, a prevailing metatheory may claim that change of form (transformational change) is a legitimate and important part of the understanding of developmental change. If a prevailing metatheory asserts the legitimacy of transformational change, then theories of development will include some type of "stage," "phase," or "level" because these are theoretical concepts used to designate transformational change: If transformational change and stage, phase, or level are part of one's metatheory, then the related metamethod will prescribe the significance of methods, which assess patterns and sequence of patterns appropriate for empirically examining these concepts in any given specific domain. If a metatheory prescribes that transformational change is unimportant to our understanding of development, then any theoretical concepts of stage, phase, or level, will be viewed negatively, and methods of pattern and sequential assessment will be understood to be of marginal interest.

Broadly, a metatheory presents a vision of the nature of the world and the objects of that world (e.g., a metatheory might present a picture of the child as an "active agent" who "constructs" his or her known world, but another metatheory might picture the child as a "recording device" that "processes" information). A metamethod presents a vision of the tools that will be most adequate to explore the world described by the metatheory.

Any rich understanding of the impact of the metatheoretical requires an historical appreciation of the emergence of specific alternative metatheoretical approaches to knowledge. Developmental psychology was born and spent its early years in a curious metatheoretical world. This world, which began in the seventeenth century, has been called the modern world or "modernity." In the past century, the modern world has undergone major crises and these have formed the context for alternative contemporary metatheories. Before discussing specific metatheories and their historical origins, an examination of the broad ways that metatheory impacts how we understand the very nature of development requires attention. This discussion establishes a developmental framework serving as a general context for the remainder of the chapter.

THE CONCEPT OF DEVELOPMENT

When exploring nature of development the one feature that virtually all agree on is that above all else development is about *change*. It is common to speak of the development of various art forms, societies, different economic systems, religion, philosophy, science, and so on, and in each case changes that the area goes through are the focus of attention. In developmental psychology, the situation is the same. As a branch of psychology, developmental psychology considers changes in behavior and the processes implied by the behavior such as intending, thinking, perceiving, and feeling. As a developmental psychology, the focus is upon these changes as they occur across the entire life span from conception to death, or within certain periods, such as infancy, childhood, adolescence, adulthood, and the late mature years.

Although the focus on change is straightforward and noncontroversial, major problems arise when considering whether every type of change should be accepted as developmental and, if not, what is the peculiar nature of the change we call developmental. Perhaps, general agreement would occur that the types of behavioral changes that occur when we become fatigued or tired would not be termed developmental change. But what about other changes that are transitory or easily reversed? For example, if someone is struck on the head they may change from a conscious to a nonconscious state; is this development change? Or, a pigeon can be trained to peck at a button when a light comes on, and then trained to not peck at the button when the light comes on; is this development change? The answer to these and other questions about the nature of development change depend to a significant degree on the metatheory that is employed to ground a definition of development.

One of the most popular characterizations of developmental change, at least among developmental psychologists, has been some variant of the idea that development is defined as "changes in observed behavior across age." This understanding is certainly a quick and ready pragmatic definition suitable to act as an operational guide to a series of empirical investigations. However, if this understanding were used to broadly give meaning to the domain of inquiry called developmental psychology, some very significant problems would emerge.

The first problem involves linking developmental change to age. On any close examination, it becomes clear that although age may operate fairly well at an observational level of discourse, at a reflective level it fails to make any meaningful distinctions. Age has no unique qualities that differentiate it from time; age is simply one index of time. Most important, there is nothing unique or novel about units of age-time, such as years, months, weeks, minutes, and so on. Should we then say that development is about changes that occur in time as some have (e.g., Elman, 2003), or that time is a "theoretical primitive?" Time can hardly be a theoretical anything, as time, in and of itself, does nothing. As Wohlwill (1973) once pointed out, time cannot be an independent variable, it is merely a dimension along which processes operate. All change—even if entirely transitory—occurs "in" time, so we come back to simply saying that development is about change. The implication here is that to arrive at meaningful distinctions that can direct a broad area of scientific inquiry we must explore further the nature of change itself. Before doing this, however, we shall consider a second problematic outcome of defining development as something like "changes in observed behavior across age." This is the problematic meaning of "change of observed behavior."

What Changes in Development: Expressive-Constitutive and Instrumental-Communicative Functions of Behavior

Behavior is clearly the observational focus of our empirical investigations—the dependent variable of our research efforts. The problem is whether "change in observed behavior" introduces the reflective distinction needed to articulate a broad inquiry. Observed behavior, or action more generally—at any level from the neuronal to the molar—can reflect both expressive-constitutive and instrumental-communicative functions. *Expressive* action expresses or reflects some fundamental organization or system. For example, in human ontogenesis behavior is often understood to be diagnostic of some cognitive, affective, or motivational system (see the systems described in the cubes on the left of Figure 2.2). These systems have characteristic forms of activity that are expressed as actions and patterns of action in the world (center horizontal lines of Figure 2.2). A verbalization may reflect the nature of the child's system of thought. A cry, in a particular context, may reflect the status of the child's attachment system. A series of behaviors may reflect the child's intentional system. This expressive function is *constitutive* in the sense that it en-

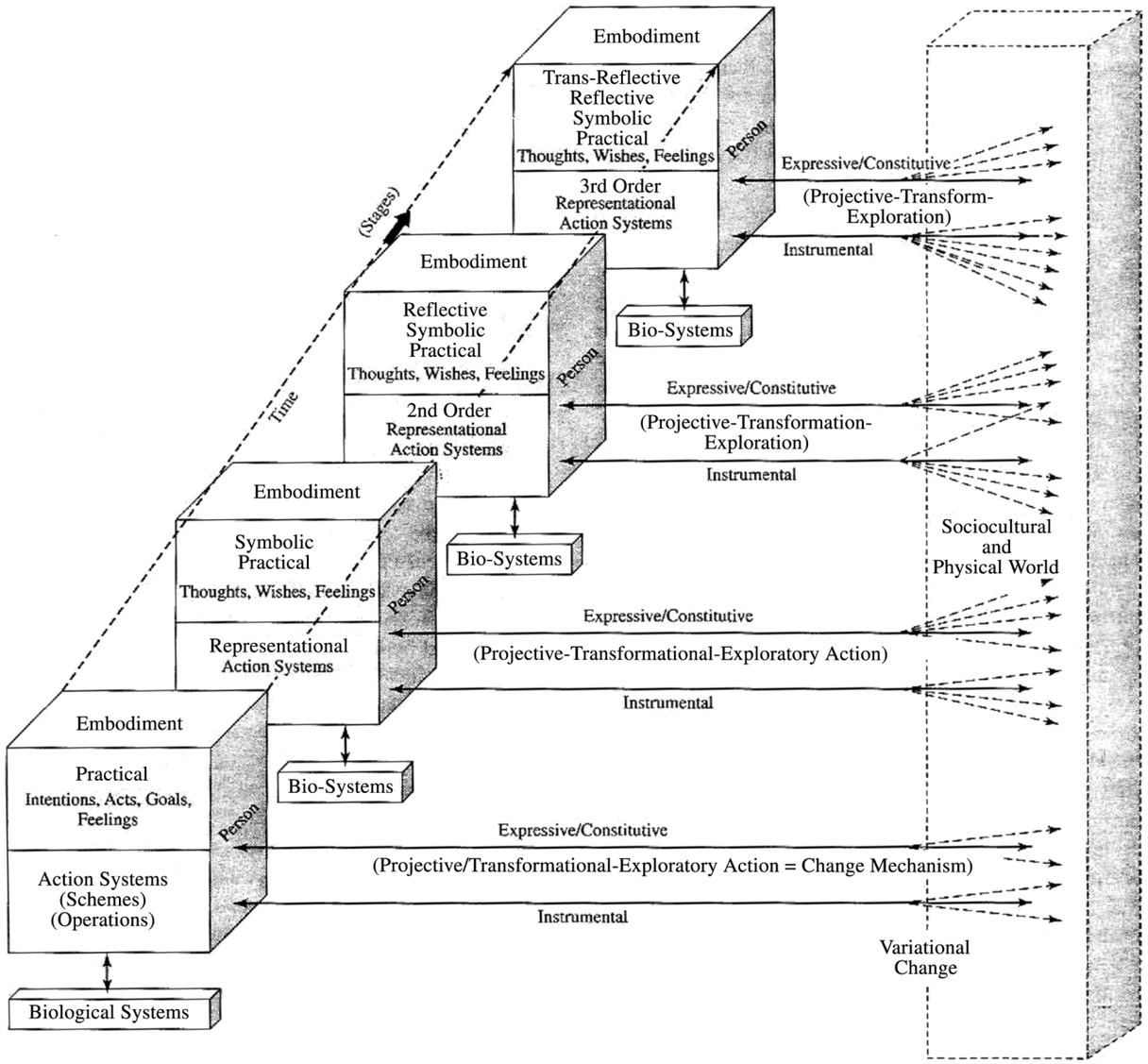


Figure 2.2 The development of the psychological subject: Levels of transformational and variational change emerging through embodied action in a sociocultural and physical world.

tails the creative function of human action (Taylor, 1995). It reflects the base from which new behaviors, intentions, and meanings are constituted. When inquiry is directed toward the assessment or diagnosis of the nature, status, or change of the underlying psychological or biological system, the expressive function is central to inquiry. When exploring the expressive function of an action, the dynamic system that is reflected in the action expression is the *what* that changes in development. Dynamic systems become transformed (left cubes of Figure 2.2) through their action (center horizontal lines of Figure 2.2). We see in the next section that dynamic systems (as a "what" of developmental change) and transformation (as a "type" of developmental change) are closely related.

Instrumental action is behavior that serves as a means to attaining some outcome; it is the pragmatic dimension of action (see center horizontal lines of Figure 2.2). For example, in human ontogenesis an expressive cognitive act or thought may also be the means to solve a problem.

An emotional act of crying may, while being expressive from one perspective, also instrumentally lead to acquiring a caregiver, and walking, which may be expressive when considered as reflecting a broad dynamic system of locomotion, may also be instrumental in acquiring nourishment. *Communicative* action extends action into the domain of the intersubjective (relation of the person cubes at the left and social world at the right of Figure 2.2). Broadly, the expressive-constitutive is the process whereby we come "to have the world we have," and the instrumental-communicative is the process whereby "we order the things in that world" (Taylor, 1995, p. ix). Expressive-constitutive and instrumental-communicative functions of action have each been the focus of developmental investigations. However, conceptual confusions arise and impact on empirical inquiry, if it is left unclear whether the focus of a specific investigation is on the expressive-constitutive or the instrumental-communicative dimension of behavior.

Consider some examples from human ontogenesis that make either expressive-constitutive functions or instrumental-communicative functions the focus of inquiry. Investigations of the infant-caregiver attachment relationship measure the proximity seeking action of the child to the caregiver. When considered as proximity seeking, the action has an instrumental character to it. However, Bowlby and his colleagues have been primarily interested in this action as an expression of an underlying attachment organization; hence, their focus is on the expressive. Bowlby and colleagues use proximity seeking as diagnostic of an underlying attachment system. Piagetian tasks such as the object permanence task, or the conservation task, when examined from an instrumental perspective, constitute successful or unsuccessful problem-solving activities. However, Piaget and his colleagues constructed and used these tasks expressively to diagnosis specific forms of cognitive organization (e.g., schemes, operations). Alternatively, while students' grade point averages may be understood as reflecting, in part, some intellectual organization, the focus of a number of social-cognitive investigations have been on the instrumental quality of this action as an adaptation or adjustment to the social-cultural context. In fact, many investigations that take a sociocultural point of view (see Pinquart and Silbereisen, 2004) limit their developmental interests to instrumental "child outcomes," "coping behaviors," and the other behaviors considered as adaptations to the cultural context. As another example, walking can be examined as an expression of a system of locomotion, but investigations may also focus on walking as instrumental to attaining a goal. Similarly, emotions may be explored as expressions of affective organization (e.g., Boesch 1984; Sroufe, 1979) or as instrumental in attaining a particular outcome (e.g., Saarni, Mumme, & Campos, 1998). Finally, although language development may be, and often has been investigated as a means of communicative functioning, it also has been alternatively examined as an expression of affective-cognitive organization (e.g., Bloom, 1998; Bloom & Tinker, 2001).

From these and other examples it becomes clear that any given action can be understood from the perspective of either its expressive-constitutive or its instrumental-communicative features. Neither the expressive-constitutive nor the instrumental-communicative are given to direct observation, both are reflective characterizations drawn and refined from commonsense understandings, and each may be a legitimate focus of inquiry. When, however, the distinction between expressive-constitutive and instrumental-communicative is not made explicit, "observed behavior" becomes ambiguous. This ambiguity fosters confusion about the specific aim of inquiry and how it contributes to our general understanding of development. Further, this ambiguity allows implicit values to seep in, eventually splitting and contextualizing the field under the influence of hidden metatheoretical assumptions. For example, consider what occurs when "observed behavior" is implicitly framed by historical behavioristic and neopositivistic values. Because early behaviorism and neopositivism excluded the idea that "organization" or "system" could be a fundamental object of inquiry (i.e., excluded the possibility that any person-centered mental systems could be included as legitimate explanations of human behavior), "observed behavior" became implicitly identified with the instrumental-communicative and *only* the instrumental-communicative.

Splitting into a dichotomy and privileging one concept over another in this example leads directly to the theory and methods wars over which concept constitutes the "legitimate" or "significant" or "meaningful" approach to empirical inquiry. For example, the classical battles between the Piagetians, Wernerians, Eriksonians on the expressive-constitutive side, and the Skinnerians, the Spence-Hull learning theorists, and social learning theorists of the Dollard and Miller school on the instrumental-communicative side represented ex-

actly this split. Each side, if not the principal figures themselves, classically assumed that its part constituted the whole. With respect to methods, the effects are more subtle or at least less explored. For example, an examination of issues of validity and reliability illustrates that validity is central to expressive interests and reliability is central to instrumental interests. The often repeated Research Methods 101 lesson, which privileges reliability with the claim that reliability concerns must be the start of measurement, is a story told by classical instrumentalists.

This example of the impact of metatheoretical assumptions represents one of three potential solutions to the relation of the expressive and the instrumental. This "nothing-but" solution takes the instrumental-communicative as privileged and marginalizes the expressive. As another example, this is the solution of any perspective that advocates an exclusively "functional" approach to a topic of inquiry (e.g., see the work on the functional theory of emotions, Saarni et al., 1998); any theory that advocates an exclusively "adaptationist" view of a domain of interest; any theory that explicitly denies or marginalizes the status of mental structures, mental organization, or biological systems as legitimate, if partial, explanations of behavior.

The second potential metatheoretical solution reverses the privileged—marginalization process. This "nothing-but" solution offers the expressive as privileged and the instrumental as the marginal. Approaches offering biological and/or mental systems as both necessary and sufficient for the explanation of behavior would be examples of this solution.

The third metatheoretical solution presents the expressive and the instrumental as co-equal complementary process that function within a relational matrix. In this third approach, expressive and the instrumental are accepted, not as dichotomous competing alternatives, but as different perspectives on the same whole (this solution is illustrated in Figure 2.2). Like the famous ambiguous figure that appears to be a vase from one line of sight and the faces of two people from another line of sight, the expressive and instrumental represent two lines of sight, not independent processes. System and adaptation, like structure and function, are separable only as analytic points of view. Focusing inquiry on the diagnosis of underlying dynamic biological and psychological systems in no way denies that behaviors have an adaptive value; focusing on adaptive value in no way denies that the behaviors originate from some dynamic system (see Overton and Ennis, in press). An interesting example of an approach that begins to promote this kind of integration is found in the in the work of Dodge and colleagues on the development of aggressive behavior. Information processing generally, and Dodge's (1986) social information processing theory specifically, are fundamentally concerned with the instrumental deployment of behaviors during real-time social and physical interactions in the world. However, Dodge and Rabiner (2004) make a very strong, explicit, and clear case for the expressive significance of "latent mental structures" in the developmental process as these impact on how the child "encodes, interprets, and responds in a variety of social situations" (p. 1005; see also Arsenio & Lemerise, 2004; Crick & Dodge, 1994).

To acknowledge both the distinction between expressive-constitutive and instrumental-communicative functions of action, and to acknowledge that they constitute two legitimate parts of a single whole, is to make an assertion of inclusivity. This acknowledgment recognizes that each function assumes a legitimate role in a unified whole of developmental inquiry and that the nature of any specific inquiry is always relative to the goals of that inquiry. From this relational perspective, issues associated with ambiguities arising from contextualizing development as "changes in observed behavior" are reduced significantly by insisting on the substitution of the phrase "changes in expressive-constitutive and instrumental-communicative features of observed behavior." This substitution does not, however, resolve the problem of exactly what kinds of change should be called developmental. For this problem, further reflection is needed on change itself.

The Nature of Developmental Change: Transformational and Variational

If developmental inquiry is to be an inclusive discipline, the issue of "developmental change" needs to be approached from as broad a perspective as possible. Perhaps, the broadest conceptualization of developmental entails the recognition and incorporation of two fundamental types of change; transformational and variational (see Figure 2.2). *Transformational change* is change in the form, organization, or structure of any system. The caterpillar transforms into the butterfly, the tadpole to the frog, water transforms into ice and gas, the seed transforms into the plant, and cells transform into the organism. All nonlinear dynamic systems, including the human psyche, undergo transformational

change. Transformational change results in the *emergence of novelty.* As forms change, they become increasingly complex. This increased complexity is a complexity of pattern rather than a linear additive complexity of elements. As a consequence, new patterns exhibit novel characteristics that cannot be reduced to (i.e., completely explained by), or predicted from, earlier components (indicated by the four system cubes on the left side of Figure 2.2). This emergence of novelty is commonly referred to as *qualitative* change in the sense that it is change that cannot be represented as purely additive. Similarly, reference to "*discontinuity*" in development is simply the recognition of emergent novelty and qualitative change (Overton & Reese, 1981). Concepts of stages, phases, or levels of development are theoretical concepts, which reference transformational change with the associated emergent novelty, qualitative change, and discontinuity. Each of the grand developmental figures of the twentieth century—Piaget, Vygotsky, Werner—acknowledged the centrality of these features of transformational development; Piaget and Werner via their ideas of development proceeding through phases of differentiation and reintegration; Vygotsky (1978) in his argument that development is not "the gradual accumulation of separate changes . . . [but] a complex dialectical process characterized by . . . qualitative transformations of one form into another [with an] intertwining of external and internal factors" (p. 73). (See also Schneirla, 1957.)

The philosopher E. Nagel (1957) articulated the broad dimensions of transformational change when he described development as entailing two fundamental features: (1) "the notion of a system, possessing a definite structure [i.e., organization] . . ." and (2) "the notion of a set of sequential changes in the system yielding relatively permanent but novel increments not only in its structures [i.e., organization] but in its modes of operation [i.e., functions] as well" (p. 17).

It is important to emphasize that transformational change references relatively enduring and irreversible changes in dynamic systems (e.g., the biological system; the psychological subject or person as a system; the cognitive, affective, and motivational systems) and changes that are sequential in nature. The enduring and irreversible characteristic of transformational change eliminates relatively transient or easily reversible changes as developmental change, while the sequential character establishes its *teleological* (goal oriented) nature. Sequence implies an order and any order is necessarily directional in character. A transformational change is one that necessarily implies a direction toward some end state or goal. Here, it is critical to recognize the metatheoretical distinction between subjective and objective teleology. Subjective teleology involves *subjectively held* "purposes," "aims," or "goals" (e.g., "I intend to become a better person") and is irrelevant to the definition of transformational developmental change. Objective teleology involves the construction of principles or rules designed to explain phenomena under investigation (e.g., "the development of x moves from lack of differentiation to more equilibrated levels of differentiation and hierarchic integration"). The rule so constructed conceptually finds, discovers, or identifies the sequential order and the end state. Any theory consists of explanations of some topic or domain and a developmental transformational theory must articulate what is developing.

It is a conceptual confusion to argue that adequate descriptions are more important than the positing of endpoints (e.g., Sugarman, 1987), or similarly to suggest a movement away from endpoints and toward "a more neutral, person-time-and-situation-geared conception of development," (Demetriou & Raftopoulos, 2004, p. 91). There is no neutral standpoint, and no description could occur without a positing of endpoints. The question is what one would possibly describe if one did not understand development as tending toward some specified end? If one wishes to describe/explain the course of acquiring language, then adult language is, of necessity, the endpoint. No description of the language of the child would be possible without this ideal endpoint. In a similar fashion, if one wishes to describe/explain the transformational development of reasoning, thought, problem solving, personality, or anything, a conceptual endpoint must serve as the ideal ultimate model.

A portion of this confusion over the positing of developmental endpoint arises from the mistaken notion that positing an ideal necessarily leads to an "adultomorphic perspective [that] forces one to view earlier behaviors and functions as immature versions of adult functions" (Marcovitch & Lewkowicz, 2004, p. 113). Central to this argument is its failure to recognize that nonlinearity (discontinuity) is characteristic of transformational developmental change. For example, Piaget's interest in examining the development of reasoning process led him to take deductive propositional reasoning as the endpoint of inquiry. However, Piaget described several quite different forms of reasoning (e.g., preoperational and

concrete operational) that function as discontinuous precursors to this adult form. It also needs to be noted that endpoints can be posited with respect to content (e.g., the adult memory model, the adult reasoning model), with respect to structure (e.g., Werner's, 1957, orthogenetic principle "development . . . proceeds from an initial state of relative globality and lack of differentiation to a state of increasing differentiation, articulation, and hierarchic integration," p. 126), and with respect to function (e.g., see Valsiner, 1998a discussion of equilibrium models; Piaget's discussions of levels of adaptation). One cannot condemn the positing of endpoints and then make claims that distal evolutionary (i.e., adaptational) determinants play a role in development (Marcovitch & Lewkowicz, 2004). Distal adaptations are endpoints.

A related conceptual confusion occurs when the concept of "maturation" is introduced into the definition of development as in "development refers to the maturation of various systems." The problems here are twofold. First, if maturation is simply understood according to its traditional dictionary meanings (i.e., "the emergence of personal and behavioral characteristics through growth processes," Merriam-Webster's Online Dictionary, Tenth Edition; "the process of becoming completely developed mentally or emotionally," Cambridge International Dictionary of English, online edition), then it is tautological with and adds nothing to the already discussed definition of transformational features of development. Second, if maturation is taken to suggest the action of biological systems, then the concept of, and potential mechanisms of development have become conflated, and this represents a serious conceptual confusion.

Embryological changes constitute some of the clearest and most concrete examples of transformational or morphological change (Edelman, 1992; Gottlieb, 1992). Through processes of differentiation and reintegration, movement occurs from the single celled zygote to the highly organized functioning systems of the 9-month fetus. Some cognitive and social-emotional phenomena of human ontogenesis have also been conceptualized as reflecting transformational change. For example, overt action may undergo a sequence of transformations to become symbolic thought, and further transformations lead to a reflective symbolic thought exhibiting novel logical characteristics (see boxes on left side of Figure 2.2). Memory may reflect transformational changes moving from recognition memory to recall memory. The sense of self and identity (Chandler, Lalonde, Sokol, & Hallett 2003; Damon & Hart, 1988; Nucci, 1996) have been portrayed by some as moving through a sequence of transformations. Emotions have been understood as differentiations from an initial relatively global affective matrix (Lewis, 1993; Sroufe, 1979). Physical changes, such as changes in locomotion, have also been conceptualized as transformational changes (Thelen & Ulrich, 1991).

Variational change refers to the degree or extent that a change varies from a standard, norm, or average (see the arrows on the right side of Figure 2.2). Take the pecking of the pigeon; changes in where, when, and how rapidly pecking occurs are variational changes. The reaching behavior of the infant, the toddler's improvements in walking precision, the growth of vocabulary, and receiving better or worse grades are all examples of variational change. From an adaptive (instrumental) point of view, developmental variational change is about a skill or ability becoming more precise and more accurate. This type of change can be represented as linear; as completely additive in nature. As a consequence, this change is understood as *quantitative* and *continuous.*

At any given level of form (i.e., any level of a dynamic system), there are quantitative and qualitative variants that constitute variational change. If thinking is understood as undergoing transformational change, then at any given transformational level, variational changes are found in variants of thought (e.g., analytic styles and synthetic styles). If emotions are presented as undergoing transformational change, then at any transformational level, variational change is reflected in differences in the degree of emotionality (more or less anxious, empathic, altruistic, and so on). If identity is thought of as undergoing transformational change, then at any transformational level, there is variational change in the type of identity assumed (i.e., individualistic or communal). If memory undergoes transformational change, there is variational change in differences in memory capacity, memory style, and memory content.

Transformational change has been identified with normative issues such as changes that are typical of phyla, species, and individuals. In ontogenesis, for example, normative changes in cognitive, affective, and motivational systems have been the central issue of concern. The focus here is sequences of universal forms whose movement defines a path or trajectory. As suggested earlier, when tracing developmental trajectories, concepts of irreversibility, discontinuity (nonadditivity,

nonlinearity), sequence, and directionality are associated with transformational change. Variational change has been identified with differential issues across and within individuals and groups. Interest has focused on local individual and group differences that suggest a particularity, and a to-and-fro movement of change. Concepts of reversibility, continuity, and cyclicity are associated with variational change. When change is considered both in terms of life forms and physical systems, transformational change is identified with what has been called the "arrow of time," and variational change is identified with the notion of the "cycles of time" (Overton, 1994a, 1994c; Valsiner, 1994).

Incorporating transformational and variational change into a broad understanding of development raises the issue of how these two forms are to be related. The same three metatheoretical solutions that have historically appeared with respect to the concept of the expressive-instrumental appear again for the transformational-variational. The first solution splits the pair, thus forming a dichotomy, and treats the instrumental as privileged bedrock. This solution marginalizes transformational change by claiming that it is mere description, which itself requires explanation. Essentially, this claim is the promise that all apparent transformational change will ultimately be explained—perhaps as our empirical knowledge increases—as the product of variation and only variation. An important consequence of this solution is that the associated metamethod will prescribe methods that can assess linear additive processes, but will marginalize methods that assess nonlinear processes. A classic example of this general solution was the Skinnerian demonstration that given only variations in pecking and reinforcement, it was possible to train pigeons to hit Ping-Pong balls back and forth over a net. Thus, it was claimed that the apparent developmental novelty of playing Ping-Pong was in reality "nothing-but" the continuous additive modifications in variation. This solution is also adopted by those who portray cognitive development as either a simple increase in representational content (see Scholnick & Cookson, 1994) or as an increase in the efficiency with which this content is processed (Siegler, 1996; Sternberg, 1984).

The second metatheoretical solution treats transformational change as the bedrock reality and marginalizes the significance of variation. Variation is seen as rather irrelevant noise in a transformational system. While this solution is seldom explicitly articulated, some stage theories such as Erik Erikson's (1968) theory of psychosocial development have elevated transformational change to a point that the importance of the variational seems to disappear below the horizon.

As described earlier, the third metatheoretical approach does not split transformation and variation into competing alternatives, but rather it understands the transformational-variational as a fundamentally necessary and real whole containing co-equal complementary processes. This solution asserts a reality in which the processes assume differentiated functional roles, but each process in itself explains and is explained by the other. Transformational systems produce variation and variation transforms the system (this solution is illustrated in Figure 2.2). This relational metatheoretical stance is described in detail later as a "take on reality" that, as suggested earlier, resolves many of developmental inquiry's most controversial problems, and opens new paths of investigation.

A Unified Concept of Development

When transformational-variational change and changes in expressive constitutive instrumental communicative action are cast into a relational matrix, they reflect complementary images of the totality of developmental change. The *expressive-constitutive* and *instrumental-communicative dimension* articulates *what* it is that changes during development. In the domain of developmental psychology, it is the *psychological subject* (or dynamic systems that explain the functioning of the subject) and the *subject's action* that become foreground. Piaget and Skinner, for example, each construct a radically different vision of the nature of the changing subject, but both focus on the subject. Piaget considers both the expressive and instrumental to each be essential features of what changes. "Schemes" and "operations" are identified as the source of the subject's expressive-constitutive action, while "procedures" are conceived as instrumental strategies designed to succeed in the actual world. For Skinner, the expressive is denied or marginalized, and "operants" represent the subject's instrumental adjustments to a changing environment.

The *transformational-variational dimension* articulates the *nature of the change* taking place. It is the *action* rather than the function of the action that becomes the foreground. Here, actions that are expressive-

instrumental in function, vary and transform. Later in the chapter, for example, the neo-Darwinian theory of evolutionary change is discussed, as is developmental systems theory. In these cases, the primary focus is on variational and transformational change of action, while the expressive-instrumental functions of the action fade to background.

Casting the dimensions of what changes, and the nature of change, as complementary lines of sight reveals that the dimensional features can be recombined depending on the goal of inquiry. For example, it is possible to form a transformational-expressive dimension. This focus explores the sequence of system changes—whether affective, emotional, physical, or cognitive system—which become reflected in sequential changes in the cognitive-affective meanings that the psychological subject projects onto her world. Similarly, the variational-instrumental dimension can be thought of as focusing inquiry on variational changes in action that result in procedures or strategies—again whether affective, emotional, physical, cognitive, and so on—which the subject employs in adjustment and adaptation.

These reflections on changes in expressive-instrumental action and transformational-variational change provide a base from which it is possible to suggest a relatively inclusive definition of development that moves beyond the ambiguities of "change in observed behavior across age" and more reasonably begins to carry the load of all of developmental inquiry. Development within this context is understood to refer to *formal (transformational) and functional (variational) changes in the expressive-constitutive and instrumental-communicative features of behavior.* Behavior is understood broadly in this definition, thus not limiting developmental inquiry to a specific field of investigation. Disciplines as diverse as history, anthropology, philosophy, sociology, evolutionary biology, neurobiology, and psychology, as well as natural science investigations of system changes all become potential forms of developmental inquiry. Developmental change within this inclusive definition includes at least—as suggested earlier—phylogenesis (i.e., the development of phyla, or evolutionary change), ontogenesis (i.e., the development of the individual), embryogenesis (i.e., the development of the embryo), microgenesis (i.e., development across short time scales, such as the development of an individual percept or individual memory), pathogenesis (i.e., the development of pathology), and orthogenesis (i.e., normal development). From this perspective, developmental inquiry necessarily becomes interdisciplinary and comparative in nature.

This inclusive relational definition of development is a starting point for further excursions both backward, into the nature and history of the metatheoretical concepts that frame the definition (and other basic features) of developmental inquiry, and forward to conceptual, theoretical, and methodological consequences of understanding development in this fashion. In gazing forward to consequences of this understanding, light is cast on a significant but often obscured conceptual feature of some of the classical developmental controversies. Consider these often debated questions: Is development universal (typical of most people, despite specific biological circumstances, culture, or social background) or particular (typical of only some people)? Is development necessarily directional or contingently directional? Is development irreversible or reversible? Is development continuous (linear; i.e., capable of being represented additively) or discontinuous (nonlinear, i.e., emergent novel forms or stages appear)? Is development fundamentally about biology or culture? Each of these questions becomes a debate only when the conceptual pair is cast as an antinomy. From an inclusive relational metatheoretical position, all such debates necessarily evaporate, as the conceptual pairs become co-equal, indissociable complementarities. Thus, for example, from the relational perpective it is possible to assert with some confidence, on both rational and empirical grounds, that while the content of memory or memory strategies, as well as the content of thinking or thinking styles, is particular (variable change), recall memory and symbolic thought are typical acquisitions of all human ontogenesis (transformational change). Similarly, there would appear to be little doubt that a raised grade point average can be reversed (variable change), but this in no way denies that the movement from babbling to language may be more profitably understood as sequential and directional and irreversible (transformational change). Reflection, as well as commonsense observation, suggests that there is some coherence to behavior and that this coherence becomes expressed (expressive) in action; yet, there is also little to deny that this activity functions in the context of a world that imposes demands on it (variable, instrumental). Reflection on several scientific disciplines, as well as commonsense observation, also suggests that in some arenas novelty emerges (transformational), while

in others arenas changes are more reasonably represented as additive (variational). And hundreds of years of failed attempts to successfully sort behavior into discrete nature piles and nurture piles should suggest that perhaps a relational approach that eliminates all "*which one* and all *how much*" questions might offer a more productive conceptual foundation for investigations into the operation of biology and culture processes in development.

Along with casting light on conceptual debates that have long framed developmental inquiry, an inclusive understanding of development has ripple effects that move out to implications for empirical methods. The most general implication is that empirical inquiry in this context abandons the aim of broad-based debunking found historically in instrumentalist approaches to science (see the later discussion of methodology). Within a relational metamethod, questions of whether stages exist (transformational change, discontinuity, sequence) or are absent (variational change, continuity) disappear. In place of these questions, inquiry that takes the transformational pole of change as its object directs itself to empirically examine the plausibility of various alternative models of stage, phase, or level change (nonlinear change). Inquiry taking variational change as its object would be explicitly recognized as irrelevant to stage issues as such, and relevant to issues such as the stability of individual differences across age, time, or stages. Such change-specific inquiry opens the door to a greater recognition of the importance of change-specific techniques of measurement. For example, investigations with the central aim of examining transformational (nonlinear) and expressive acts often call for the application of contemporary order-scaling techniques and correlational techniques to assess changes in transformational patterns, and latent traits (see, the later discussion of methodology; e.g., Bond & Fox, 2001; Fischer & Dawson, 2002; Sijtsma & Molenaar, 2002). Studies of variational change (stability, continuity), those tracing the trajectory of variational change (i.e., the developmental function), and those exploring instrumental acts typically call for traditional correlational procedures and traditional experimental procedures (see the later discussion of methodology, and, e.g., Appelbaum & McCall, 1983).

The following sections describe and examine in detail the nature of split and relational metatheories, along with an important metatheory nested within the relational. These sections also describe the impact of these metatheories on various concepts and issues in the field of developmental psychology. Following the extended discussion of split and relational metatheories, there is a section devoted to epistemological-ontological issues. There, a history of the philosophical traditions that establish the conceptual frameworks for split and relational approaches will be described along with further implications for concepts and theories of development drawn from these traditions. Finally, these traditions will serve as background for a section exploring split and relational approaches to the metamethods and methods of developmental psychology.

SPLIT AND RELATIONAL METATHEORIES

Earlier it was mentioned that the most general and abstract metatheories have traditionally been called "worldviews." In developmental psychology, the most widely discussed worldviews have been those described by Steven Pepper (1942) as the mechanistic, the contextualist, and the organismic (Ford & Lerner, 1992; Overton, 1984; Overton & Reese, 1973; Reese & Overton, 1970). The worldviews discussed here are closely related to Pepper's categorization. *Split metatheory* entails all of the basic categories described by Pepper as mechanistic, including a commitment to viewing the ultimate nature of the universe, and hence the nature of the psychological subject, as reactive, uniform, and fixed. *Relational metatheory* alternatively embraces most of the basic categories described by Pepper as contextualistic and organismic, including a commitment to understanding the ultimate nature of both universe and persons as active, organized, and changing. Relational metatheory however, departs from Pepper's skepticism about the possibility of uniting contextualism and organism, and offers what it considers to be a productive rapprochement (Overton & Ennis, in press).

Split Metatheory

Split metatheory entails several basic defining principles, including "splitting," "foundationalism," and "atomism." *Splitting*—a concept that emerged from the thinking of Rene Descartes—is the separation of components of a whole into mutually exclusive pure forms or elements. In splitting, these ostensibly pure forms are cast into an exclusive "either/or" framework that forces them to be understood as contradictions in the sense that one category *absolutely* excludes the other (i.e., follows the logical law of contradiction that it is never the case

that A = not A). But, in order to split, one must accept the twin principles of *foundationalism* and *atomism.* These are the metatheoretical axioms that there is ultimately a rock bottom unchanging nature to reality (the foundation of foundationalism), and that this rock bottom is composed of elements—pure forms—(the atoms of atomism) that preserve their identity regardless of context. A corollary principle here is the assumption that all complexity is *simple complexity* in the sense that any whole is taken to be a purely additive combination of its elements.

Splitting, foundationalism, and atomism are all principles of decomposition; breaking the aggregate down to its smallest pieces, to its bedrock (Overton, 2002). This process also goes by other names including *reductionism* and *the analytic attitude* (Overton, 2002). Split metatheory requires another principle to reassemble or recompose the whole. This is the principle of *unidirectional and linear (additive) associative or causal sequences.* The elements must be related either according to their contiguous co-occurrence in space and time, or according to simple efficient cause-effect sequences that proceed in a single direction (Bunge, 1962; Overton & Reese, 1973). Split metatheory admits no determination other than individual efficient causes or these individual causes operating in a conjunctive (i.e., additive) plurality: No truly reciprocal causality is admitted (Bunge, 1962; Overton & Reese, 1973).

All antinomies emerge from a split metatheoretical context. The individual-social or individual-collective or person-social antinomy, for example, represents all behavior and action as the additive product of elementary bedrock pure forms identified as person and sociocultural. Arising from this splitting, behavior is understood as an aggregate composed of these two pure forms, and the question becomes one of the primacy or privileged quality of one or the other. Nativism-empiricism or nature-nurture is a closely related antinomy in which the pure forms consist of, on the one hand, some basic biological form or element (e.g., DNA, genes, neurons) and, on the other hand, some basic environmental element (e.g., parents, society, culture). These examples are explored in this and following sections.

Recently, the pursuit of the person-sociocultural antinomy has been a defining characteristic of contemporary sociocultural (e.g., Cole & Wertsch, 1996; Wertsch, 1991) and social constructivist approaches (e.g., Gergen, 1994). These follow the work of Marx who pursued the broader ideas-matter antinomy, and claimed a bedrock foundational primacy for material sociocultural objects; hence, his presentation of dialectical *materialism.* Wertsch acknowledges Marx's contribution and frames his own work within the person-social antinomy by endorsing both a split interpretation of Vygotsky (i.e., "In pursuing a line of reasoning that reflected their concern with Marxist claims about the *primacy of social forces* Vygotsky and his colleagues . . . contended that many of the design features of mediational means *originated in social life,*" 1991, p. 33, emphasis added) and a split interpretation of Luria:

> As stated by Luria (1981, p. 25), "in order to explain the highly complex forms of human consciousness one must go beyond the human organism. One must seek the origins of conscious activity and 'categorical' behavior *not in* the recesses of the human brain or in the depths of the spirit, *but in* the external conditions of life. Above all, this means that one must *seek these origins in the external processes of social life,* [emphasis added] in the social and historical forms of human existence." (Wertsch, 1991, p. 34)

At times, social constructivist and sociocultural splitting becomes more subtle. Cole and Wertsch (1996) begin one article by acknowledging, on the basis of several direct Piagetian quotes, that Piaget—a traditional villain of both socioculturalist and social constructivists, who is often inaccurately accused of privileging the person—"did not deny the co-equal role of the social world in the construction of knowledge" (p. 251). However, these authors then switch the ground of the issue from the social world specifically to culture mediation entailed by the social world and argue, both in heading ("The Primacy of Cultural Mediation," p. 251) and in text, that culture is to be privileged:

> Social origins take on a special importance in Vygotsky's theories that is less symmetrical than Piaget's notion of social equilibration. . . . For Vygotsky and cultural-historical theorists more generally, the *social world does have primacy over the individual* in a very special sense. Society is the bearer of the cultural heritage. . . . (p. 353, emphasis added)

The field of behavior genetics provides a second example of an approach to inquiry that is grounded and defined within a split metatheory. The broad goal of behavior genetics, using the methods of family, twin, and adoption studies, is to partition (split) the variation in any behavioral score (e.g., a measure of personality, psychopathology, intelligence, language, cognition) into the proportion of the variation caused by foundational

genes (pure form) and the proportion caused by the foundational environment (pure form; Plomin, 1986, 1994). "Behavior genetic models use quantitative genetic theory and quasi-experimental methods to decompose phenotypic (measured) variance into genetic and environmental components of variance" (McGuire, Manke, Saudino, Reiss, Hetherington, & Plomin, 1999, p. 1285). The primary tool employed to effect this splitting is the quantitative formula, called the "heritability index" or "heritability coefficient." This index itself entails a commitment to the additive components-of-variance statistical model (including analysis of variance and all correlation based statistics), which has a basic assumption that each score is a linear function of independent elements (i.e., the score is the sum of component effects, Winer, 1962, p. 151; also see Overton & Reese, 1973). Further, it is generally assumed that the correlational patterns produced through the application of this formula are reflections of an underlying causal reality in which genes and environment primarily contribute additively to the behavior under investigation (Vreeke, 2000). Within the behavior genetic frame, the ultimate goal is to discover the specific genetic causal pathways. The idea here is to unravel and parse conjunctive pluralities of efficient causes believed—within the context of a split metatheory—to explain any behavior, and thereby arrive at an ultimate genetic bedrock of explanation. As Plomin and Rutter (1998) say with respect to the anticipated discovery of genes associated with specific behaviors:

> The finding of genes will provide the opportunity to unravel the complicated causal processes. . . . No longer will we have to focus on how much variation in the general population is genetically influenced; instead we can make the crucial transition from "black box" inferences regarding genetic influences to the observation of specific genes. (p. 1238)

Relational Metatheory

In an analysis of the historical failures of split metatheory, as well as the emptiness of its seeming rival—postmodern thought—Bruno Latour (1993) has proposed a move away from the extremes of Cartesian splits to a center or "middle kingdom" position where entities and ideas are represented not as pure forms, but as forms that flow across fuzzy boundaries. This is a movement toward what Latour terms "relationism" a metatheoretical space where foundations are groundings, not bedrocks of certainty, and analysis is about creating categories, not about cutting nature at its joints. Relational metatheory builds on Latour's proposal. It begins by clearing splitting from the field of play and in so doing it moves toward transforming antinomies into co-equal, indissociable complementarities. As splitting and foundationalism go hand in hand, removing the one also eliminates the other. Splitting involves the conceptual assumption of pure forms, but this assumption itself springs from the acceptance of the atomistic assumption that there is a fixed unchanging bedrock bottom to reality composed of elements that preserve their identity regardless of context. Thus, acceptance of atomism leads directly to the belief that the mental (ideas, mind) and the physical (matter, body) are two absolutely different natural kinds of things. And if nature were composed of such natural kinds, then it would seem reasonable to believe in the possibility of cutting nature at its joints. A relational metatheory rejects atomism and replaces it with holism as a fundamental guiding principle. Within this conceptual frame, fixed elements are replaced by contextually defined parts with the result that—as the philosopher John Searle (1992) has suggested—"the fact that a feature is mental does not imply that it is not physical; the fact that a feature is physical does not imply that it is not mental" (p. 15). Similarly, the fact that a feature is biological does not suggest that it is not cultural; the fact that a feature is cultural does not suggest that it is not biological. Building from this base of holism, relational metatheory moves to specific principles that define the relations among parts and the relations of parts to wholes. In other words relational metatheory articulates principles of analysis and synthesis necessary for any scientific inquiry, which include (a) the identity of opposites, (b) the opposites of identity, and (c) the synthesis of wholes.

Holism

Holism is the conceptual principle that the identities of objects and events derive from the relational context in which they are embedded. The whole is not an aggregate of discrete elements, but an organized and self-organizing system of parts, each part being defined by its relations to other parts and to the whole. Complexity in this context is *organized complexity* (Luhmann, 1995; von Bertalanffy, 1968a, 1968b), in that the whole or dynamic system is not decomposable into elements arranged in additive linear sequences of cause-effect relations (Overton & Reese, 1973). Nonlinear dynamics

are a defining characteristic of this type of complexity. In the context of holism, principles of splitting, foundationalism, and atomism are rejected as meaningless approaches to analysis, and fundamental antinomies are similarly rejected as false dichotomies.

The rejection of pure forms or essences found in holism has broad implications for developmental psychology. For example, as suggested in the last section, the nature-nurture debate is framed by the agenda of splitting and foundationalism. In its current split form, no one actually asserts that matter, body, brain, and genes or society, culture, and environment provide *the* cause of behavior or development: The background idea of one or the other being the privileged determinant remains the silent subtext that continues to shape discussions. The most frequently voiced claim is that behavior and development are the products of the *interactions* of nature and nurture. But interaction itself is generally conceptualized as two split-off pure entities that function *independently* in cooperative and/or competitive ways (e.g., Collins, Maccoby, Steinberg, Hetherington, & Bornstein, 2000). As a consequence, the debate simply becomes displaced to another level of discourse. At this new level, the contestants agree that behavior and development are determined by *both* nature *and* nurture, but they remain embattled over the relative merits of each entity's essential contribution. Population behavior genetics continues its focus on the classical question of *how much* each form contributes to a particular behavior. Other split approaches continue the battle over *which* of the two pure forms determines the origin and function of a specific behavior. Thus, despite overt conciliatory declarations to the contrary, the classical *which one* and *how much* questions (see Anastasi, 1958; Schneirla, 1956), continue as potent divisive frames of inquiry. However, it would be impossible to cast questions of development as issues of "nativism" and "empiricism" (Spelke & Newport, 1998) were it not for the assumption of pure forms. Rejecting atomism and embracing holism on the other hand eliminates the idea of pure forms and consequently makes any notion of natural foundational splits untenable. This destroys the scientific legitimacy of *which one* and *how much* questions in any arena of inquiry.

But the acceptance of holism does not, in itself, offer a detailed program for resolving the many fundamental antinomies that have framed developmental psychology and other fields of scientific inquiry. Such a program requires principles according to which the individual identity of each concept of a formerly dichotomous pair is maintained, while simultaneously affirming that each concept constitutes, and is constituted by, the other. For example, both nature and nurture maintain their individual identity, while it is simultaneously understood that the fact that a behavior is a product of biology does not imply that it is not equally a product of culture; conversely, the fact that a behavior is a product of culture does not imply that is not equally a product of biology. This is accomplished by considering the identity and differences as two *moments of analysis.* The first moment being based on the principle of the identity of opposites; the second being based on the principle of the opposites of identity.

The Identity of Opposites

The principle of the *identity of opposites* establishes the identity among fundamental parts of a whole by casting them not as exclusive contradictions, as in the split methodology, but as differentiated polarities (i.e., co-equals) of a unified (i.e., indissociable) inclusive matrix, as a relation. As differentiations, each pole is defined recursively; each pole defines and is defined by its opposite. In this identity moment of analysis, the law of contradiction is suspended and each category contains and, in fact, *is* its opposite. Further—and centrally—as a differentiation this moment pertains to character, origin, and outcomes. The character of any contemporary behavior, for example, is 100% nature because it is 100% nurture. There is no origin to this behavior that was some other percentage—whether we climb back into the womb, back into the cell, back into the genome, or back into the DNA—nor can there be a later behavior that will be a different percentage. Similarly, any action is both expressive and instrumental, and any developmental change is both transformational and variational.

There are a number of ways of articulating this principle, but perhaps the clearest articulation is found in considering the famous ink sketch by M. C. Escher titled *Drawing Hands.* As shown in Figure 2.3, here a left and a right hand assume a relational posture according to which each is simultaneously drawing and being drawn by the other. In this relational matrix, each hand is *identical*—thus co-equal and indissociable—with the other in the sense of each drawing and each being drawn. This is a moment of analysis in which the law of contradiction (i.e., Not the case that A = not A) is relaxed and identity (i.e., A = not A) reigns. In this *identity moment of analysis,* pure forms collapse and categories flow into each

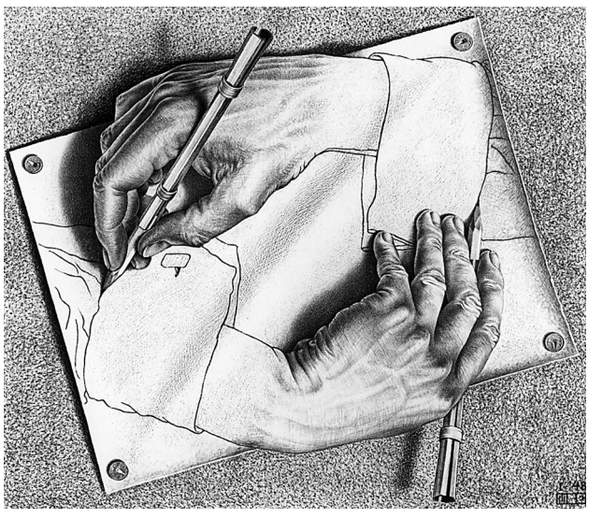


Figure 2.3 *Drawing Hands* by M. C. Escher. ©2006 The M. C. Escher Company–Holland. All rights reserved. www.mcescher.com. Used by permission.

other. Each category contains and *is* its opposite. As a consequence, there is a broad inclusivity established among categories. If we think of inclusion and exclusion as different moments that occur when we observe a reversible figure (e.g., a necker cube or the vase-women illusion), then in this identity moment we observe only inclusion. In the next (opposite) moment of analysis the figures reverse, and there we will again see exclusivity as the hands appear as opposites and complementarities.

Within this identity moment of analysis, it is a useful exercise to write on each hand one of the bipolar terms of a traditionally split antinomies (e.g., person and culture) and to explore the resulting effect. This exercise is more than merely an illustration of a familiar bi-directionality of effects suggested by many scientific investigators. The exercise makes tangible the central feature of the relational metatheory; seemingly dichotomous ideas that are often been thought of as competing alternatives can enter into inquiry as co-equal and indissociable. It also concretizes the meaning of any truly nonadditive reciprocal determination (Overton & Reese, 1973).

If inquiry concerning, for example, person, culture, and behavior is undertaken according to the principle of the identity of opposites various constraints are imposed, as with any metatheory. An important example of such a constraint is that behavior, traits, styles, and so on cannot be thought of as being decomposable into the independent and additive pure forms of person and culture. Thus, from the perspective of relational metatheory, the goals of sociocultural or social constructivist approaches in attempting to elevate society and culture to a privileged primary position is simply a conceptual confusion.

If the principle of the identity of opposites introduces constraints, it also opens possibilities. One of these is the recognition that, to paraphrase Searle (1992), the fact that a behavior is biologically or person determined does not imply that it is not socially or culturally determined, and, the fact that it is socially or culturally determined does not imply that it is not biologically or person determined. The identity of opposites establishes the metatheoretical position that genes and culture, like culture and person, and brain and person, and so on, operate in a truly *interpenetrating* manner.

Because the idea and implications of suspending the law of contradiction in some contexts and applying it in others is not a familiar one, some clarifying comments are needed. Relational metatheory, owes much to the notion of the *dialectic* as this was articulated by the nineteenth-century philosopher G. W. F. Hegel (1770–1831). For Hegel, historical—and by extension developmental—change is a dynamic expressive-transformational process of growth, represented and defined by the dialectic. Central to Hegel's dialectic is the idea of a process through which concepts or fundamental features of a dynamic system *differentiate* and move toward *integration.* Any initial concept or any basic feature of a dynamic system—called a "thesis" or an "affirmation"—contains implicit within itself an inherent *contradiction* that, through action of the system in the world, becomes differentiated into a second concept or feature—the "antithesis" or "negation" of the thesis. As a consequence, even in the single unity of thesis there is the implicit contradictory relation of thesis-antithesis, just as in the unity of the single organic cell there is the implicit differentiation into the unity of multiple cells. This points to the fundamental relational character of the dialectic.

As thesis leads to antithesis—producing the differentiation of a relational polarity of opposites—a potential space between them is generated, and this becomes the ground for the *coordination* of the two. The coordination that emerges—again through the mechanism of action of the system—constitutes a new unity or integration—called the "synthesis." The coordinating synthesis is itself a system that exhibits novel systemic properties while subsuming the original systems. Thus, a new relational dynamic matrix composed of three realms—thesis-antithesis-synthesis—is formed. The integration

that emerges from the differentiation, like all integrations, is incomplete. The synthesis represents a new dynamic action system—a new thesis. Thus, begins a new growth cycle of differentiation and integration.

In this relational scheme, the polarity of opposites (i.e., thesis and antithesis) that emerges from the initial relatively undifferentiated matrix (i.e., thesis) does not constitute cut-off (split) contradictory categories that absolutely exclude each other. Having grown from the same soil as it were, the two, while standing in a contradictory relation of opposites, also share an identity. Hegel referred to this relation as the "identity of opposites" (Stace, 1924) and illustrated it in his famous example of the master and slave. In this example, Hegel demonstrated that it is impossible to define or understand the freedom of the master without reference to the constraints of slavery; and consequently impossible to define the constraints of slavery without the reference to the freedom of the master. Freedom thus contains the idea of constraint as constraint contains the idea of freedom, and in this we see the identity of the opposites freedom and constraint.

The justification for the claim that a law of logic—for example, the law of contradiction—can reasonably both be applied and relaxed depending on the context of inquiry requires a recognition that the laws of logic themselves are not immutable and not immune to background ideas. In some metatheoretical background traditions, the laws of logic are understood as immutable realities given either by a world cut off from the human mind or by a prewired mind cut off from the world. However, in the background tradition currently under discussion the traditional laws of logic are themselves ideas that have been constructed through the reciprocal action of human minds and world. The laws of logic are simply pictures that have been drawn or stories that have been told. They may be good pictures or good stories in the sense of bringing a certain quality of order into our lives, but they are still pictures or stories, and it is possible that other pictures will serve us even better. Wittgenstein (1953/1958), whose later works focused on the importance of background or what we are calling metatheoretical ideas, made this point quite clearly when he discussed another law of logic—the law of the excluded middle—as being one possible picture of the world among many possible pictures:

> The law of the excluded middle says here: It must either look like this, or like that. So it really . . . says nothing at all, but gives us a picture. . . . . And this picture *seems* to determine what we have to do and how—but it does not do so. . . . Here saying "There is no third possibility" . . . expresses our inability to turn our eyes away from this picture: a picture which looks as if it must already contain both the problem and its solution, while all the time we *feel* that it is not so. (para. 352)

The transformation of competing alternatives into co-equal, indissociable partners is illustrated in a recent exchange of comments concerning research on the topic that social psychology refers to as the "fundamental attribution error." In this exchange, one group (Gilovich & Eibach, 2001) proceeded from a split position and noted that "human behavior is not easily parsed into situational and dispositional causes" (p. 23); they further claimed that it is difficult to establish "a precise accounting of how much a given action stems from the impinging stimulus rather than from the faculty or disposition with which it makes contact" (p. 24). The reply to this comment, from a group committed to an identity of opposites (Sabini, Siepmann, & Stein, 2001), asserts that they reject such a position because it reflects confusion between competing and complementary accounts. They argue that the problem with the question:

> How much John's going out with Sue stems from her beauty rather than from his love of beautiful women . . . is not that it is difficult to answer; it is that it is conceptually incoherent. It is incoherent because it construes two classes of accounts that are in fact complementary as if they were competing. The heart of our argument is that one must take this point seriously: All behavior is jointly a product of environmental stimuli and dispositions. (p. 43)

A similar, but somewhat more subtle, example is found in a recent dialogue on spatial development. Uttal (2000) began this dialogue with the *seemingly* complementary view that his claims about spatial development "are based on the assumption that the relation between maps and the development of spatial cognition is reciprocal in nature" (p. 247). However, in an analysis of Uttal's position, Liben (1999) raises the question of whether Utall is operating within the context of an identity of opposites, which she proposes as her own approach:

> As I read his thesis, Uttal seems to be suggesting an *independent* contribution of maps, positing that exposure to maps can play a *causal* role in leading children to develop basic spatial concepts. My own preference is to propose a

> more radically *interdependent* [emphasis added] role of organismic and environmental factors. (p. 272)

A third, more general, illustration of the power of the principle of the identity of opposites to transform competing alternatives into co-equal, indissociable partners is found in returning to the nature-nurture debate. As already suggested, within relational metatheory behavior, traits, and styles cannot be thought of being decomposable into independent and additive pure forms of genes and environment. From this perspective, the goals of behavior genetics simply represent conceptual confusion. The percentages derived from the application of heritability indices, whatever their value, can never be taken as a reflection of the separate contributions of genes and environment to individual differences because the relation of genes and environment (a left and a right Escherian hand) is not independent and additive. Moving beyond behavior genetics to the broader issue of biology and culture, conclusions such as "contemporary evidence confirms that the expression of heritable traits depends, often strongly, on experience" (Collins et al., 2000, p. 228) are brought into question for the same reason. Within a relational metatheory, such conclusions fail because they begin from the premise that there are pure forms of genetic inheritance termed "heritable traits" and within relational metatheory such a premise is unacceptable.

Within the nature-nurture debate, and in other areas, the identity of opposites also calls for a reinterpretation of the very notion of interaction. In split metatheory, "interaction" has been defined as two independent pure forms—biological and cultural—that join to produce an event. This has been called "conventional interactionism" (Oyama, 1989; see also, Lerner, 1978; Overton, 1973). In this metatheoretical context, it is possible for interaction to be understood as the cooperation or competition among elements (e.g., Collins et al., 2000) or as a quantitative situation in which one or the other element contributes more or less to a behavior (e.g., Scarr, 1992). But consider again Escher's drawings. Do the two hands contribute to the drawing and in some sense interact? They do interact, but not in an additive fashion such that contributions to drawing and being drawn could be parceled out and ascribed to one or the other hand. In the relational approach, any concept of *interaction* (e.g., interaction, co-action, transaction) must be taken to entail interpenetration; interdefinition; fusion (Tobach & Greenberg, 1984); and, most broadly, *relations.* Here independent items represent an abstraction that may prove useful for certain analytic purposes, but such abstractions in no way deny the underlying identity of opposites. The analytic and the synthetic are, themselves, two poles of a relational matrix, as are the notions of abstract and concrete (e.g., Lerner, 1978; Overton, 1973; see also Magnusson & Stattin, 1998, for an extended discussion of alternative forms of interaction).

The Opposites of Identity

While the identity of opposites sets constraints and opens possibilities, it does not in itself set a positive agenda for empirical inquiry. The limitation of the identity moment of analysis is that, in establishing a flow of categories of one into the other, a stable base for inquiry that was provided by bedrock elements of the split metatheory is eliminated. Re-establishing a stable base within relational metatheory requires moving to a second moment of analysis. This is the oppositional moment, where the figure reverses and the moment becomes dominated by exclusivity. In this opposite moment of analysis, it becomes clear that despite the earlier identity, Escher's sketch shows a *right* hand and a *left* hand. In this moment, the law of contradiction (i.e., Not the case that A = not A) is reasserted and categories again exclude each other. As a consequence of this exclusion, parts exhibit *unique* identities that differentiate each from the other. These unique differential qualities are stable within any general dynamic system and may form relatively stable platforms for empirical inquiry. The platforms created according to the principle of the opposites of identity become *standpoints, points of view, or lines of sight,* in recognition that they do not reflect absolute foundations (Harding, 1986). They may also be considered under the common rubric *levels of analysis,* when these are not understood as bedrock foundations. Again, considering Escher's sketch, when left as left and right as right are the focus of attention, it then becomes quite clear that—were they large enough—one could stand on either hand and examine the structures and functions of that hand. Returning to the nature-nurture example, while explicitly recognizing that any behavior is 100% biology and 100% culture, alternative points of view permit the scientist to analyze the behavior from a *biological* or a *cultural standpoint.* Biology and culture no longer constitute competing alternative explanations; rather, they are two points of view on an object of inquiry that has been both created by, and will only be fully understood through multiple viewpoints.

To state this more generally, the unity that constitutes human identity and human development becomes discovered only in the diversity of multiple interrelated lines of sight.

The Synthesis of Wholes

Engaging fundamental bipolar concepts as relatively stable standpoints opens the way, and takes an important first step, toward establishing a broad stable base for empirical inquiry within a relational metatheory. However, this solution is incomplete as it omits a key relational component, the relation of parts to the whole. The oppositional quality of the bipolar pairs reminds us that their contradictory nature still remains, and still requires a resolution. Further, the resolution of this tension cannot be found in the split approach of reduction to a bedrock reality. Rather, the relational approach to a resolution is to move away from the extremes to the center and above the conflict, and to here discover a novel system that will coordinate the two conflicting systems. This is the principle of the synthesis of wholes, and this synthesis itself will constitute another standpoint.

At this point, the Escher sketch fails as a graphic representation. While *Drawing Hands* illustrates the identities and the opposites, and while it shows a middle space between the two, it does not describe a coordination. The synthesis for this sketch is an unseen hand that has drawn the drawing hands and is being drawn by these hands. The synthesis of interest for the general metatheory would be a system that is a coordination of the most universal bipolarity imaginable. Undoubtedly, there are several candidates for this level of generality, but the polarity between *matter or nature,* on the one hand, and *society,* on the other, seems sufficient for present purposes (Latour, 1993). Matter and society represent systems that stand in an identity of opposites. To say that an object is a social object in no way denies that it is matter; to say that an object is matter in no way denies that it is social. The object can be analyzed from either a social or a physical standpoint, and the question for synthesis becomes the question of what system will coordinate these two systems. Arguably, the answer is that it is *life* or living systems that coordinate matter and society. Because our specific focus of inquiry is the psychological, we can reframe this matter-society polarity back into our nature-nurture polarity of *biology* and *culture.* In the context of psychology then, as an illustration, write "biology" on one and "culture" on the other Escher hand, and what system coordinates these systems?—the human organism, the *person* (see Figure 2.4a). Persons—as integrated self-organizing dynamic system of cognitive, emotional, and motivational processes and the actions this system expresses—represent a novel level or stage of structure and functioning that emerges from, and constitutes a coordination of, biology and culture (see Magnusson & Stattin, 1998, for an analysis of a methodological focus on the person).

At the synthesis then, there is a standpoint that coordinates and resolves the tension between the other two members of the relation. This provides a particularly broad and stable base for launching empirical inquiry. A *person standpoint* opens the way for the empirical investigation of universal dimensions of psychological structure-function relations (e.g., processes of perception, thought, emotions, values), their individual differences, and their development across the life span. Because universal and particular are themselves relational concepts, no question can arise here about whether the focus on universal processes excludes the particular, it clearly doesn't as we already know from the earlier discussion of polarities. A process viewed from a universal standpoint in no way suggests that it is not contextualized. The general theories of Jean Piaget (1952), Heinz Werner (1940/1957), James Mark Baldwin (1895), William Stern (1938), and Erik Erikson (1968); the attachment theory and object relations theories of John Bowlby (1958); Harry Stack Sullivan (1953); and Donald Winnicott (1965, 1971) all are examples of developmentally oriented relational person standpoints.

It is important to recognize that one standpoint of synthesis is relative to other synthesis standpoints. Life and society are coordinated by matter, and thus, within psychological inquiry, *biology* represents a *standpoint* as the synthesis of *person and culture* (Figure 2.4b). The implication of this is that a relational biological approach to psychological processes investigates the biological conditions and settings of psychological

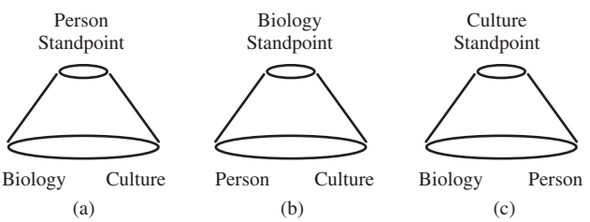


Figure 2.4 Relational standpoints in psychological inquiry: (a) person, (b) biology, and (c) culture.

structure-function relations and the behaviors they express. This exploration is quite different from split—foundationalist approaches to biological inquiry that assume an atomistic and reductionistic stance toward the object of study. The neurobiologist Antonio Damasio's (1994, 1999) work on the brain-body basis of a psychological self and emotions is an excellent illustration of this biological relational standpoint. And in the context of his biological investigations Damasio (1994) points out:

> A task that faces neuroscientists today is to consider the neurobiology supporting adaptive supraregulations [e.g., the psychological subjective experience of self]. . . . I am not attempting to reduce social phenomena to biological phenomena, but rather to discuss the powerful connection between them (p. 124). . . . Realizing that there are biological mechanisms behind the most sublime human behavior does not imply a simplistic reduction to the nuts and bolts of neurobiology. (p. 125)

A similar illustration comes from the Nobel laureate neurobiologist Gerald Edelman's (1992; Edelman & Tononi, 2000) work on the brain-body base of consciousness:

> I hope to show that the kind of reductionism that doomed the thinkers of the Enlightenment is confuted by evidence that has emerged both from modern neuroscience and from modern physics. . . . To reduce a theory of an individual's behavior to a theory of molecular interactions is simply silly, a point made clear when one considers how many different levels of physical, biological, and social interactions must be put into place before higher order consciousness emerges. (Edelman, 1992, p. 166)

A third synthesis standpoint recognizes that life and matter are coordinated by society, and again granting that the psychological inquiry is about psychological processes, *culture* represents a standpoint as the synthesis of *person* and *biology* (Figure 2.4c). Thus, a relational cultural approach to psychological processes explores the cultural conditions and settings of psychological structure-function relations. From this *cultural standpoint* the focus is upon cultural differences in the context of psychological functions as complementary to the person standpoint's focus on psychological functions in the context of cultural differences.

This standpoint is illustrated by "cultural psychology," or "developmentally oriented cultural psychology." However, not all cultural psychologies emerge from relational metatheory: For example, when a cultural psychology makes the social constructivist assertion that social discourse is "prior to and constitutive of the world" (Miller, 1996, p. 99), it becomes clear that this form of cultural psychology has been framed by split foundationalist background ideas. Similarly, when sociocultural claims are made about the "primacy of social forces," or claims arise suggesting that "mediational means" (i.e., instrumental-communicative acts) constitute the *necessary* focus of psychological interest (see, e.g., Wertsch, 1991), the shadow of split foundationalist metatheoretical principles are clearly in evidence.

A recent example of a relational developmentally oriented *cultural standpoint* emerges in the work of Valsiner (1998b), which examines the "social nature of human psychology." Focusing on the social nature of the person, Valsiner stresses the importance of avoiding the temptation of trying to reduce person processes to social processes. To this end, he explicitly distinguishes between the "dualisms" of split foundationalist metatheory and "dualities" of the relational stance he advocates. Ernst Boesch (1991) and Lutz Eckensberger (1990, 1996) have also presented an elaboration of the relational cultural standpoint. Boesch's cultural psychology and Eckensberger's theoretical and empirical extensions of this draw from Piaget's cognitive theory, from Janet's dynamic theory, and from Kurt Lewin's social field-theory and argues that "cultural psychology aims at an integration of individual and cultural change, an integration of individual and collective meanings, a bridging of the gap between subject and object" (e.g., Boesch, 1991, p. 183).

In a similar vein, Damon (1988) offers a vision of the cultural standpoint in his discussion of "two complementary developmental functions, . . . the social and the personality functions of social development" (p. 3). These are presented by Damon as an identity of opposites. The social function is an act of integration serving to "establish and maintain relations with other, to become an accepted member of society-at-large, to regulate one's behavior according to society's codes and standards" (p. 3). The personality function is the function of individuation; an act of differentiation serving the formation of the individual's personal identity that requires "distinguishing oneself from others, determining one's own unique direction in life, and finding within the social network a position uniquely tailored to one's own particular nature, needs, and aspirations" (p. 3). Although others could also be mentioned as illustrative (e.g., Grotevant, 1998; Hobson, 2002), it should be noted in conclusion here that Erik Erikson (1968), was operat-

ing from exactly such a relational line of sight when he described identity as "a process 'located' *in the core of the individual* and yet also *in the core of his communal culture*" (p. 22).

As a final point, concerning syntheses and the view from the center, it needs to be recognized that a relational metatheory is not limited to three syntheses. For example, *discourse or semiotics* may also be taken as a synthesis of *person* and *culture* (Latour, 1993). In this case, biology and person are conflated and the biological/person and culture represents the opposites of identity that are coordinated by discourse.

In summary to this point, the argument has been made that metatheoretical principles form the ground out of which grow the concepts and methods of any domain of empirical inquiry. Split metatheory produces dichotomous understandings of the world and methods that rely exclusively on the analytic ideal of the reduction of psychological process and behaviors to fixed elements, followed by the additive linear causal recomposition of elements. Split metatheory has led to the creation of a broad array of antinomies that constrict empirical inquiry. Relational metatheory heals these splits by generating inclusive holistic understandings of the world, and methods that are inherently analytic-synthetic. The relational framework promotes a truly multidisciplinary, multimethod approach to inquiry in which each individual approach is valued not as a potentially privileged vantage point, but as a necessary line of sight on the whole.

Relational metatheory grounds the unified definition of development discussed earlier, and offers methods for unraveling many conceptual knots that impact on our exploration of developmental change. However, the abstract nature of relational metatheory requires that other isomorphic metatheories mediate between this level and the more circumscribed levels of both theory and empirical observation. Again, the notion of levels of analyses and levels of metatheory become critical to a full understanding of the impact of basic concepts on empirical inquiry. Currently, *developmental systems* constitutes the best example of a metatheory that is nested within relational metatheory. Developmental systems (Gottlieb, Wahlsten, & Lickliter, 1998; Lerner, 2002; Overton, 2003; Oyama, 2000), takes seriously the centrality of holism, activity, organization, change, and nonlinearity. This approach specifically conceptualizes the individual organism as an active self-organizing systems that develops through the co-action or transaction of individual parts—initially genes-environment—in a manner that is often nonlinear in nature. The nonlinear character of this growth means that as the system transforms, novel features and novel levels of functioning emerge, and these cannot be reduced to (i.e., completely explained by) earlier features. Thus, the genetic-environmental system transforms through action into the cellular-environmental system, and then into the organ-environmental system, and ultimately the person-environmental system. Further transformations of the person-environment system result in developmental changes in cognitive, affective, and motivational subsystems. Variants of the developmental systems metatheory are found in perspectives described by Thelen and Smith (1998) as "dynamic systems"; by Magnusson and Stattin (1998) as a "holistic person" approach; and by Wapner and Demick (1998) as a "holistic, developmental, systems-oriented" approach. Developmental systems metatheory operates close to the level of theory itself and sometimes merges with specifically theoretical concepts.

In a later section, an important metatheory that operates at a midlevel between relational metatheory and developmental system is described. This interrelated set of concepts is termed developmentally oriented embodied action metatheory. It functions to extend relational metatheory and further grounds several important developmental and developmentally relevant concepts including the nature and function of the systems and subsystems that become the central domain of developmental analysis. Before turning to this description, the next section examines development and evolution as these concepts are expressed in relational and split metatheories.

DEVELOPMENT AND EVOLUTION: RELATIONAL HISTORY AND RELATIONAL MODELS

Development and evolution have been indissociable complementary concepts throughout the history of developmental psychology. As Broughton (1981) pointed out, it was the American developmental psychology pioneer James Mark Baldwin "who first attempted a synthesis of philosophy and the life sciences through a description of progressive stage by stage intellectual development (Baldwin, 1897/1973) and its continuities and discontinuities with biological organization and adaptation (Baldwin, 1902/1976)" (p. 396). Baldwin's

concern with the complementarity of evolution and individual development led him to explorations of the relation between the genome and the phenotype, and specifically questions concerning how individual adaptations during the course of ontogenesis might impact on species evolution (1902/1976). An important outcome of this work was the proposal of a process termed "organic selection" (1895) and known later as the "Baldwin effect" (see Piaget, 1967/1971, 1974/1980; see also Cairns, Chapter 3, this *Handbook,* this volume), which offered a non-Lamarckian alternative to Darwin's split mechanistic process of natural selection. Broadly, organic selection refers to the possibility of a phenotypic adaptation coming to be replaced by a genetic mutation. Such a replacement runs counter to the classical Darwinian and neo-Darwinian gene centered position that the sole function of the environment is to select from what the genome provides.

In Europe, the work of another founder of developmental psychology, William Stern (1938), also presented a framework for a developmental psychology in which evolutionary and individual developmental processes were tightly interwoven: "In the concept of development lies not merely a bare sequence of states and phases, but *evolution*; preparation, germination, growth, maturation, and recession as a meaningful process that is by nature of an organized kind" (p. 30). Heinz Werner later carried this framework to North America in his *Comparative Psychology of Mental Development* (1940/1948). Here, and in other works, Werner articulated the complementarity of evolution and development through an insistence that developmental psychology entails a *comparative* approach to formal similarities as well as material and formal differences among ontogenetic, phylogenetic and other change sequences, as follows:

> Such a developmental approach rests on one basic *assumption,* namely, that wherever there is life there is growth and development, that is, formation in terms of systematic, orderly sequence. This basic *assumption,* then entails the view that a developmental conceptualization is applicable to the various areas of life science. . . . Developmental psychology does not restrict itself either to ontogenesis or phylogenesis. . . . (1957, p. 125)

Of all the developmentalists, who have articulated and emphasized the basic complementarity of individual development and evolution, it was Jean Piaget who most extensively explored this relation. Piaget's work is best known for its person-centered approach to conceptual development from infancy through adolescence. However, when Piaget turned his attention to process explanations of this and other forms of development he moved to a broad based epigenetic stance and there explored fundamental biological × psychological × environmental interactions. It was in this context that he produced two major works (1967/1971, 1974/1980) that grappled both empirically and conceptually with the genotype-phenotype relation. Based on his own empirical studies with the common snail, *Limnaea stagnalis,* Piaget, like Baldwin, became convinced of the inadequacy of the neo-Darwinian gene dominated explanation according to which a random (genetic) variation and natural (environmental) selection process is presumed to account for adaptations that occur both intra- and intergenerationally across the course of organic life. He similarly became convinced that a Lamarckian solution in which phenotypic adaptations come to have a direct impact on the genome was equally untenable. In place of both of these, Piaget eventually (1967/1971, 1974/1980) proposed a model of the "phenocopy." This model describes a mechanism whereby individual phenotypic adaptations indirectly impact the genome and ensure intergenerational transmission of some behavioral characteristics The model builds upon Piaget's own general conceptualization of the "equilibration" process, found in his writings on ontogenetic development, and on Baldwin's notion of organic selection.

The model of the phenocopy begins with a recognition that individual development includes the several levels of organization described earlier, as each interacts (i.e., interpenetrates) with its environment (i.e., levels of DNA, protein production, cell formation, tissue growth, organ formation, the organism as a whole, the organization of behavior, and ultimately, in the case of human development, affect, motivation, and cognition). The dynamic organized systems of behavior present at birth are not the direct reflection of some split-off biologically determined innate mechanism, but the product of an epigenetic process that grows these levels across the period of prenatal development. The model accepts Baldwin's notion of organic selection with respect to this ascending series. Variational products of lower (earlier) levels may be selected according to modifications produced at higher levels. For example, "the extremely complex internal processes of the germ

cell . . . may effectively allow, prevent, or modify the transmission of mutations arising within the DNA" (Piaget, 1974/1980, p. 51).

Piaget's unique contribution lies in the further relationally based proposal that, along with this ascending effect, there is a descending one in which a disequilibrium at higher levels may, in certain situations, cause disequilibrium at lower ones ultimately resulting in a genomic copy of the phenotype or "phenocopy." The preadapted action systems available at birth function in an environment that presents conflicts and obstacles, and the impact of these obstacles represents a system disequilibrium. Importantly, these environmental obstacles do not constitute a specific message sent back to the system; this would be the beginning of a Lamarckian solution. Rather, the sole function of disequilibrium is to feed back to the system that something has gone wrong and, thus, to set in motion reequilibration processes, which are represented as variational exploratory activity. Exploratory activity constitutes phenotypic variations and in many cases the adaptation that results from this variation has no generalized impact on the biosystem (e.g., the French have been speaking French for more than a thousand years, but there have been no suggestions that French is genetically transmitted). However, the disequilibrium may impact on lower levels of organization and cause further disequilibrium all the way down to the genomic level. The response to this descending disequilibrium will produce variational exploratory activity at each level impacted. If the disequilibrium reaches to the genomic level, the variants selected will ultimately represent a genetic copy of the phenotype.

In presenting the phenocopy model, Piaget (1974/1980) explicitly acknowledged the close connection between his own work on equilibration and modern theories of self-organizing systems (i.e., dynamic systems that resist disorder and transform random process into ordered structures; p. 110). It is not surprising that others operating from a contemporary developmental systems perspective have continued to argue for a relational reciprocity of development and evolution (e.g., Ingold, 2000; Oyama, 2000) and have continued to explore the genotype-phenotype developmental relation. Recently, Gottlieb (2002), after reviewing the selective breeding and early experience literature, proposed a three-stage model for the developmental-behavioral initiation of evolutionary change that is highly consistent with Piaget's. The first stage of Gottlieb's model entails changes in ontogenetic development (novel behavioral adaptations) occurring across generations and encouraging new environmental relations. In the second stage, which may or may not entail changes in structural genes, the new environmental relations evoke latent anatomical or physiological change, and in the final stage genetic changes occur. As Gottlieb (2002) points out, "It is important to observe that, in this theory, evolution has already occurred phenotypically at the behavioral, anatomical, and physiological levels before the third stage is reached. Hence, new variations and adaptations arise before they are selected for and are therefore not a consequence of natural selection" (p. 217).

In summary, from its origins and continuing in the work of various developmental systems approaches, developmental psychology has operated within a relational frame with respect to the conceptualization of development and evolution as a reciprocal complementarity. However, beginning in the 1990s with the emergence of so-called evolutionary psychology (Buss, 1999; Tooby & Cosmides, 1992) and later evolutionary developmental psychology (Bjorklund & Pellegrini, 2002) this complementarity was fractured by a split-off conceptualization that embraces a genetic determinism and an additive concept of interaction. In this split account, genetic programs established across the course of evolution determine behavioral variation, while culture selects the individual variants that constitute individual developmental adaptations. This split perspective on evolution and development arose out of earlier ethological and sociobiological approaches, but its fundamental concepts are grounded in neo-Darwinian metatheory. There have been a number of excellent critiques of the conceptual problems raised by nonrelational accounts of evolutionary and developmental evolutionary psychology (e.g., Lickliter & Honeycutt, 2003; Mameili & Bateson, in press; Rose & Rose, 2000). We now focus on the way that split neo-Darwinian metatheory comes to impact these and other areas of traditional developmental interest.

DEVELOPMENT AND EVOLUTION: SPLIT APPROACHES

Neo-Darwinian metatheory has been variously termed the *neo-Darwinian synthesis* and *the modern synthesis.* It emerged in the 1940s based on a marriage of the evolutionary position of Darwin, called classical Darwinism, and the genetics of Mendel. There is some irony to

the use of the term "modern" as the approach is now some 60 years old. It is well known that the core of the synthesis is the duality of *random variation* and *natural selection.* From the beginning, both for Mendel with respect to genetics and for Darwin with evolution, there was a rigid separation (i.e., split) between the *internal* and the *external.* For evolutionists, the statement: "Mutations are random with respect to their environment" meant that the processes that accounted for the variation between individuals were independent of the evolutionary process that selects individuals. For geneticists, the genotype constituted the internal state of the organism, and the phenotype constituted the outside or outward manifestation (see Figure 2.5).

Along with the split between inner and outer, the most important feature of the neo-Darwinian synthesis is that evolutionary *change* is defined in terms of variation in gene frequencies and *only* variation in gene frequencies. Thus, the metatheory establishes that *change is understood as variation, not transformation.* Transformational change is essentially written out of the story and treated as epiphenomenal. Within the metatheory, genes (or DNA, to be more precise) cause phenotypes by "supplying information," "instructions," or "programs." Genes themselves are thought of as packages of independent causes, or gene pools that exert their influence in a one-way outward causal flow of direction. This independent causal aggregate and the transmission of causes from this aggregate then results in the outward manifestation called the phenotype.

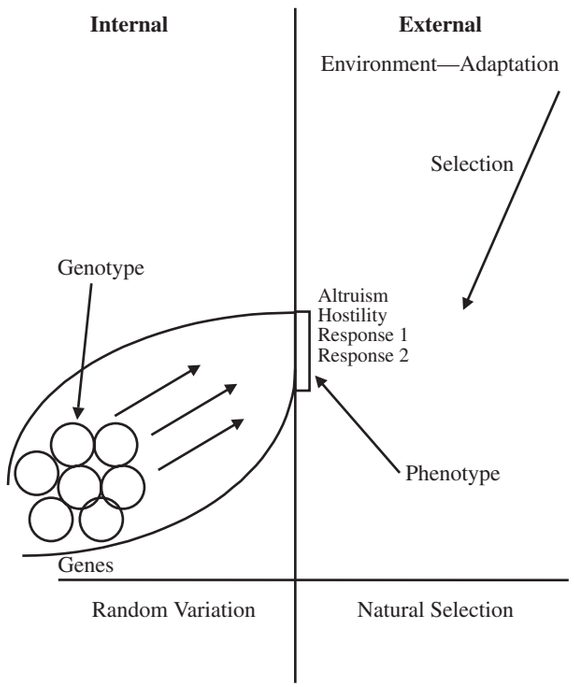


Figure 2.5 The split neo-Darwinian metatheory.

This metatheory has come to acquire a number of metaphors that support and enhance interpretations of split-off entities, fragments, aggregates, and linear unidirectional causality (see Nijhout, 1990; Oyama, 1989). Metaphors include the "bean bag" concept of the genome as independent packages, the notion that "instructions are transmitted," and the idea of a "program," "blueprint," or "instructions."

The *internal* aggregate produces random variation, but it is the *external* natural selection that determines the appearance of change. The *phenotype* constitutes the observed variability of behavior. The environment operates upon this variability as an *independent causal agent* to select those characteristics that promote survival. Two points need emphasis about this dualistic (i.e., split internal and external) understanding of causes. First, we have here the prototype for biological causes (internal) and social-cultural causes (external) as split, independent forces. Causality remains linear (additive) and unidirectional in the split model. When we tell the inside story, there is no reciprocal causation; causes simply operate independently and in a single direction, from internal toward external. The outside story replicates this; there is no reciprocal causation and the direction is now external toward internal.

The second point to note about the dualistic narrative of evolution as variation is the manner in which the concept of "adaptation" becomes formulated and established as a central feature of the external story (Gould, 1986; Lewontin, 2000). Adaptation is identified with "adjustment" and consequently refers to a *change designed to fit an independent context. Context* (i.e., social-cultural factors) selects those characteristics that best fit; hence, the central notion of competition and survival of the fittest.

In summary, the evolutionary metatheory described by the neo-Darwinian synthesis involves an internal aggregate gene pool that presents a package of solutions and an external environment that presents various problems to be solved (see Lewontin, 2000). This "adaptationist" program splits subject (genes) and object (environment) into isolated bits of reality and assigns chance variation to the former and contingent selection to the latter. The overall process is entirely contingent.

All elements—inside and outside—are fundamentally interchangeable, and any outcome could have been otherwise had other elements randomly appeared. At no point does any fundamental principle of organization enter the process; hence, all change is, in principle, reversible (Overton, 1994a).

There are many possible applications of this split neo-Darwinian metatheory to issues of developmental change. Those described below are selected to illustrate the breadth and depth to which this form of thinking has impacted on developmental issues, theory, concepts, and methodology.

Split Neo-Darwinian Metatheory: Developmental Applications

The first example of the impact of this split evolutionary metatheory, on developmental understanding is the famous/infamous nature-nurture issue. Although the neo-Darwinian metatheory did not generate the nature-nurture controversy (that had more to do with the original great splitters, Galileo and Descartes, who are discussed in a later section), it supports its continuance and limits "solutions" to attempts to put nature pieces and nurture pieces back together. The controversy is supported by the neo-Darwinian radical rupture of the whole into an inside (gene, biology) story that comes to be called nature, and an outside (social-cultural, experience) story called nurture. Once this split is confirmed as ontologically real, behaviors or characteristics (e.g., altruism, aggression, empathy, thinking, language) are explained as the causal outcome of one or the other, or some additive combination of the two. The controversy becomes the questions of *which one* fundamentally determines change, or *how much* does each contribute independently to determining change, or *how* does each contribute to determining change (Anastasi, 1958; Lerner, 1978; Overton, 1973).

The "solution" to the nature-nurture issue under this split metatheory requires choosing among several strategies designed to deal with combining and/or suppressing *independent pieces.* First, included among these strategies is *biological determinism,* which treats the outside story as epiphenomenal, and argues that the fundamental causes of behavior are given by the inside story. For example, this strategy argues that the capacity for violence is given by the genes (the real cause) and social-cultural events simply trigger the underlying biological capacity. *Social determinism,* the mirror image of biological determinism, is the strategy of treating the inside story as epiphenomenal, while arguing that the outside story provides the fundamental causes of behavior. The claim here is that there is sufficient genetic variability for either violence or gentleness, and social-cultural factors are the real cause of violent behavior. Both strategies usually decry the idea of dualism, but they deal with the dualism by suppressing the functional reality of one or the other sides of the neo-Darwinian narrative.

A third split nature-nurture strategy has been called *conventional interactionism* (Oyama, 1989; see also, Lerner, 1978; Overton, 1973). Dualism, although clearly a functional part of the scheme, is ignored by this strategy, and it is insisted that any characteristic is partially the effect of each factor. This strategy sometimes places the duality on a continuum and argues that various characteristics are more or less determined by one or the other factor (e.g., see Scarr, 1992). This is the quantitative additive compromise that was mentioned earlier with respect to split issues generally. In the final strategy, *bio/social interactionism,* dualism is *celebrated.* Generally, this approach makes claims that the biological sets the limits, or establishes "predispositions," or "constraints" for behavior and the social-cultural determines behavioral expression. This compromise is the most direct reflection of the neo-Darwinian metatheory of the nature of change (e.g., Karmiloff-Smith, 1991).

These four nature-nurture strategies do not exhaust the list of possible "solutions," nor are they necessarily mutually exclusive. Each tends at times to merge into another. However, neither the complexities of nature-nurture nor even the details of alternative nonsplit solutions are central here (see Overton, 2004a, for an extended discussion). Rather, the central point of emphasis is that the whole class of traditional solution strategies emerges because and *only* because of the acceptance of a particular metatheoretical story about the nature of things. This is the story in which "nature" (genetics, biology) is identified with an ontologically real *inside* called *nurture* that is radically split from an ontologically real *outside* called "nurture" (experience, social-cultural). If this conceptual distinction is rejected as an ontological description of "the Real," the controversies themselves evaporate.

A second example of the use of the neo-Darwinian metatheory as a template for understanding developmental phenomena emerges from the behaviorist literature. In this arena, several have noted (Oyama, 1989;

Skinner, 1984; Smith, 1986, 1990) that Skinner's model represented a direct application of the neo-Darwinian story. Skinner's operants had to originate from somewhere, but Skinner's behavioristic outside story of the subject (instrumental as opposed to expressive function of behavior) never required an articulation or elaboration on these internal origins. All that was required was the output of the inside neo-Darwinian story; the random variation of a set of operant (instrumental) responses. Given this base, Skinner's outside story can and does focus on natural selection or "selection by consequences" as presenting "the real" functional variables in the development of behavior.

More central to contemporary developmental psychological interests than Skinner's position is the work of Belsky, Steinberg, and Draper (1991), who used the neo-Darwinian metaphor as a frame for a developmental theory of socialization. Their strategy for explaining socialization has been to wed a social-biological approach to Bronfenbrenner's (1979) behavioral ecology. *Sociobiology* asserts the adaptationist strategic claim that natural selection favors behavioral strategies that increase fitness. Sociobiology also provides the authors with an inside story biologically grounded in "the modern view of evolution" (p. 663; i.e., the 1940s "modern" synthesis or neo-Darwinian synthesis). *Behavioral ecology,* alternatively, represents the outside story; the argument that behavior strategies are "contextually conditioned," shaped, or selected by the environment. "From sociobiology we take the maxim that natural selection tends to favor behavior that increases fitness. From *behavioral ecologists* we take the maxim that behavioral strategies that contribute to reproductive success are . . . contextually conditioned" (p. 648). And, "central to our theory is the notion drawn from modern evolutionary biology that humans . . . adjust their life histories in response to contextual conditions in a manner that will enhance reproductive fitness—or at least would have in the environment of evolutionary adaptation" (p. 663). The issue here does not entail the critique of this approach at either a theoretical or an observational level of discourse. The issue here concerns a recognition that this approach arises from a particular metatheory, and the consequences of accepting this metatheory, are different from those that follow from accepting another metatheory. This metatheory fosters split theoretical and observational understandings of the nature of developmental change and its explanation. The consequence of this split story is that only variability is allowed as fundamentally real developmental change, and explanation can occur only within the categories of "biological causes" and "social-cultural causes" (see Lewontin, 2000).

The investigation of mechanisms of development constitutes another important contemporary example of the neo-Darwinian metatheory of variational change and internal-external causes being applied to conceptually contextualize an important developmental psychological issue (see Hoppe-Graff, 1989; Sternberg, 1984 for a general discussions of developmental mechanisms). Siegler (1989, 1996; Siegler & Munakata, 1993) presented a scheme that represents hypothesized mechanisms of cognitive development as being analogous to several genes. Each mechanism produces alternative types (random selection), and the environment selects (natural selection) these types according to fitness criteria (see Figure 2.6).

For Siegler (1989), a mechanism of cognitive development is any "mental process that improves children's ability to process information" (p 353). This means that the developmental outcome (effect) of any mechanism

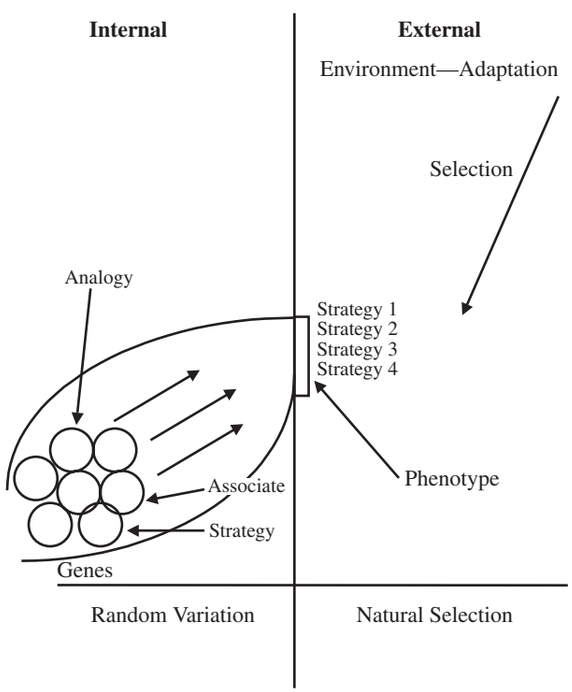


Figure 2.6 The neo-Darwinian metatheory and mechanisms of development (variational change).

(cause) is improvement in stored knowledge. Improvement here refers either to increases in amount of knowledge stored or to the effectiveness of the machinery that stores and accesses the knowledge. Thus, ultimately, development is defined in terms of stored knowledge. This in itself limits developmental change to variational change; there is no room here for transformational change as a fundamental type of change. To account for the change in stored knowledge, Siegler proposes five broadly conceived "mechanisms" of development: (1) synaptogenesis (a member of the broader class of neural mechanisms), (2) associative competition, (3) encoding, (4) analogy, and (5) strategy choice.

Each proposed developmental mechanism is understood as being analogous to an individual gene. Each is an internal packet with an outward flow of causality from genotype to phenotype. The strategy choice gene, to take one example of the five mechanisms (see Figure 2.6), causes variation in the phenotype. The result is variation in external behavior as in learning Strategy 1, Strategy 2, or Strategy 3, and so on. As a specific analogy, consider the idea of tail length in an animal. The human would have an innately prewired set of alternative strategies just as the rat would have a set of alternative genes for tail length (or technically, alleles at a particular locus).

Having presented the inside story of variational and *only* variational change, the outside story then comes into play for Siegler. The alternative strategies are conceived as being in competition for survival. The environment selects (i.e., causes) the strategy that is to survive, and that strategy is the one that best facilitates the processing of information and, hence, the building of stored knowledge. The rat might phenotypically appear with a tail length of 1″, 2″, or 3″ depending on which had been selected; individual children might come with Strategy 1, Strategy 2, or Strategy 3.

In summary, for Siegler, fast and effective knowledge acquisition defines human development and is explained by phenotypical behaviors, which are a result of underlying causal mechanisms that are built into the system. Considering knowledge acquisition, the phenotypical behavior, and the underlying mechanism as a totality constitutes both a description and an explanation of development. Siegler and Munakata (1993) have said: "The centrality of variation and selection within . . . change mechanisms does not seem coincidental. Multiple competing entities seem essential for adaptation to changing environments. Effective selection among the variants is essential for producing progressively more successful performance. Achieving these functions of variation and selection may be essential for any developing system" (p. 3).

In addition, Kuhn and her colleagues (D. Kuhn, Garcia-Mila, Zohar, & Andersen, 1995) have proposed a wide ranging cognitive position concerning the development of scientific reasoning that parallels Siegler's with respect to the exclusivity of variational change and adaptation. In their scheme, knowledge acquisition strategies, metacognitive competence, and metastrategic competence are presumed to be available in rudimentary forms in young children and constitute the elementary building blocks of scientific reasoning. These skills appear as intraindividual variability of behavior in problem solving, and development or change "appears as a gradual shift in the distribution of the use of a set of strategies of varying adequacy" (p. 9). White (1995), in commenting on this movement "toward an evolutionary epistemology of scientific reasoning" (p. 129) notes the striking similarity to the historical behavioral "scheme of trial-and-error learning proposed by Edward L. Thorndike (1898) at the turn of the century" (p. 134) and contrasts it with the Piagetian perspective that emphasizes the dialectic of transformational and variational change as codefining fundamental features of development (Overton, 1990):

> Instead of wide-sweeping structural changes in the logical engines available to the child, there are changes in cognitive *elements* that the child can call into play when confronted with a problematic situation. The changes are not wide sweeping. They are more local, particulate. Yet there is transfer. . . . The emergence of scientific reasoning depends on an orchestration of a number of cognitive *elements* that have to work together. *Change, as it occurs, is by no means irreversible.* (White, 1995, p. 135, emphasis added)

It needs to be emphasized again that, in the examples described, the type of change being identified as developmental follows directly from the neo-Darwinian metatheory as variational change and not transformational or morphological change. Siegler's proposed mechanisms of development, along with Kuhn's, Skinner's, the social biology/behavioral ecology, and socialization approaches, contemporary evolutionary psychology, and recent forays into developmental evolutionary psychology all describe change in which no

fundamental transformational novelty emerges. In each example, forms and the change of forms—changes in forms of thought from infancy to childhood, and to adolescence, or changes in forms of personality organization, or changes in emotional organization from global affect to differentiated specific emotions—are simply excluded from discussion or treated as epiphenomenal. In each of the neo-Darwinian generalizations, inside causes (nature) provide a variational base of behaviors, while outside causes (nurture) winnow down and shape that variation. Variation and the winnowing and shaping process constitute the definition and explanation of development within this story. Transformational or morphological change has simply been excluded from the fundamental story of development and treated as mere appearance.

Split Neo-Darwinian Metatheory: A Flawed Story of Change?

These several examples have been presented to demonstrate how split metatheory—specifically neo-Darwinian metatheory—can impact on the understanding and explanation of developmental change in various domains. Next, we turn to the question of the ultimate viability of this metatheory.

The split between variational change and transformational change that is a part of the neo-Darwinian story has created a broad paradox in the life sciences: On the one hand a significant number of psychologists have been turning to the neo-Darwinian story as a context within which to understand developmental change; on the other hand, many who work more directly in the fields of biological and evolutionary change complain that the neo-Darwinian story is outdated and deeply flawed because it fails to incorporate developmental change. More specifically, these critics argue that it is flawed because it omits the kind of developmental change defined as transformational change. These critics, from the fields of biology, evolutionary biology, evolutionary developmental biology, and anthropology include Brooks (1992; Brooks & Wiley, 1991), Edelman (1992), Gilbert (2003; Gilbert, Opitz, and Raff, 1996), Goodwin (1992), Gould (2000), Kauffman (1992, 1995), Ingold (2000), and Lewontin (2000). This same criticism has been articulated within the psychological community by a variety of developmental systems oriented investigators (e.g., Bateson, 1985; Gottlieb, 1992, Chapter 5, this *Handbook,* this volume; Kuo, 1967; Lehrman, 1970; Schneirla 1957; Tobach, 1981; Varela, Thompson, & Rosch, 1991).

These critics are not becoming anti-Darwinian or anti-evolutionary. They are simply articulating the need for modification and expansion of the neo-Darwinian story. Evolutionary biologists, developmental biologists, neurobiologists, geneticists, paleontologists, anthropologists, and psychologists speak in many different voices when they argue this point, but they uniformly agree on the following: Regardless of the level of analysis one chooses to explore, concepts of *organization, system, structure, or form—as well as the transformation of organization, system, structure, or form—must enter into a new evolutionary synthesis* in every bit as central a fashion as concepts of variation and selection enter the current narrative. Development—conceived as ordered changes in the form, organization, or structure of a system—must be directly integrated into the current narrative of variational change and selection.

Gilbert (2003), a developmental biologist, describes the origin of the exclusion of development (transformational change) from evolution:

> The developmental approach became excluded from the Modern Synthesis. . . . It was thought that population genetics could explain evolution, so morphology and development were seen to play little role in modern evolutionary theory. (p. 778)

Edelman (1992), a neurobiologist, goes on to articulate the dominant theme of most contemporary revisionist critics by arguing for the need to reintroduce the centrality of form and change of form (transformation) into an expanded neo-Darwinian narrative:

> The part of Darwin's program that needs most to be completed . . . is concerned with how animal form, tissue structure, and tissue function could have arisen from ancestors—the problem of morphologic evolution. (p. 48)

> Morphology—the shape of cells, tissues, organs, and finally the whole animal—is the largest single basis for behavior. (p. 49)

> To accomplish it [completing Darwin's program] we need to show how development (embryology) is related to evolution. We need to know how genes affect form through development. (p. 51)

Along with the criticism that there is more to the story of evolution than variational changes in gene frequencies, the revisionists argue against the interpretation of genes as independent split-off atomic entities,

and they call for a recognition that "genomic regulatory networks underlying ontogeny, exhibit powerful 'self-organized' structural and dynamical properties" (Kauffman, 1992, p. 153). As a consequence of recognizing the genome itself as a self-organizing system (i.e., an active form-changing organization), there is a call to "invent a new theory of evolution which encompasses the marriage of selection and self-organization" (Kauffman, 1992, p. 153; see also Varela et al., 1991).

Further, this group points out that evolutionary theory—as limited to random variation and natural selection—has become too sharply focused on the maintenance of diversity (i.e., focused on the reversible, and the cyclical) while ignoring the significance of the origin and developmental paths of diverse forms (i.e., the transformational, and the directional; Brooks, 1992; Lewontin, 2000).

Finally, the revisionists argue that the concept of adaptation to a split-off environment, as described by the neo-Darwinian metatheory of natural selection, severely limits understanding. They argue for a healing of the dualism of a split-off internal and external through a relational recognition that it is both the case that biological organisms construct their social-cultural world, and that the social-cultural world constructs biological organisms (Edelman, 1992; Lewontin, 2000).

Virtually all of the themes argued by contemporary evolutionary revisionists assert the need for an understanding that is relational in nature; an understanding where inside and outside, variation and transformation, biological and social-cultural as well as other fundamental splits are viewed as analytic distinctions, not ontological cuts in nature. This relational understanding yields distinctions that allow an investigator to stand at a particular line of sight and explore from that particular point of view without declaring that point of view to be "the real." An illustration of these themes in human ontogenesis is found in the contrast between the split-off adaptationist story found, for example, in Skinnerian theory and the social learning theories discussed earlier, and the relational picture of adaptation found in the work of Jean Piaget. Like Skinner (1984) and social learning theories, Piaget (1952) introduces adaptation as a fundamental and central theoretical concept. However, unlike these neo-Darwinian theorists, Piaget's concept of adaptation is always understood as the complement of a second central theoretical concept, organization. As with the modern evolutionary revisionists, Piaget stresses time and time again that *organization* (the form) and *adaptation* (the function) are two poles of the same relational matrix, two aspects of the same whole. It is neither that organization will ultimately be reduced to adaptation, nor that organization provides the variation and adaptation the selection. Novel organization emerges from processes of adaptation, but adaptation operates under the constraints of current organization. Organization and change of organization (transformational change) become the focus when inquiry is directed toward issues of emergent novelty, sequence, and irreversibility. Adaptation becomes focal as inquiry is directed toward issues of activity, process, and variation. Structure and function are not independent split-off either/or solutions to problems; structure and function, organization and activity, form and process, are alternative perspectives on the same whole.

In summary, the neo-Darwinian "modern synthesis" is a split metatheory that has consequences for developmental inquiry across a broad range of domains. As a narrative that speaks of variational change exclusively, it provides a conceptual context for, and reinforces, other narratives that would claim development is about variational change and *only* variational change, and that explanation is about biological causes and/or social-cultural causes. It is only within a relational metatheory that variation and transformation become indissociable complementarities and only within this metatheory do evolution and development return to the same complementary position.

DEVELOPMENTALLY ORIENTED EMBODIED ACTION METATHEORY

This section describes a metatheory that is consistent with relational metatheory but operates at a midlevel between relational metatheory and developmental system. This interrelated set of concepts is termed developmentally oriented embodied action metatheory. It functions to extend relational metatheory and further grounds several important developmental and developmentally relevant concepts including the nature and function of the systems and subsystems that become the central domain of developmental analysis

Embodiment

Several basic terms define a developmental oriented embodied action approach. Each term is associated with relational principles. For the moment, *embodiment* is the most central of these basic concepts, because

embodiment is a concept of synthesis that bridges and integrates biological, sociocultural, and person-centered approaches to psychological inquiry. Until recently, the trend of developmental inquiry over the past several decades had been moving toward ever increasing fragmentation of the object of study. Beginning in the early 1980s, the examination of human development aggressively promoted split and foundational approaches to inquiry, including variable oriented, discourse, modular, and domain specific inquiry. Each of these was advanced with claims that it presented the bedrock foundation from which scientific knowledge must grow. The result was that inquiry into human development was increasingly split into biologically determined, culturally determined, and bio-culturally determined behavior, innate modules of mind, situated cognitions, domain specific understandings, and communicative and instrumental functioning. What became lost in the exclusivity of these projects was the psychological subject as a vital integrated embodied center of agency and action. This is the embodied person—functioning as a self-organizing dynamic action system—expressively projecting onto the world, and instrumentally communicating with self and world, thoughts, feelings, wishes, beliefs, and desires. This is the embodied person who emerges from and transacts with the relational biological-cultural world, thereby developmentally transforming his or her own expressive and adaptive functioning and the world itself.

Embodiment is the affirmation that the lived body counts in our psychology. It is not a split-off disengaged agent that simply moves around peeking at a preformed world and drawing meaning directly from that world. It is not a set of genes that causes behavior nor a brain nor a culture. Behavior emerges from the embodied person actively engaged in the world. The concept of embodiment was first fully articulated in psychology by Maurice Merleau-Ponty (1962, 1963) and it represents a relational movement away from any split understanding of behavior as an additive product of biological and sociocultural determinants.

Embodiment is the claim that perception, thinking, feelings, desires—*the way we behave, experience, and live the world*—is contextualized by our being *active agents* with this *particular kind of body* (Taylor, 1995). The kind of body we have is a precondition for our having the kind of behaviors, experiences, and meanings that we have. As Johnson states, "Human beings are creatures of the flesh. What we can experience and how we make sense of what we experience depend on the kinds of bodies we have and on the ways we interact with the various environments we inhabit" (1999, p. 81).

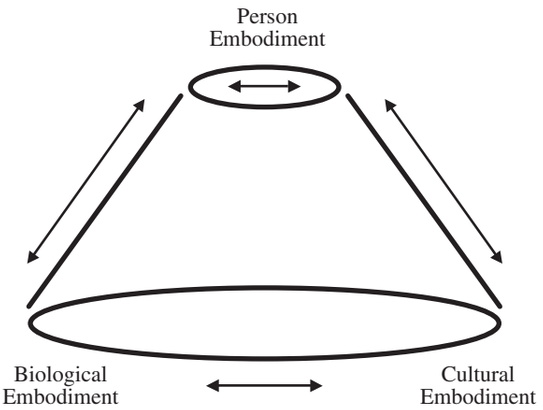


Figure 2.7 Embodied person, biology, culture.

As a relational concept embodiment includes not merely the physical structures of the body but *the body as a form of lived experience, actively engaged with the world of sociocultural and physical objects.* The *body as form* references the biological line of sight, the *body as lived experience* references the psychological subject standpoint, and the *body actively engaged with the world* represents the sociocultural point of view. Within a relational perspective, embodiment is a concept that bridges and joins in a unified whole these several research points of synthesis without any appeal to splits, foundationalism, elements, atomism, and reductionism (see Figure 2.7).

Biological Embodiment

Contemporary neuroscience has increasingly endorsed the significance of embodiment as an essential feature of the biological line of sight as it addresses psychological issues. For example, Antonio Damasio (1994, 1999)—exploring the neurological dimension of emotions—and Gerald Edelman (1992; Edelman & Tononi, 2000)—exploring the neurological dimensions of consciousness—along with Joseph LeDoux (1996)—exploring the neurological dimension of emotions—all support an embodied approach to biological-psychological inquiry and all argue that the cognitive, affective, and motivational systems and actions that constitute mind can no longer be thought of as the direct expression of genetic modularities (as nativists such as Steven Pinker, 1997, would claim), nor can they be thought of as a functionalist piece

of software, nor even as merely a function of brain processes. Rather, they argue, these meanings must be considered in a fully embodied context (see also, Gallese, 2000a, 2000b). As Damasio says:

> Mind is probably not conceivable without some sort of embodiment (1994, p. 234). And further, commenting on contemporary perspectives on mind, "This is Descartes' error: the abyssal separation between body and mind. . . . The Cartesian idea of a disembodied mind may well have been the source, by the middle of the twentieth century, for the metaphor of mind as software program . . . [and] there may be some Cartesian disembodiment also behind the thinking of neuroscientists who insist that the mind can be fully explained in terms of brain events [i.e., connectionism], leaving by the wayside the rest of the organism and the surrounding physical and social environment—and also leaving out the fact that part of the environment is itself a product of the organism's preceding actions." (1994, pp. 249–250)

Similarly, Edelman (1992) argues:

> The mind is embodied. It is necessarily the case that certain dictates of the body must be followed by the mind. . . . Symbols do not get assigned meanings by formal means; instead it is assumed that symbolic structures are meaningful *to begin with*. This is so because categories are determined by bodily structure and by adaptive use as a result of evolution and behavior. (p. 239)

Sociocultural Embodiment

From the cultural point of synthesis, social constructivists not committed to a split metatheoretical approach (e.g., Harre, 1995; Sampson, 1996) have come to embrace embodied action as a relational anchoring to the relativism of split-off discourse analysis. Sampson (1996) argues for "embodied discourses" as these "refer to the inherently embodied nature of all human endeavor, including talk, conversation and discourse itself" (p. 609; see also, Csordas, 1999; Ingold, 2000; Overton, 1997). Perhaps the most fully articulated contemporary employment of embodiment in a developmentally oriented cultural psychology is found in Boesch (1991). Boesch's presentation of *The I and the body* is a discussion of the centrality of embodiment for a cultural psychology. Thus, he states "The body, obviously, is more than just an object with anatomical and physiological properties: *it is the medium of our actions,* it is with our body that we both conceive and perform actions" (p. 312, emphasis added).

Person-Centered Embodiment, Action, and Development

The person-centered or psychological subject point of synthesis constitutes the standpoint that frames the major focus of any specifically psychological theory of development. This point of synthesis maintains a theoretical and empirical focus on the psychological processes and patterns of psychological processes as these explain the psychological subject's actions and the development of these actions in the world (see Figure 2.8–A). This approach to developmental inquiry requires the description of five critical interwoven concepts—*person, agent, action, experience, and person-embodiment.* Before detailing these concepts this person-centered standpoint needs to be briefly contrasted with what have been termed "variable" approaches.

Variable and Person-Centered Standpoints

Variable approaches focus inquiry on biological, cultural, and individual variables as these are understood to operate as predictors, correlates, risk factors, or antecedent causes of behavior. The distinction between this and a person-centered or child-centered standpoint is similar to that described some time ago by Block (1971), and more recently elaborated by Magnusson (1998; Magnusson & Stattin, 1998) and others (e.g., Cairns, Bergman, and Kagan, 1998; Hart, Atkins, & Fegley, 2003; NICHD Early Child Care Research Network, 2004; Robins & Tracy, 2003). As Magnusson has suggested, from a variable approach various individual

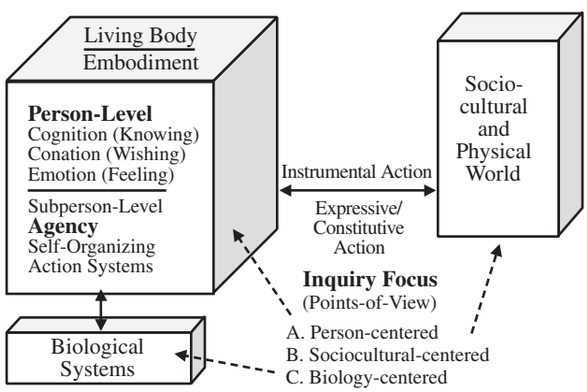


Figure 2.8 Embodied action: A relational approach to inquiry.

variables (i.e., "child factors," "child characteristics") and contextual environmental and biological variables are understood as the explanatory actors in the processes being studied (see Figure 2.9). From a person-centered standpoint, self-organizing dynamic action systems—which identify psychological mechanisms—operate as the main vehicles of explanation. Although variable approaches often suggest a split-off exclusivity, they can in fact be transformed into to yet another necessary point of view of relationally integrated inquiry. A variable-centered approach inquiry, aiming at the prediction of events, states, and movements, and a person-centered approach, aiming at explaining psychological processes and their transformation come into conflict only in the reductionistic case where one or the other is asserted as the exclusive foundational aim of inquiry. In this context, it is important to recognize that the complementarity here is one of aim and not one suggesting that variable inquiry is oriented to research methods and person-centered inquiry is oriented to conceptual context. Both approaches entail the translation of theory into the empirically assessable, and the translation of the empirically assessable into theory. Perhaps the clearest example of an important contemporary developmental theory that grounds itself within a variable tradition is found in Bronfenbrenner's bioecological model (Bronfenbrenner & Morris, 1998).

The single most important value of recognizing a person-centered standpoint as a necessary point of synthesis, along with the biological (Figure 2.8–B) and cultural (Figure 2.8–C) points of synthesis, is that it rescues psychology generally, and developmental psychology specifically, from becoming a mere adjunct to

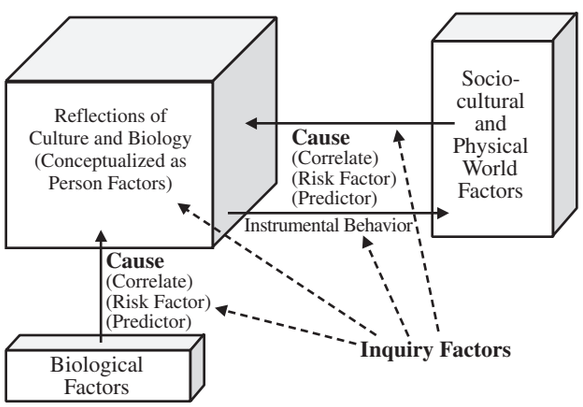


Figure 2.9 A variable approach to inquiry.

biology, culture, discourse, narrative, or computer science. *Psyche* initially referenced "soul" and later "mind," and if psychology is not to again lose its mind—as it did in the days of the hegemony of behaviorism—keeping the psychological subject as the center of action is a necessary guard against explanatory reduction to biology, culture, discourse, and so on.

The second benefit that accrues to maintaining, a person-centered approach as a necessary point of view is that this perspective again highlights the fact that any act can be profitably understood—in a complementary bipolar fashion—as both *expressive-constitutive and as instrumental-adaptive.* Split or dichotomous approaches—especially split-off variable approaches—lead to the illusion that acts exhibit only adaptive-instrumental-communicative functions. A person-centered approach argues that any act may also be understood as an expression of an underlying dynamic organization of cognitive, affective, and conative meanings, and this expression operates to constitute the world as known, felt, and desired. Here, Bloom's work (Bloom & Tinker, 2001) on the development of language provides an excellent illustration of the power of conceptualizing language acquisition in the context of the expression of person-centered cognitive, affective, and conative-motivational meanings, rather than exclusively as an instrumental tool operating solely for communicative ends.

A third benefit derived from a person-centered point of view is that it provides the necessary context for the resolution of certain important problems related to our general understanding of psychological meaning. Specifically, a person-centered approach is a necessary frame for solving the so-called symbol-grounding problem. This is the question of how to explain that representational items (i.e., a symbol, an image) come to have psychological meaning (Bickhard, 1993). I return to this problem in a more detailed fashion later.

With these examples of some of the benefits of a child- or person-centered approach to developmental inquiry as background, it is possible to turn to a specific description of this metatheoretical approach, which entails the five critical interwoven concepts of *person, agent, action, experience, and person-embodiment.*

Person-Agent

Person and agent are complementary Escherian levels of analysis of the same whole (see Figure 2.8–A). The person

level is constituted by genuine psychological concepts (e.g., thoughts, feelings, desires, wishes) that have intentional qualities, are open to interpretation, and are available to consciousness (Shanon, 1993), or in other words have psychological meaning. The agent level—called the subpersonal level by some (Dennett, 1987; Russell, 1996)—here refers to action systems or dynamic self-organizing systems. "Schemes," "operations," "ego," "attachment behavioral system," and "executive function" are some of the concepts that describe these action systems.

Taken as a whole, the person-agent forms the nucleus of a psychological metatheory of mind. And, in this context, mind is defined as a self-organizing dynamic system of cognitive (knowings, beliefs), emotional (feelings), and conative or motivational (wishes, desires) meanings or understandings, along with procedures for maintaining, implementing, and changing these meanings. Importantly, it must be noted and underlined that a person-centered metatheory of mind is not an encapsulated cognition but a theory that includes emotions, wishes, desires, and cognition. Further, there is no question about where mind is located: Mind emerges from a relational bio-sociocultural activity matrix. In the present context, mind is a person-centered concept because the approach being described takes the *person standpoint.* As a person-centered concept, mind bridges naturally to both the biological (Figure 2.8–C) and the sociocultural (Figure 2.8–B).

Action, Intention, Behavior

Person-agency is the source of action and a person-centered approach establishes the framework for what has traditionally been termed an *action theory* (Brandstädter, 1998; Brandstädter & Lerner, 1999; Mueller & Overton, 1998a). At the *agent level,* where it is not necessary to limit a definition to the human organism, action is defined as the *characteristic functioning of any dynamic self-organizing system.* For example, a plant orients toward the sun. Weather systems form high and low pressure areas and move from west to east. Alternatively, human systems organize and adapt to their biological and sociocultural worlds. At the *person level,* action is defined as *intentional activity* (i.e., meaning giving activity). Intentionality, however, is not to be identified with consciousness: While all acts are intentional, only some intentions are conscious or self-conscious. In a similar fashion, intention is not to be identified solely with a symbolic level of reflection. Following Brentano (1973/1874), all acts, even those occurring at the most sensory-motor level of functioning intend some object.

Action is often distinguishable from *behavior,* as the action of the person-agent implies a *transformation* in the intended object of action, while behavior often simply implies movement and states (e.g., the classically defined "response" was understood as specific movement in space and time—a behavior—see von Wright, 1971, p. 199). As action, when the infant chews (act)—something that from a *sociocultural standpoint* is called a "basket"—the infant, from a *person-centered standpoint,* is transforming this part of her known world into a practical action—chewable. Piaget's cognitive developmental theory is a good example of a child-centered developmental action theory where the metatheoretical "action" becomes translated into specific theoretical concepts. Thus, Piaget's basic theoretical concepts of "function," "assimilation," "accommodation," "operation," "reflective abstraction," all reference action. And Piaget (1967) repeatedly affirms the centrality of action throughout his writings: "I think that human knowledge is essentially active. To know is to assimilate reality into systems of transformations. To know is to transform reality. . . . To my way of thinking, knowing an object does not mean copying it—it means acting upon it" (p. 15). "To know an object . . . is to act on it so as to transform it" (1977, p. 30). "Nothing is knowable unless the subject acts in one way or another on the surrounding world" (1980, p. 43).

Action serves at least three major functions in the development of mind (see Figure 2.1). First, *action expresses cognitive-affective-conative meaning.* It is important to recognize that meaning, like many other basic concepts, has relational complementary definitions that are determined by the standpoint being taken (Overton, 1994b). "I mean" and "it means" operate in a relational matrix. The former is concerned with person-centered meanings, the latter with sociocultural meanings and reference. From a person-centered standpoint, the focus of analysis is on "I mean" and secondarily on how "I mean" becomes associated with "it means." Considered in its expressive moment, action entails the projection of person-centered meanings, thus transforming the objective environmental world (i.e., an object point of view) into an actual world as known, felt, desired. World, here is another relational bi-polar concept. The *actual* world

is the world of meanings constructed by the person—the known world; the *environmental or objective* world is the world of reference, examined from a sociocultural standpoint.

The second function that action serves is the *instrumental function of communicating and adjusting person-centered meanings.* Communication, dialogue, discourse, and problem solving all call attention to the relational to-and-fro movement between the expression of the self-organizing system, and instrumental adaptive changes. Completely adapted (i.e., successful) action entails only the *projection* of meaning onto the world (e.g., If I intend this object before me to hold water as a cup, and successfully drink from it, no change occurs in my conceptual system). Partially adapted (i.e., partially successful) action results in exploratory action, or *variations* (e.g., If the intended cup leads to water leaking onto my shirt, I vary my actions such as putting my finger across a crack in the object). Exploratory action that is adaptive (e.g., The finger placement permits successful drinking) leads to reorganization of the system (transformational change) and new meanings (e.g., A cup is an object without open cracks).

Experience and Action. This general cycle of projected action, and exploratory variational action as the accommodation to encountered resistances, constitutes the third and most general function of action: *Action defines the general mechanism of all psychological development.* From a person-centered developmental action standpoint *all development is explained by the action of the subject.* However, this metatheoretical concept will be translated into specific theoretical concepts at the level of theory itself (e.g., Piaget's concepts of assimilation-accommodation and equilibration identify action mechanisms of development).

In claiming that action is the general mechanism of all development, it is necessary to recognize that within an action based perspective *action and experience are identical concepts.* As a consequence, the claim that action is the mechanism of development is identical to the claim that experience is the mechanism of development. All development occurs through experience. But in this definition it should be clear that experience as action excludes neither the biological nor the sociocultural. In fact, experience understood as action of the person-agent represents a synthesis of these two.

Experience is itself yet another concept that acquires alternative meanings depending on whether the focus is from the person-agent or the objective environmental standpoint. From each perspective, experience is identified as the interaction of the act and the environment (i.e., acts intend objects), but each has a distinct emphasis regarding the locus of this interaction. From the person-agent standpoint (Figure 2.8–A), *experience is the action of exploring, manipulating, and observing the world,* while from an environmental standpoint (Figure 2.8–C), *experience is an objective event or stimulus present in the context of the act.* As understood from the person-agent standpoint, when experience is described as a feeling, the reference here is the person-centered felt meaning of the observational, manipulative, and exploratory action.

In the history of psychology, and especially developmental psychology, the complementarity of these usages has often been lost in a world of split metatheory. As a consequence, implicitly or explicitly, experience has frequently been identified with, and only with, the objective stimulus. When this privileging of the stimulus occurs it carries with it the split metatheoretical principle of investing the privileged concept with a causal power. Consider, for example:

> For Schneirla, experience referred to all stimulus influences that act on the organism throughout the course of its life. . . . Any stimulative influence, any stimulus that acts on the organism in any way, is a part of experience. (Lerner, 2002, p. 152)

Here, experience is both defined exclusively by the stimulus and the stimulus is conceptualized as causally acting on. The consequence of such split understandings is that they again draw us back into a fruitless nature-nurture debate in which "experience" become pitted against "innate" or against "biological maturation" as one of two competing alternative explanation of behavior; thus, empty questions such as "Does experience influence behavior and change?" "How much does experience count in adolescence?" rise to the fore. When, on the other hand, experience is conceptualized as the complementary "act-environment," these and all other nature-nurture questions disappear, being replaced by empirical explorations that examine acts in relation to their source (person-agent) or acts in relation to the environment (see Overton & Ennis, in press).

When experience is understood as entailing the developmental *action cycle* of projection-transformation (of the known world) exploration-transformation (of the system), experience also becomes the psychological

bridge between biological and cultural systems. There is no sense here of an isolated, cut off, solitary human psyche. Person-centered experience emerges from a bio-sociocultural relational activity matrix (see, for example, Gallese 2000a, 2000b; Suomi, 2000) and this experience both transforms the matrix and is transformed by the matrix. Person development is not a split-off nativism or environmentalism, or a split-off additive combination of the two. The neonate is a dynamic system of practical action meanings. These meanings represent the outcome of 9 months of the interpenetrating action of biology-environment, and this interpenetration stretches all the way down to DNA (Gottlieb, 2002; Lewontin, 2000). Finally, it cannot be repeated too frequently that to say that development is explained by experience does not deny that development is explained by biology and that development is explained by culture. What is denied is the absolute exclusivity of any of these standpoint explanations.

Development of Person-Agent

Psychological development of the person-agent entails the epigenetic stance that novel forms emerge through the interpenetrating actions of the target system, and the resistances the target system encounters in both the actual and objective sociocultural and physical environment. It is through interpenetrating actions that the system changes and becomes differentiated. But differentiation of parts implies a novel coordination of parts and this coordination itself identifies the emergence of novelty (see Figure 2.2). Thus, as suggested earlier, the neurological action system becomes differentiated through the interpenetrating actions of neurological-environmental functioning. This differentiation leads to a novel coordination or reorganization that eventually leads to the adapted level of conscious practical action found in the neonate. Consciousness is a systemic property of this emergent action system. The initial adapted practical consciousness is a minimum awareness of the meaning entailed by an act (Zelazo, 1996). Consciousness cannot be reduced to or "squeezed" out of lower stages, it is the result of a transformation. Similarly, further developmental differentiations and coordinations of actions—described as higher levels of consciousness—emerge through the interpenetrations of conscious action and the sociocultural and physical worlds it encounters (see Figure 2.2). Symbolic meaning and the symbolic representational level of meanings (Mueller & Overton, 1998a, 1998b) describes forms of consciousness that arise from the coordination of practical actions; reflective and transreflective (reflective symbolic understandings of reflective symbolic understandings) meanings describe further developmental advances in the coordination of action systems.

In summary, to this point the nucleus of a relationally informed person-centered developmental action metatheory of mind has been described, where mind is conceptualized as a dynamic self-organizing system of cognitive (knowings, beliefs), emotional (feelings), and conative or motivational (wishes, desires) meanings or understandings, along with procedures for maintaining, implementing, and changing these meanings. Mind, through expressive projections—transforms the world as known, and—through adaptive exploration—transforms itself (i.e., develops). However, this remains a nucleus and only a nucleus, because it lacks the critical necessary feature of embodiment.

Person-Agent Embodied Actions

Person-agency is the source of action, and action is the source of meaning; but this action itself is embodied. As discussed earlier, embodiment is the claim that our perception, thinking, feelings, desires—the way we experience or live the world—is contextualized by our being active agents with this particular kind of body. At the agent level, embodiment specifies the characteristic nature of the activity of any living system (e.g., the actual world of the fly is necessarily shaped by the nature of the fly's embodied acts). At the person level, embodiment affirms that—from the beginning—bodily acts constrain and inform the nature of intentionality (Margolis, 1987). Intentionality is not limited to a symbolic, reflective, or transreflective system of psychological meanings. Intentionality also extends to a system of psychological meanings that characterize practical embodied actions operating at the most minimum level of consciousness. These most basic meanings and all others "come from having a body with particular perceptual and motor capabilities that are inseparably linked" (Thelen, Schöner, Scheier, & Smith, 2001, p. 1). They arise—as Piaget repeatedly insisted—from the sensorymotor functioning that represents a concrete instantiation of embodied actions.

Varela et al. (1991) have sketched a general outline for an embodied theory of cognition. Sheets-Johnstone (1990) provides an evolutionary anthropological perspective on human embodiment and thought, and Santostefano (1995) has detailed the emotional and

cognitive dimensions of practical, symbolic, and reflective embodied meanings. Further, many who have studied psychopathology, from R. D. Laing (1960) to Donald Winnicott (1965) and Thomas Ogden (1986), argue that disruptions in the embodied actions of the person-agent are central to an understanding of the development of severe forms of psychopathology (see Overton and Horowitz, 1991).

At the level of practical actions (see Figure 2.2), Bermudez's (1998) work on the development of self-consciousness is central to an understanding of the impact of an embodied person conceptualization. Bermudez's fundamental argument is that late emerging forms of meaning found in symbolic and reflective consciousness develop from—and are constrained by—embodied self-organizing action systems available to the infant. Most important, these early systems entail person-level somatic proprioception and exteroception. As these person-centered processes interpenetrate the physical and sociocultural worlds, proprioception operates as the differentiation mechanism for the emergence of a self-consciousness action system, and exteroception operates as the differentiation mechanism for the emergence of an object-consciousness system. Hence, over the first several months of life a basic practical action associated with "me" and "other" develops, which in turn becomes transformed into the symbolic "me" and "other" of early toddlerhood. Thelen's (2000) work on the role of movement generally, and specifically "body memory," in infant cognitive functioning is another closely related area that illustrates the importance of embodiment at the level of practical actions.

Langer's (1994) empirical studies represent important demonstrations of the intercoordination of embodied action systems as these intercoordinations move development from the practical to the symbolic plane of meaning (see Figure 2.2). Earlier work by Held and his colleagues (e.g., Held & Bossom, 1961; Held & Hein, 1958) illustrates the significance of *voluntary* embodied action at all levels of adaptation. Goodwyn, & Acredolo (1993) research on the use of bodily gestures as signs expressing practical meanings in older infants suggests the expressive and instrumental value of embodied practical gesture. Other work has elaborated on the significance of bodily representations at the symbolic and reflective levels of meaning. For example, while the use of fingers for counting is well documented (Gelman & Williams, 1998), Saxe's (1981, 1995) research has shown cross-culturally that other bodily representations enter into counting systems. Further, earlier research by Overton and Jackson (1973) and more recently by Dick, Overton, and Kovacs (2005) has demonstrated that bodily gestures support emerging symbolic representations at least until the level of reflective meanings.

At the level of symbolic, reflective, and transreflective conceptual functioning (see Figure 2.2), the writings of Lakoff and Johnson (1999; see also, Lakoff, 1987) are well known for their detailed exploration of the significance of embodiment. For Lakoff and Johnson, embodiment provides the fundamental metaphors that shape meanings at all levels of functioning. In a parallel but distinct approach, Kainz (1988) has described how the basic laws of ordinary logic (i.e., the law of identity, the law of contradictions, and the law of the excluded middle) can be understood as emerging from the early embodied differentiation of self and other. Finally, Liben's (1999) work on the development of the child's symbolic and reflective spatial understanding presents a strong argument for an understanding of this development in the context of an embodied child rather than in the context of the disembodied eye that traditionally has framed this domain.

EPISTEMOLOGICAL-ONTOLOGICAL ISSUES

In broad outline, to this point the chapter has explored the nature of the concept of development and related concepts as they are grounded and sustained within a hierarchy of metatheories. The discussed metatheories—split, relational, embodied action, developmental systems—are themselves contextualized by metatheoretical concepts that operate at yet a higher level of discourse (see Figure 2.1). These are the *epistemological* (i.e., issues of knowing) and *ontological* (i.e., issues of reality) level of metatheory to which we turn next. The conceptual issues that are illustrated at these levels have evolved across the course of history, and any clear exposition of these issues itself necessitates an historical approach.

Metaphysics is the broad area of philosophical inquiry concerned with conceptual inquiry into the nature, origin, and structure of the world or "being." *Ontology* is the domain of metaphysics concerned with question of what constitutes the Real with a capital R (Putnam, 1987). *Epistemology* is about knowing, and its primary question concerns the validity of what and how we know. Understood relationally, epistemology is a narrative about how we know what is Real, and ontology is a narrative about the Real as we know it. Historically,

each domain has offered sets of alternatives in answer to its fundamental question. The basic epistemological candidates for yielding valid knowledge have been *reason and observation.* In the ontological domain, matter and form have been primary candidates for the Real. When matter is interpreted as bits, or elements, or uniform pieces, and form is taken as pattern, structure, or organization, then *uniformity and organization,* as the surrogates of matter and form respectively, are the candidates for what constitutes the Real. A related set of candidates for the nature of the Real concerns the assumed activity status of matter and form. The Real may be assumed to be fundamentally *inactive and unchanging,* or it may be assumed to be fundamentally *active and changing.* Thus, it is possible to conceptualize (a) an inactive and unchanging matter—a Newtonian favorite; (b) an active and changing matter—a pre-Newtonian understanding, as well as Einstein's post-Newtonian understanding of the nature of the physical world; (c) an inactive and unchanging form—a position often attributed to Plato; and (d) an active and changing form—Leibniz's monadology and Hegel's dialectic.

In discussing ontology and the Real, it cannot be too strongly emphasized that there is a critical distinction between the use of the term "real" in everyday commonsense life and the ontological. No one argues that there is a lack of reality or realness in the experienced everyday world. This is commonsense realism. Commonsense realism accepts the material existence of a real, actual, or manifest world and all ontological-epistemological perspectives treat people, and animals, and physical objects as having such a real existence. The ontological issue of the Real with a capital R (Putnam, 1987) is a very different issue. It concerns the idea of having a base or foundation from which everything else emerges. In this limited sense, the Real is defined as that which is not dependent on something else, or that which cannot be reduced to something else.

If we were to approach the issue from a split understanding, then matter and form would become a dichotomy. In this case, the assertion of *either* matter *or* form as the Real would privilege the former and marginalize the latter as reducible Appearance. Asserting split matter to be the Real yields a *materialist ontology.* Within this ontological position, form, pattern, organization, and ideas are cast as appearances that ultimately are assumed to find their source or origin in the foundational Real (i.e., matter). For example, when the concept "system," is used within this split ontological frame, it simply references the individual elements of matter such as neurons. Or, as a social example, "community" merely refers to the linear aggregate of individuals. Choosing split-off form as the foundational Real would assert an *idealist ontology.* In this choice elements, individuals, and bits, would achieve an identity only in the context of the pattern or form that would constitute the Real. Within this ontological context, "system" would be the foundational Real, and matter, such as neurons, a mere reflection of this Real. "Community" in this case would be foundational and "individuals" would be taken to be an expression of this form. When the narrative is split, as in these cases, the Real becomes an absolute foundation and this is referred to as *foundationalism or a foundationalist position.*

Plato and Aristotle and the Relational Developmental Tradition

For Plato and Aristotle, there were no radical splits between ontology and epistemology or between the alternatives in each domain. Each took the problem of knowing as his focus. Both reason and observation, and form and matter constituted an indissociable complementary matrix for understanding the world. Plato favored an epistemological emphasis on reason; Aristotle articulated more precisely the dialectical balance of reason and observation. Plato's point of view, or line of sight, began from the ontological significance of form or pattern described in his doctrine of Ideas. However, he admitted another line of sight, which was matter as a "formless, indefinite, substrate of things" (Stace, 1924). Aristotle emphasized the significance of the relational nature of form and matter. Form and matter were understood as dialectically related, as in Escher's *Drawing Hands.* Formless matter or matterless form were simply not possible. Aristotle maintained that only individual things exist, but "existence" did not imply a simple split-off matter. Existence implied matter in the context of the categories (forms) of space and time. Thus, existence was not the criterion of the Real; the relational form/matter constituted the Real. As Ross (1959) points out, " 'Matter' is not for Aristotle a certain kind of thing as we speak of matter in opposition to mind. It is a purely relative term—relative to form" (p. 76).

Plato and Aristotle also held a relational view of inactivity-fixity (termed "Being") and activity-change (termed "Becoming"). Plato is most widely known for his postulation of a realm of timeless forms (i.e., a realm of the unchanging). In modern times, this notion has cast Plato as the father of the search for "essences"

of nature and, thus, what has been called *essentialism* (see Mayr, 1982). Conceived in this split fashion, the fixed forms of essentialism constitute the conceptual grounding for contemporary nativist positions that interpret "structure" and "organization" as fixed and unchanging. It is unlikely, however, that Plato intended this split interpretation (Cornford, 1937; Lovejoy, 1936; Nisbet, 1969), as Plato himself specifically stated, "that *only* the divine is changeless; that the world of man and society is an incessant process of development and of becoming" (Nisbet, 1969, p. 308).

Aristotle's relational understanding of the nature of *being* (static, fixed, inactive, unchanging) and *becoming* (active, changing) is expressed in his concepts of the "potentiality" and "actuality" of individual things. The actuality of an object of inquiry (i.e., what the object is at a given moment) points to its being. The passage from potentiality to actuality points to the becoming of the object (Ross, 1959, p. 176; Wartofsky, 1968). Coming into being (i.e., becoming) constituted Aristotle's conceptualization of developmental change and—as in the unified definition of development elaborated earlier in this chapter—he emphasized both the transformational and variational nature of change as critical relational features of becoming. Aristotle referred to transformational change as "generation and destruction," and variational change "alteration" (Ross, 1959, p. 101–102). Despite the centrality of development (i.e., becoming) to his system, it is often suggested that Aristotle's ideas promoted an understanding of nature as a hierarchical organization of unchanging forms that later became celebrated as the *scala naturae* or "The Great Chain of Being" (Lovejoy, 1936). The attribution of this nonevolutionary and, hence, nondevelopmental view of nature to Aristotle confuses his ontological-epistemological stance with the proposal of a single possible biological classificatory system (Lovejoy, 1936, p. 58). Aristotle was the champion of a logic of classification, but the other side of the story is that he also recognized the dangers and limitations of any specific system of classification. Today, to characterize Aristotle as an antievolutionist who promotes a static conception of hierarchical forms (see Mayr, 1982) misses the relational character of Aristotle's work.

Modernity and the Rise of the Split Tradition

In the seventeenth century with the dawn of the modern age or "modernity," split metatheory began its historical journey. The story of modernity is defined both by a quest for absolute certainty of knowledge (Toulmin, 1990) and by an effort to expand individual freedom, especially freedom of thought. Building knowledge on rational and reasoned grounds, rather than on the grounds of authority and dogma, was understood as the key to each of these goals. The early protagonists who developed the basic story line were Galileo Galilei, and his physics of a natural world *disconnected* from mind; Rene Descartes, whose epistemology elevated disconnection or splitting to a first principle; and Thomas Hobbes, who saw both mind and nature in a vision of atomistic materialism. Of the three, Descartes was to have the greatest and most lasting impact on the formation of split metatheory.

Descartes major contributions entailed the introduction and articulation of *splitting and foundationalism* as core interrelated epistemological themes. As described earlier splitting is the formation of a dichotomy—of an exclusive either/or relationship—and foundationalism is claim that one or the other elements of the formed dichotomy constitutes the ultimate Real. Nature and nurture, idealism and materialism (form and matter), reason and observation, subject and object, constancy and change, biology and culture, and so on all can be—and under the influence of Cartesian epistemology are—thought of as split-off competing alternatives. Privilege the one as the Real—as the *foundation*—and it follows under a split interpretation that the other is marginalized as mere appearance or epiphenomenal.

The foundation here is the final achievement of absolute certainty and the end of doubt. The foundation is not a vantage point, standpoint, or point of view, and certainty and doubt are not dialectically related as an identity of opposites. Descartes's foundationalism describes *the* final fixed secure base. It constitutes an absolute, fixed, unchanging bedrock; a final Archimedes point (Descartes, 1969).

With splitting and foundationalism in place, the theme of *reductionism* was firmly planted in the history of this tradition, and virtually all change to the present day represents elaboration and variation of the idea that Appearance will ultimately be reduced to (i.e., explained by) the Real. "Eliminative reductionism," "ontological-reductionism," "property ontological-reductionism," "theoretical-reductionism," "definitional-reductionism," "causal reductionism," (Searle, 1992) "radical or leveling reductionism," "microreductionism," "smooth reductionism," "semantic reductionism" (Shanon, 1993), and

"biosociological reductionsim" (Bunge & Ardila, 1987)—while each making interesting and valuable discriminations to the plot line—add little to the theme (Overton, 2002).

Having literally invented *dualism* by splitting the Real into a Subject piece and an Object piece, Descartes—and all others who have since accepted the Cartesian categories—was faced with the problem of how to put the individual pieces back together again. If there is an absolute bedrock to nature and this bedrock is composed of individual elements, there must be a glue that can join the pieces into the appearance of wholeness. Descartes favored the solution called *interactionism,* a solution not unlike some of the "conventional" interactionist positions discussed earlier with respect to the nature-nurture issue. According to conventional interactionism any behavior is explained as the additive outcome of pure forms of fixed elements labeled nature and pure forms of fixed elements labeled nurture.

Empiricism, Materialism, and Objectivism

Cartesian splitting and foundationalism came to operate as a permanent background frame for modernity's split tradition. However, the specification of the *nature* of the ultimate foundation remained at issue. It was left to Hobbes and later empiricists to operate within the frame of subject split from object, mind split from body, ideas split from matter, and to build into this frame the materialist identification of *atomistic matter* as the ultimate ontological foundation—the Real. In the eighteenth century—a period called the Enlightenment—British empiricism arose as a protest against the rational and subjective elements found in Descartes—against both the "*I*" and the "*think*" of the famous "I think, therefore I am." In the epistemological writings of John Locke, George Berkeley, and David Hume, reason became split off from observation and *empiricism* arose as the doctrine that all knowledge originates in the senses (observation) and only the senses and, hence, all knowledge must ultimately be reducible to sense information (see Overton, 1998 for an extended discussion). This empiricist line of modernity continued to pursue the goal of building knowledge on rational and reasoned grounds, but the rational and reason came to be considered acquisitions, which in turn needed to be explained as arising from the senses and only from the senses. This forced monism operated to marginalize subjectivity, mind, or ideas, thereby creating *objectivism*; the belief that the ultimate material Reality exists as an absolute—independent of mind or knower (Searle, 1992). This constituted, as Putnam (1990) has said, an epistemological "God's eye view."

Objectivist matter thus came to constitute the ontological Real to which the manifold of commonsense experience would be reduced to arrive at the goal of science; a systematized body of *certain* empirical knowledge. Support for the materialist foundation arose and was further defined by Newton's contributions. Central among these was the redefinition of the nature of matter in a way that conceived of all bodies as fundamentally inactive. Prior to Newton, matter was understood as inherently active. Matter had been conceived in terms of the relation of being (static, fixed) and becoming (active, changing). Newton, however, through his concept of inertia, split activity (becoming) and matter (being) and redefined matter as inactivity (Prosch, 1964).

The redefinition of bodies as inert matter, and the assumption of the atomicity of matter (i.e., bodies are ultimately aggregates of elemental matter that is uniform in nature, and in combination, yields the things of the world), were basic for Newton's formulation of his laws of motion. However, they were also ideas that a later generation generalized into a metaphysical worldview that identified the nature of the Real as fixed inert matter and *only* fixed inert matter. This "billiard ball" or "mechanistic" worldview entailed "the notion that basically everything . . . was made up of small, solid particles, in themselves inert, but always in motion and elasticitly [sic] rebounding from each other, . . . and operating mechanically" (Prosch, 1964, p. 66). Within this split worldview, all human psychological processes, including the cognitive (perception, thought, reasoning, memory, language), the affective (emotions), and the conative (motivation, wishes, desires), were necessarily reduced to a bedrock of sensations. Associations were used as the glue designed to explain how from these simple sensations it would be possible to have the complex ideas, emotions, and desires that are apparent in commonsense understanding.

With these themes at hand—*splitting, foundationalism, materialism, objectivism*—it was a short epistemological step to the formulation of a complete scientific methodology termed "mechanical explanation" that with relatively minor modifications has extended to the present day as the basic methodology of neopositivism and later instrumentalism, conventionalism, and functionalism. This notion of explanation is discussed in a later section on methodology.

While the eighteenth century empiricists focused their enquiry primarily on cognitive issues ("complex ideas") in the nineteenth century, the Utilitarian philosophy of Jeremy Bentham, passed down through James and John Stuart Mill, and Alexander Baine, sought an extension of the empiricist doctrine by applying the Newtonian paradigm to the explanation of actions, values, morals, and politics (Halevy, 1955). The *experimental* psychologies of Wundt and Titchener grew from this ground, followed by the functionalist perspectives of Angell, Carr, Woodworth, and, ultimately, behaviorism and multiple forms of neobehaviorism, including learning theories and social learning theories of development. With behaviorism, "stimuli" and "responses" came to replace the earlier "sensations" as bedrock explanatory concepts.

In the twentieth century, the split tradition continued operating as a metatheory for various domains of inquiry, including developmental inquiry. In philosophy, the tradition extended its influence in the articulation of Anglo-American analytic philosophy. As the name suggests, analytic philosophy has continued to maintain the Cartesian split categories and to the present day, in various surrogate forms, pursue the analytic ideal of finding the "atoms," or absolute bedrock foundational elements of knowing (Rorty, 1979). The British line of this approach located its foundationalism in the analysis of "ordinary language." The American line pursued the same goal in the "neutral data language" and "observation sentences" of neopositivism, elaborated in the writings of Moritz Schlick, Roudolf Carnap, Gustav Bergmann, Herbert Feigl, Carl Hempel, A. J. Ayer, and the "earlier" Ludwig Wittgenstein (of the *Tractatus Logico-Philosophicus*).

Modernity and the Elaboration of Relational Metatheory

As British empiricism followed its route of splitting and foundationalism, the German modern period continued to elaborate relational epistemological and ontological issue. At the forefront of the German Enlightenment stands Leibniz's grand synthesis of a universal mathematics and a metaphysics of individuality (Gadamer, 1993). For Leibniz, epistemology as the universal, the knowing of the Subject, was joined in a relational matrix with ontology as the particular, the being of the Object. The twentieth-century philosopher, Ernst Cassirer (1951) captures this fundamental relational quality of Leibniz's work when he asserts that "the central thought of Leibniz's philosophy is therefore to be looked for neither in the concept of individuality nor in that of universality. These concepts are explicable only in mutual relationship; they reflect one another" (p. 33).

Leibniz

With ontology as the line of sight, Leibniz, a contemporary of Locke, refused to split off being from becoming. Activity and ceaseless change were fundamental to the nature of the Real. In his concept of substance, Leibniz substituted a "pluralistic universe" in place of Descartes's dualism and Locke's materialist monism. Leibniz's "monad" is the fundamental unit of this universe. The monad " 'is' only in so far as it is active, and its activity consists in a continuous transition from one new state to another as it produces these states out of itself in unceasing succession. . . . Never is one of these elements just like another; never can it be resolved into the same sum of purely static qualities" (Cassirer, 1951, p. 29). "In Leibniz's philosophy an inalienable prerogative is first gained for the individual entity. The individual no longer functions as a special case, as an example; it now expresses something essential in itself. . . . Every individual substance is not only a fragment of the universe, it is the universe itself seen from a particular viewpoint. And only the totality of these unique points of view gives us the truth of reality" (Cassirer, 1951, pp. 32–33).

From an epistemological line of sight, if substance is in "continuous transition from one state to another," then understanding entails the rational discovery of the rule of this transition and the laws according to which it occurs. This is Leibniz's rationalism. It differs significantly from Descartes's in that there is no return to God as the imprinter of these universal ideas, nor is reason split from observation. Universal ideas as rules and laws, and particular experiences as observations, are relational or co-relational. Knowing may begin in observation, but observation proceeds in the context of some system, idea, or form. Analysis is not suppressed in Leibniz's system; it occupies a significant place in his thought. However, analysis is not privileged over synthesis; all analysis implies a whole or synthetic aspect according to which the analysis proceeds. Cassirer (1951) points out that, for Leibniz, the "concept of the *whole* has gained a different and deeper significance. For the universal whole, which is to be grasped can no longer be reduced to a mere sum of its parts. The new whole is organic, not mechanical; its nature does not consist in the sum of its parts but is presupposed by its parts and con-

stitutes the condition of the possibility of their nature and being" (p. 31).

The Leibnizian tradition is a relational tradition, and it emerged, as Cassirer suggests, from an organic understanding of the nature of events and the nature of knowing. Thus, it was within an emerging organic worldview that specific features of the relational ontological-epistemological ground came to be articulated. The significance of the legacy of the Leibnizian relational tradition for developmental inquiry is—like the significance of the legacy of the Newtonian split tradition—severalfold. First, it established a distinct rationale for the proposal that knowing necessarily proceeds from a "point of view" or line of sight. The importance of perspective or point of view is traceable to Plato (Kainz, 1988), but Leibniz gave it a central significance by embedding it in the relational context of parts to whole. *Point of view* does not imply an unrestrained relativism as it sometimes seems to suggest in contemporary usage. A "point of view" within the Leibnizian tradition, only becomes a point of view as it is embedded with other points of view within a broader context. For example, Subject and Object become "points of view" only within a broader organic unity that joins the two within a relational matrix. Without this unity, they are simply isolated elements and the application of the phrase "point of view" is quite meaningless.

In the postmodern era of contemporary Continental philosophy, point of view continues to exert a strong influence through the concept of "horizon" of understanding or inquiry. The notion of horizon appears in the works of Nietzsche and Husserl, but it has been most fully developed in the hermeneutics of Hans-Georg Gadamer (1989). A *horizon* is the entire range of understanding that can be generated from a particular vantage point. Achieving a horizon entails placing something in the foreground or what is termed the process of *foregrounding,* a methodological principle that is inherently relational in nature. Whatever is foregrounded must be foregrounded from something else. Consequently, foregrounding makes visible this other that is joined with it in a relational matrix. With respect to developmental inquiry, for example, to "foreground" the subject is to recognize the object; to foreground the expressive is to recognize the instrumental, or to foreground the transformational is to recognize the variational. It is the reciprocity of horizons, or what is termed the *fusion of horizons* that ultimately constitutes truth in such a relational system. The situation here is similar to the familiar reversible figure of the vase-person. From one vantage point, we foreground, and, thus, acquire the horizon of two faces turned toward each other. The two faces become a legitimate object of inquiry, moving toward a full achievement of this horizon. From another vantage point, a vase is foregrounded and a different horizon is acquired. Both horizons yield legitimate objects of study; yet, both are parts of the one whole, and that whole constitutes the fusion of horizons.

Other developmental implications of the Leibnizian relational tradition follow from the principle that activity, change, and organization are as fundamental as stability, fixity, and uniformity. Activity-stability, change-fixity, and organization-uniformity compose the bipolarities, or relative moments, of the ontological-epistemological relational matrix. This became the principle of *Becoming* in philosophical and developmental inquiry (Overton, 1991b). As suggested earlier, it contrasts directly with the Newtonian-Humean tradition of split off *Being,* where activity, change (other than random variation), and organization are treated as ultimately reducible Appearances.

The principle of Becoming, whose origins are traceable to the pre-Socratic works of Anaximander and Heraclitus (Wartofsky, 1968), takes, as its line of sight, activity, change, and organization as necessary and nonreducible features of the cosmos (Allport, 1955; Nisbet, 1969). In the eighteenth century, Becoming was generalized from Leibniz's ontology to an understanding of man, society, and nature.

In 1725, Giambattista Vico attacked the static view of human nature and proposed that changes of society are the reflection of the imminent and necessary development of the human mind. In 1755, Kant, in his *General History of Nature and Theory of the Heavens,* applied the notion of Becoming to the material world, and maintained that this world continuously evolves in a systematic and ordered fashion. And from 1784 on, in a series of four volumes, Johann Gottfried Herder extended the idea of Becoming to include nature, living species, and human society alike (Toulmin & Goodfield, 1965).

Hegel

In the late eighteenth and early nineteenth centuries, the most influential figure to advance the principle of Becoming was G. W. F. Hegel (1770–1831). For Hegel, history was a necessary dynamic process of growth, defined as expressive-transformational change. The nature of this change was defined by the dialectic (see earlier discussion), a process through which concepts or fundamental

features of a system *differentiate* and move toward *integration.* This process, suggests a grounding for understanding change as directional. In split understandings, there must always be a controversy over whether change is best characterized as *either* cyclical (variational) *or* directional (transformational). Within the dialectical context, this dichotomy is resolved through recognition that the polarities of thesis-antithesis constitute the cyclical dimension of change. However, such cycles are never closed, as they would be in a circle. When a circle is opened a bit, it does not return precisely to its starting point. As a consequence, with the continuation of activity, the open cycle forms a spiral (the synthesis or integration). With the repetition of spirals, a direction is formed (see Overton 1994a, 1994c).

In the nineteenth century, the principle of Becoming was extended in the works of social theorists such as Comte, Marx, and Spencer and in the writings of biologists such as Wolff, Goethe, and von Baer. And James Mark Baldwin (1895, 1897/1973) first formulated a developmental psychology specifically in terms of dialectical categories. As Broughton (1981) points out, "his [Baldwin's] . . . orientation came to be tempered with a Hegelian view of dialectical progress through qualitatively distinct levels of consciousness" (p. 399; see also, Freeman-Moir, 1982).

In the twentieth century, Heinz Werner (1948, 1957) drew his own theoretical approach from the dialectical feature of the principle of Becoming. In this context, he proposed the orthogenetic (normal development) principle as a universal explanatory principle, or law, of transformational change. The *orthogenetic principle* asserts that "whenever there is development it proceeds from an initial state of relative globality and lack of differentiation to a state of increasing differentiation, articulation, and hierarchic integration" (1957, p. 126). But Werner was not alone among twentieth-century developmentalists in constructing metatheoretical and theoretical understandings framed by the dialectic of Becoming. Piaget, for example, draws from the same image in laying out the metatheoretical grounding for his "*equilibration*" explanation of human transformational development: "These global transformations . . . gradually denote a sort of law of evolution which can be phrased as follows: assimilation and accommodation proceed from a state of chaotic undifferentiation to a state of differentiation with correlative coordination" (Piaget, 1954, p. 352). Similarly, Vygotsky (1978) maintains that development is best characterized as "a complex dialectical process characterized by periodicity, unevenness in the development of different functions, metamorphosis or qualitative transformation of one form into another" (p. 73).

It is significant also that these three major developmentalists of the last half of the twentieth century—Piaget (Piaget & Garcia, 1991, p. 8), Werner (Werner & Kaplan, 1963, p. 11) and Vygotsky (1978) all considered development to be change entailing a spirality that emerges from cycles and yields direction (see Figure 2.6). As Vygotsky noted specifically with respect to higher psychological functions, "Development, as often happens, proceeds here not in a circle but in a spiral, passing through the same point at each new revolution while advancing to a higher level" (p. 56).

Along with classical developmental theorists like Werner, Piaget, and Vygotsky, dynamic theorists, both from the British object-relations (e.g., Fairbairn, 1952; Winnicott, 1965) and the ego psychology schools (Erikson, 1968) have found the core dialectical Becoming notions of "activity," "differentiation," and "integration" central for understanding both normal and pathological human ontogenesis (Overton & Horowitz, 1991).

This discussion has focused on the historical impact of the Leibnizian-Hegelian tradition as it advanced and articulated the principle of Becoming. More broadly, the philosophical grounding of the relational developmental tradition was progressively elaborated from Leibniz to Kant to Hegel, and it was Kant's own contribution that simultaneously both advanced and retarded this process. Kant's line of sight was epistemological, and because knowing is a human activity, his focus was on the human conditions necessary for knowledge. Hume, after splitting reason (mind) from observation, had come to argue that valid (universal and necessary) knowledge cannot be found in the observational world, which yields only the particular and the contingent. Kant agreed, but adopting a relational stance, he argued that this fact does not lead to the dismissal of valid knowledge. Rather, it simply demonstrates that if contingent knowledge is a feature of the observational world, then valid knowledge must be a feature of thought, of mind.

Kant

Arguing from the relational perspective, Kant maintained that both valid and contingent knowledge are essential aspects of human experience (i.e., both the universal and the particular, the necessary and the contingent are features of human experience). Consequently, the question was not—as assumed in the

Newtonian-Humean split tradition—whether it was possible to have valid knowledge. The central question became the conditions of mind that had to be assumed to produce the experienced valid knowledge. Kant began the description of these conditions with the presupposition that reason-thought-concepts form a relational matrix with observation-intuitions-perceptions. This affirmation of the Leibnizian relational tradition—itself often described as Kant's (1781/1966) attempt to reconcile rationalism and empiricism—is nowhere better articulated than in the famous relational aphorism ascribed to him: "Concepts without percepts are empty, percepts without concepts are blind." This often repeated aphorism is a variant of Kant's actual "Thoughts without contents are empty, intuitions without concepts are blind. . . . The understanding cannot see, the senses cannot think. By their union only can knowledge be produced" (p. 45).

From this overarching relational commitment, Kant presented a philosophical sketch of human cognition that further affirmed both the activity and organization features of the Becoming tradition. Kant's description of mind basically entailed three interrelated dynamic system components. Because Kant did not split structure and function, these dynamic systems are sometimes examined from the structural perspective and are called "faculties" and "forms." At other times, they are examined from the functional perspective and called "powers" or "activities": First, sense data or content is transformed into *a priori* categories of space and time according to the *forms of intuition* or forms of perception. Second, perceptions become synthesized in terms of *a priori categories of understanding*. The categories of understanding (e.g., existence, reality, causality, necessity) operate as a base level rule system that orders percepts according to the very features that Hume had dismissed (e.g., necessity, causality, reality, existence). Third, the *imaginative faculty* characterizes the activity of mind as it functions to synthesize perceptions and categories into objects of knowledge; "There exists therefore in us an active power for the synthesis of the manifold which we call imagination. . . . This imagination is meant to change the manifold of intuition into an image" (1781/1966, p. 112).

In addition to these three basic components of mind, Kant described a faculty of "judgment." Judgment is the active process that applies knowledge—gained through intuition, understanding, and imagination—to the practical world. This scheme of the relation between knowledge and the accessing and application of that knowledge became the background for a later cognitive developmental distinction between the development of a cognitive competence and the development of procedures for accessing and applying that competence (Chandler & Chapman, 1994; Overton 1990, 1991a; Overton & Dick, in press).

Kant and the Phenomena-Noumena Split

Although this sketch of human cognition is grounded in the relational, two additional features of Kant's position are inconsistent with the relational developmental tradition: Kant's Cartesian split of phenomena and noumena, and that Kant considered the categories and forms of intuition to be fundamentally unchanging. *Noumena* were described as "things-in-themselves," or objects and events independent of any representation of the object or event. *Phenomena* were described as representations of objects and events as they are known by the knower. For Kant, these spheres were split. The thing-in-itself was disconnected from knowing, and knowing was disconnected from the thing-in-itself. A direct consequence of this split is that the (person) point of view became a privileged position, in the same way that the Newtonian-Humean tradition had made the point of view a privileged position.

One broad impact of this Kantian split for developmental inquiry is that it came to form the background logic for the nativist side of the nature-nurture debate, just as the Newtonian-Humean split formed the background logic for the nurture side. This nativism—whether with respect to Chomskyian (1975) explanations of language (see Jackendoff, 1994; Overton, 1994b; Pinker, 1997), or with respect to other contemporary forms of neo-nativism (e.g., Astuti, Solomon, Carey, 2004; Baillargeon, 1993; Karmiloff-Smith, 1991; J. M. Mandler, 1992; Spelke & Newport, 1998)—presents a picture of the human mind as a set of innate rules, untouched by history and culture; an inversion of the empiricist tradition, which presents a picture of history and culture, untouched by the human mind.

Hegel's Relational Developmental Reconciliation of Mind and Nature

Hegel resolved Kant's split and moved his static categories back into a more fully coherent relational developmental context. Hegel (1807, Introduction) began his work from the position that there could be no detached thing-in-itself, just as there could be no detached knowing-in-itself. Rather, the world of knowing and

the world of actual objects operated within the same dialectical relational matrix as other fundamental categories. This is the meaning of his well-known relational aphorism: "What is reasonable [the known] is actual [the object] and what is actual is reasonable" (Hegel, 1830, p. 9). Like Kant and others who held this line of thought, Hegel took the a subject, person centered, or phenomenological point of view. However, for Hegel, the world of actual objects and events became a dialectical feature of this perspective.

In his *phenomenology* (i.e., the study of experience) of mind (i.e., of the subject), Hegel distinguished two features or "moments" of consciousness: (1) the *moment of knowledge* (i.e., knowing, thinking, "notion") and (2) the *moment of truth* (i.e., the actual or object). At any point, these moments may not stand in a harmonious relationship, as when what one thinks to be the case (moment of knowledge) turns out to be in error with respect to the actual world (moment of truth). In this dialectic history comes to play a central role, and knowledge becomes developmental, as when there is a lack of correspondence between these two moments then "consciousness must alter its knowledge to make it conform to the object" (Hegel, 1807, p. 54). Thus, while Kant maintained that knowing is action that remains static in its form, Hegel held knowing to be action that transforms itself across time.

In Hegel, the Kantian stable and fixed features of mind became fluid and changing, or as Hundert (1989) points out, Kant's metaphor of mind as "a steel filing cabinet" became replaced by a metaphor of organic growth. This metaphor of organic growth then assumes the position as background that sustains and promotes future thinking from a relational-developmental perspective. The metaphor is evident in the relational concepts of "differentiation" and "integration" that emerge from the dialectic, and Hegel's description of the development of knowledge that he presents in the first pages of his *Phenomenology,* stands as a prototype for the developmental organic vision:

> The bud disappears in the bursting-forth of the blossom, and one might say that the former is refuted by the latter; similarly, when the fruit appears, the blossom is shown up in its turn as a false manifestation of the plant, and the fruit now emerges as the truth instead. These forms are not just distinguished from one another, they also supplant one another as mutually incompatible. Yet at the same time their fluid nature makes them moments of an organic unity in which they not only do not conflict, but in which each is as necessary as the other; and this mutual necessity alone constitutes the life of the whole. (Hegel, 1807, p. 2)

The Hegelian image of growth according to active processes of system differentiation and integration contrasts sharply with the Kantian image of fixed, *a priori* given active systems. A number of contemporary domains of developmental inquiry reflect the legacy of these traditions. For example, the Kantian metaphor of mind as a fixed "steel filing cabinet" provides background support for contemporary approaches to developmental inquiry that offer the digital computer as their guiding model of the nature of mind. The computer image itself fixes an understanding of the nature of cognitive-affective processes, change, and persons. The reality that emerges from this metaphor portrays cognitive development as either a simple increase in representational content (Scholnick & Cookson, 1994), which this machine "processes," through various linear causal mechanisms, or as an increase in the efficiency of the computational machinery itself (Siegler, 1989, 1996; Sternberg, 1984). In this picture, there is no room for the expressive-transformational change found in the works of Hegelian oriented investigators such as Piaget, Werner, Erikson, Bowlby, and others

The Kantian-Hegelian contrast also grounds and sustains an important debate in the domain of affective development among those who begin from a shared understanding that "emotions are not 'stimuli' or 'responses' but central, organizing features of personality and behavior" (Malatesta, Culver, Tesman, & Shepard, 1989, p. 5). Moving from this shared subject or person centered point of view that takes expressive change as the domain of developmental inquiry, a Kantian group (e.g., Ekman, 1984; Izard, 1977; Izard and Malatesta, 1987) and a Hegelian group (e.g., Lewis 1993; Sroufe, 1979) set off on different paths concerning how best to characterize the affective development of the child. The Kantians argue for the adequacy of models that describe the infant as having a number of "discrete" basic emotions innately available. The Hegelians argue that a more adequate description suggests that the infant begins affective life—as well as social and cognitive life—as a relatively undifferentiated action system that becomes differentiated and reintegrated through operating on the actual world. Malatesta et al. (1989) capture the psychological translation of the Hegelian framework with respect to Sroufe's work: "Affects begin as undifferentiated precursor states of distress and nondistress

and differentiate into specific emotions only gradually. Differentiation occurs in a stage-like way as a function of major developmental reorganizations" (p. 11).

The debate over the form of emotional development is paralleled by a debate about the nature of the relationship between cognitive and emotional development. This debate is also framed by split and relational positions. The split positions assert that conceptual boundaries are cuts of nature. The relational developmental position understands them as moments of functioning. As Santostefano (1995) points out, "Cognition and emotion will remain segregated as long as investigators view the boundary as real and the domains as opposites, either independent of each other (e.g., Zajonc, Pietromonaco, & Bargh, 1982), parallel and interacting with one another (e.g., Leventhal, 1982) or with one dominating the other (e.g., Izard, 1982; G. Mandler, 1982)" (p. 63).

Phenomenological Constructivism and Realism

The Hegelian reconciliation of mind and nature established the conceptual base for a particular type of constructivism that is probably best referred to as phenomenological constructivism. *Constructivism* is broadly the position that the activity of mind necessarily participates in the construction of the *known* world. Constructivism is an epistemological position that affirms the necessity of the constitutive dimension of the person in *all* knowing. Constructivism is usually contrasted with *Realism,* which is the epistemological claim that the world as known is a direct reflection of a mind-independent world. For the realist, perception of this world is direct, without the mediating activity of mind (see, for example, Gibson, 1966, 1979). *Phenomenological constructivism* is the position that the mind constructs the world as known, but the known world is a co-actor in the process of construction. Following Hegel, there are alternative object worlds, and it is important to be explicit about whether inquiry is focusing on the subject's object world—inquiry explores phenomenological constructivism—or the physical-cultural object world—inquiry explores implications of the settings within which phenomenological constructivism occurs. Hilary Putnam (1987) clearly captures the sense of phenomenological constructivism: "My view is not a view in which the mind makes up the world. . . . If one must use metaphorical language, then let the metaphor be this: the mind and the world jointly make up the mind and the world" (p. 1). Phenomenological constructivism best characterizes Piaget's (1992) writings, as he suggests when he declares himself, "neither empiricist nor a priorist but rather constructivist or partisan of dialectic as a source of novelties" (p. 215).

Object relations as a family of theories of human development, along with Erikson's ego theory and the cognitive-affective theories of Piaget and Werner, all focus their inquiry on the psychological development of the individual or the person. However, phenomenological constructivist inquiry may take as its point of view either this constructive process or the correlation between this process and cultural-biological objects. Thus, within phenomenological constructivism, as within the broader relational framework, theories of *intrapsychic* development and theories of *interpersonal* development do not necessarily conflict. Consider, Piagetian intrapsychic and Vygotskyian interpersonal approaches to development. The development of individual intrapsychic dynamic organizations has been the Piagetian focus of inquiry, but a good deal of Piaget's own investigations concerned the role of the interpersonal-cultural context (Carpendale & Mueller, 2004; Overton, 2004b; Piaget, 1995; Youniss & Damon, 1992). The sociocultural interpersonal process has been the Vygotskian focus; yet, Vygotsky's writings demonstrate a significant interest in intrapsychic dynamic organizations of the person. van der Veer and Valsiner (1994) argue that it is inaccurate to depict Piaget and Vygotsky as irreconcilable opponents, as Piaget and Vygotsky did not differ about the development of "personal-cognitive (and affective) structures" (p. 6) and there is an "actual closeness of the basic personalistic (i.e., person centered) standpoints of both . . . [that] has gone without attention" (p. 6). As a consequence of both their reciprocal interests and their metatheoretical closeness, Piaget and Vygotsky can reasonably be offered as alternative poles of a broadly unified approach to developmental inquiry: Piaget's intrapsychic inquiry functions in the context of the Vygotskian interpersonal action, as Vygotsky's interpersonal inquiry functions in the context of the Piagetian intrapsychic action.

Hermeneutics: Gadamer and the Relational Developmental Tradition

Hans-Georg Gadamer (1976, 1989, 1993) in Europe, along Charles Taylor (1979, 1985, 1991, 1995) in North America, illustrate contemporary forms of the Leibnizian-Hegelian relational developmental philosophical tradition. Although both Gadamer and Taylor

reject features of the Hegelian system (e.g., the dogmatic notion that history must proceed according to the dialectic), each draws from and extends Hegel's notions of the relational, the developmental, and the centrality of action as both expressive-constitutive and instrumental-communicative. Both also contributed to an understanding of the centrality of embodiment; Gadamer in his existential grounding of the hermeneutic and Taylor in his explicit discussions of embodiment.

Broadly, hermeneutics is the theory or philosophy of the interpretation of meaning. Its heritage goes back to a classical period when the hermeneutic task involved the discovery of the meaning of sacred texts. Schleiermacher made important formative contributions during the Romantic period. Vico and Droysen later added a historical dimension to the problem of interpretation, and Dilthey, in his *Critique of Historical Reason* at the turn of the twentieth century developed the method of *verstehen* (understanding) as a methodology for the human sciences (Bleicher, 1980).

Gadamer's hermeneutic approach has been labeled "universal hermeneutics" or "philosophical hermeneutics" (as distinct from Habermas's "critical hermeneutics" to be discussed in a later section). As heir of the hermeneutic tradition, Gadamer (1989) elaborates upon the method of *verstehen* (see the relational developmental methodology section of this chapter), but it goes beyond a methodology to present a broad philosophical position that seeks to answer the question: "How is understanding possible?"

The Hermeneutic Circle: Transformational Change. The *hermeneutic circle*—a reaffirmation of the Leibnizian-Hegelian holism of the unity of parts to whole—constitutes the *fundamental background condition for all understanding* from a hermeneutic point of view. Understanding moves forward from preunderstanding to understanding in a circular movement. The whole—whether a text that requires understanding, or some general phenomenon of inquiry, such as human development—is initially approached with the meanings, or "prejudices" that constitute common sense. These are the initial meanings of what hermeneutics terms the *preunderstanding*. These anticipatory meanings—called *the horizon of a particular present* (Gadamer, 1989, p. 306)—are projected onto the phenomenon of inquiry. As a consequent, they form an early stage in understanding. However, the object of inquiry is not merely a figment of projection but is itself an internally coherent whole; thus, the object of inquiry reciprocally operates as a corrective source of further projections of meaning. Through this circle of projection and correction understanding advances, and the notion of an advance or progression is appropriate here because the hermeneutic circle is never a closed circle, and represents—following Hegel's dialectic—the open *cycle* whose action creates a continuing directional spirality to knowing. "The circle is constantly expanding, since the concept of the whole is relative, and being integrated in ever larger contexts always affects the understanding of the individual part" (Gadamer, 1989, p. 190).

The hermeneutic circle has formed the conceptual context for several features of developmental inquiry. When inquiry is focused on the transformational nature of ontogenetic change, the hermeneutic circle becomes the conceptual context for the Piagetian theory of assimilation-accommodation, as the action mechanism of change. *Assimilation* constitutes the projection of expressive meanings (i.e., affects, perceptions, cognitions) onto a world being constituted. *Accommodation* constitutes the action of correction, as assimilation yields partial success-partial failure. Psychological development necessarily proceeds from some organization (sensory motor, representational, reflective) that constitutes preunderstanding, and this is projected to constitute the world as experienced. But this projection meets the demands of a world with its own structure, and action corrects itself in anticipation of further projection.

When inquiry is focused on defining the *scientific nature* of developmental inquiry, then the hermeneutic circle articulates the relational scientific logic called "abduction" or "retroduction." This concept and its place in a relational metamethod will be detailed in the methodology section of this chapter.

In claiming the hermeneutic circle as the core precondition for understanding, Gadamer follows Heidegger, by grounding the concept in the existential world (1989, p. 293). Through this grounding (a) epistemology and ontology are joined as relative moments in the whole of understanding, and (b) understanding is identified as both relational (the reciprocity of the interpreter and tradition) and variational-transformational (the oscillating movement of part and whole leads to changes in the form of the individual and tradition).

The hermeneutic circle, as the precondition for understanding, owes an obvious debt to the Leibnizian-Hegelian holistic tradition. Gadamer acknowledges this debt, and identifies himself as "an heir of Hegel." However, this kinship is defined most significantly when Gadamer articulates the specific conditions for under-

standing; for here he endorses the Hegelian "dialectic of the universal and concrete as the summation of the whole of metaphysics" (Gadamer, 1993, p. 51).

The preservation and renewal of the dialectic of universal and concrete—the transcendental and the immanent—defines the core of Gadamer's approach. Here *universal and concrete stand in a dialectic relationship,* an identity of opposites. Each is granted an ontological reality.

The Marxist Split Tradition

Karl Marx was an early admirer of Hegel and an heir to the Leibnizian-Hegelian tradition. His work affirmed the centrality of both activity and the dialectic. However, and most importantly, Marx elevated the material world to an absolute privileged position as *the* source of thought. In this move, Marx reasserted a split tradition. Marx's *dialectical materialism* thus became another foundationalist position similar to the Newtonian-Humean tradition in that both appeal to a mind-independent material world as the absolute bedrock of the Real.

Social and Biological Constructivism

The Marxist split tradition became the ground for a second type of constructivism, *social constructivism.* If the material world is elevated to a privileged ontological status, then this world of instrumental-communicative social relations, and *only* this world, provides the base for building the categories of thought. Once the categories of thought are acquired from the split-off social world, the person projects these socially instilled categories back onto the world, and, in this sense, constructs the known world. Hence, social constructivism is the constructing of the known world from an instrumental-communicative social relations foundation and *only* from this foundation. This position was later elaborated by the pragmatist George Herbert Mead under the rubric of "social behaviorism" (Mead, 1934). Vygotsky, who was writing at about the same time as Mead, has come to be viewed as the father of the social constructivist movement—probably because Vygotsky's writings were initially "discovered and propagated by small groups of 'progressive' young Marxists who saw his work as providing, among other things, a foundation for a criticism of the prevailing tendency to attribute individual failure and success to genetic endowment" (van der Veer & Valsiner, 1994, p. 5).

When Vygotsky is placed in a social constructivist framework, there is no rapprochement between he and Piaget—between the interpersonal and the intrapsychic. When located in this frame, his work becomes more closely aligned with the Gibsonian (Gibson, 1966, 1979) realist ecological position. In this context, the person's "intentions" become reduced to instrumental acts that change through a Darwinian-like selection process in accordance with the affordances of the environment for action (Reed, 1993; Rogoff, 1993).

Social constructivism, as a split position, tends to not even address phenomenological constructivism. Instead, social constructivism places itself in a dichotomous, either/or relationship with yet a third variety of constructivism, *biological constructivism.* Biological constructivism emerges from the Kantian split. It involves the claim that the person cognitively-affectively constructs the world as known, but that genetic endowment determines the fundamental nature of the person who does the constructing. Scarr (1992) nicely illustrates biological constructivism. She maintains, on the one hand, that "reality" is constructed by experience, and thus, it is "not a property of a physical world" (p. 50). On the other hand, she asserts that "*genotypes drive experiences.* . . . In this model, parental genes determine their phenotypes, the child's genes determine his or her phenotype, and the child's environment is merely a reflection of the characteristics of both parents and child" (p. 54). The biological and social constructivist confrontation, as it turns out, is yet another manifestation of the split nature-nurture dichotomy.

The Marxist split tradition has continued to exert a strong contextual influence over both the interpretation of Vygotsky's approach, and, more broadly, the interpretation of the relationship between the intrapsychic and the interpersonal. The Marxist tradition has been elaborated, and these elaborations often function as the epistemological-ontological ground for conceptualizing the interpersonal and social-cultural features of development. Jurgen Habermas's "critical theory" represents the most carefully and fully articulated contemporary elaboration of the Marxist split tradition.

Habermas and the Marxist Split Tradition

In a negative sense, the core of Habermas's work is the denial of any possible centrality of the expressive-constitutive subject as a point of reference. As McCarthy points out, "the key to Habermas's approach is his rejection of the 'paradigm of consciousness' and its associated 'philosophy of the subject' in favor of the through-and-through intersubjectivist paradigm of 'communicative' action" (1993, p. x). Habermas himself

considers this move to an exclusive privileging of the instrumental-communicative to be a "paradigm-change," which leaves behind any vestige of Cartesian "subjectivism" or "metaphysics of subjectivity" (Habermas, 1993b, p. 296). From this position, Habermas (1991, 1992) analyzes favorably George Herbert Mead's "social behaviorism" as furthering the same paradigm shift, and he attacks "the moral point of view" taken by expressive-constitutive oriented developmental investigators such as Kohlberg because here "issues of moral cognition take precedence over questions of practical orientation" (1993a, p. 121).

In a more positive vein, Habermas attempts to locate all the traditional dialectical tensions between subject-object, self-other, and reason- observation *within* the domain of communication and social practice (McCarthy, 1991). If this conceptualization functioned as a point of view thereby allowing another point of view that located the same tensions within the expressive-constitutive subject, it would constitute a powerful perspective from which to explore the instrumental-communicative features of development. However, Habermas insists that the dialectical tensions *must be located in the instrumental-communicative realm, and only in the instrumental-communicative realm.* This insistence on exclusivity, undercuts the potential of the position by perpetuating a split that ultimately unnecessarily constrains developmental inquiry.

Culture and Development in Split and Relational Metatheories

The Marxist split tradition has, in recent times, been an influential background for the study of culture and development. Wertsch (1991) highlights this in his "cultural" approach to development. He begins his broadly synthetic account by setting a contrast between developmental inquiry that focuses on "the universals of mental functioning" and his own focus on "sociocultural specifics." However, rather than continuing this contrast of the universal and the particular—the transcendent and the immanent—in a relational context, Wertsch explicitly establishes the Marxist ontological agenda, and casts Vygotsky and Luria solidly in this tradition, by stating:

> In pursuing a line of reasoning that reflected their concern with Marxist claims about the *primacy of social forces* [emphasis added], Vygotsky and his colleagues . . . contended that many of the design features of mediational means [instrumental activity] originated in social life. As stated by Luria (1981), "in order to explain the highly complex forms of human consciousness one must go beyond the human organism. One must seek the origins of conscious activity and 'categorical' behavior not in the recesses of the human brain or in the depths of the spirit, but in the external conditions of life. Above all, this means that one must seek these origins in the external processes of social life, in the social and historical forms of human existence" (p. 25). (Wertsch, 1991, p. 33–34)

The Marxist split tradition then becomes the bridge between Vygotsky and M. M. Bakhtin (1986) whose contribution was a conception of meaning and language that is thoroughly external to the expressive-constitutive subject (Kent, 1991), as follows:

> Both Vygotsky and Bakhtin believed that human communicative practices give rise to mental functioning in the individual. . . . They were convinced that "the social dimension of consciousness is primary in time and in fact. The individual dimension of consciousness is derivative and secondary" (Vygotsky, 1979, p. 30). (Wertsch, 1991, p. 13)

However, in Wertsch's estimation Vygotsky failed to sufficiently pursue the Marxist tradition, for given that Vygotsky was "interested in formulating a Marxist psychology, he made precious little mention of broader historical, institutional, or cultural processes" (1991, p. 46). Consequently, Wertsch draws on Habermas's (1984) account of instrumental-communicative action, and moves beyond Vygotsky to Bahktin's contribution, to pursue the general claim that "mediational means emerge in response to a wide range of social forces" (1991, p. 34).

Shweder's (1990) approach to culture and development is another contemporary illustration of the background influence of the Marxist split tradition (see also Cole, 1995, 1996; Miller, 1996; Rogoff, 1990, 1993). However, in proposing an outline for a "cultural psychology," he follows a more Habermas-like strategy by locating the dialectic tension of subject and culture necessarily in the realm of instrumental, thereby denying any reality to the fully embodied expressive subject. In Shweder's presentation, the universal, the transcendent, the ideal, and the fixed are explicitly denied any fundamental reality (1990, p. 25); thus, a dichotomy is established that privileges the particular, the immanent, the practical, and the relative. As a result, when Shweder (Shweder & Sullivan, 1990) identifies the subject or person of his subject-culture inquiry, it explicitly is not, nor could it be, the universal or ideal subject

found in some domains of cognitive-affective and personality research. Shweder explicitly excludes this subject, and instead offers the "semiotic subject" characterized by instrumental rationality and instrumental intentionality only. The final result is little different than a straight forward Skinnerian (1971) position or frame in which it is permissible to consider "higher mental processes" only to the extent that they are understood as being defined by a specific repertoire of instrumental responses correlated with specific stimuli. Similarly, for Shweder, "rationality" and "intentions" are defined as instrumental problem solving behaviors that are correlated with cultural contexts.

When the Marxist tradition is the ground for developmental inquiry, as in these illustrative examples, activity is central—as action is central in the Leibnizian-Hegelian relational tradition. However, it is important to keep in focus the fact that activity, in the Marxist tradition, is necessarily restricted to the instrumental-communicative. When Rogoff (1993) discusses cognition—as Sweder discusses intentions or Bakhtin discusses language and meaning—it becomes restrictively defined as "the active process of solving mental and other problems" (p. 124). The Leibnizian-Hegelian tradition accepts both this instrumental action, and expressive mental action as relational moments. But when Rogoff addresses the expressive, she first reframes it as a static formulation and then rejects it as a "cognition as a collection of mental possessions" (p. 124). The result of splitting off the expressive subject, is that Rogoff's own "relational" approach is a relation between the instrumental-communicative subject and cultural contexts. This she presents as an approach, which permits the consideration of "individual thinking or cultural functioning as foreground without assuming that they are actually separate elements" (p. 124). This is correct, but the assumption of "separate elements" has already been made in the background, and the unwanted element of this assumption has already been suppressed.

The expressive-instrumental Leibnizian-Hegelian tradition of the centrality of action is illustrated in a number of action theories that focus on the role of culture in human development (see Oppenheimer, 1991 for a review). However, a particularly rich account is found in the work of E. E. Boesch (1991). As Eckensberger (1989) points out:

> Bosech begins with the notion that any action and any goal has two dimensions or aspects: one . . . is *the instrumental aspect,* that an action is carried out instrumentally in order to reach a goal. For example, one takes a hammer to drive a nail into the wall. There is, however, a second aspect in any action, which Boesch calls the *subjective-functional aspect* [the expressive-constitutive]. Here, the driving of the nail may have the subjective-functional meaning that one feels proud of being able to do so, one may also enjoy it, or it may even be related to feelings of rage. In any case, the action of nailing receives a meaning beyond its instrumental purpose. (p. 30)

From this base, Boesch (1980, 1991, 1992) and Eckensberger (1989, 1990, 1996) formulate the beginnings of a developmentally oriented cultural psychology that is more inclusive than those founded in the Marxist tradition. Boesch's system and Eckensberger's extension of this system draw from Piaget—whom Boesch calls the first action theorist—as well as from Janet's dynamic theory, psychodynamic theory, and Kurt Lewin's field-theory. Elaborating on the relational theme of expressive-constitutive/instrumental-communicative action they argue for a cultural psychology that aims at an integration of "cultural and individual change . . . individual and collective meaning systems . . . [and one that] should try to bridge the gap between objectivism and subjectivism" (Eckensberger, 1990).

Inclusive relational developmental models of the individual and culture are not limited to the European continent. For example, as described earlier, Damon (1988, 1991; Damon & Hart, 1988), presents the outline of just such an approach in his discussion of "two complementary developmental functions, . . . the social and the personality functions of social development" (1988, p. 3). Moving within the broader Leibnizian-Hegelian concepts of differentiation and integration, Damon presents the interpenetration of the two functions as an identity of opposites. Furth (1969), also explicitly presented a relational view of social development in which "self and other as isolated entities are denied in favor of relations" (Youniss, 1978, p. 245), and this perspective has been the continuing focus of Youniss and his colleagues (e.g., Davidson & Youniss, 1995; Youniss & Damon, 1992). This relational perspective has most recently been expanded in the literature on infant development (Mueller & Carpendale, 2004; Hobson, 2002) through a focus on the contrast between individualist (split) and relational approaches to the origin and nature of social development:

> The basic tenet of the relational framework is that the self always already lives within a social world and is always already immersed in relations with other. These relations

> are not established in the mind of the individual, but in common space through interaction and dialogue. . . . Neither self nor other are primary. Rather self and other are sustained by particular interactive relations, and it is within and through these relations that concepts of self and other evolve. (Mueller & Carpendale, 2004, p. 219)

Pragmatism

A final epistemological-ontological tradition that requires a brief exploration to establish a grounding for an inclusive understanding of development is the American pragmatism of Pierce, James, and Dewey. Pragmatism's fundamental postulates cohere as a contextualist worldview (Pepper, 1942) that draws on many Leibnizian-Hegelian themes, including holism, action, change, and the dialectic. The focus of these themes is located on the *instrumental* rather than the expressive pole of the relational dialectic. If Gadamer and Taylor (see also Ricoeur, 1991) can be said to represent the phenomenological perspective of the relational developmental philosophical grounding, then pragmatism, particularly the work of James and Dewey, can be read as representing the instrumental perspective.

Putnam (1995) describes *holism* as one of the chief characteristics of James' philosophy. This holistic commitment leads to an "obvious if implicit rejection of many familiar dualisms: fact, value, and theory are all seen by James as interpenetrating and interdependent" (p. 7). James (1975) addresses virtually all the traditional dichotomies of split-off traditions, and he, along with Dewey (1925), argue for a relational interpenetrating understanding of universal-particular, inner-outer, subject-object, theory-practice, monism-pluralism, and unity-diversity. Although affirming the ontological reality of the dialectic of interpenetration, the stress and the focus of pragmatism is, however, on the particular, the outer, object, practice, pluralism, and diversity.

Epistemologically, pragmatism repudiates the foundationalism of an ultimate fixed object of knowledge, and insists on the connection of knowledge and action. Knowledge arises out of action, out of particular practices or *praxis.* In this respect, James and Dewey differ little from Habermas, Gadamer, Bahktin, and Taylor. Rather than specifically elaborating the notion of dialogue as the mediator of knowing (expressive and instrumental), the concept of experience carries this function in pragmatism. Experience manifests its relational dialectical as well as its embodied character in being what James terms a "double-barrelled" (1912, p. 10) concept. "It recognizes in its primary integrity no division between act and material, subject and object, but contains them both in an unanalyzed totality" (Dewey, 1925, pp. 10–11). *Experience* refers to *both* the action of the subject (i.e., the subject's embodied active exploration, active manipulation, and active observation of the object world) *and* the object world's active impingement on the subject. "It includes *what* men do and suffer, *what* they strive for . . . and endure, and also *how* men act and are acted upon" (p. 10). For purposes of empirical investigation, analysis separates this integrity into two points of view, and hence two different analytic meanings. However, the empirical question is not whether experience is truly one or the other. The question is how each form of experience contributes to the understanding of human development.

Change and novelty are also basic to the pragmatists position. However, the focus of change in pragmatism is on the variational rather than transformational. Similarly, novelty is the new variant rather than the emergent level of organization found in transformational change. This focus is due in part to pragmatism's Darwinian evolutionary commitment ("Darwin opened our minds to the power of chance-happenings to bring forth fit results if only they have time to add themselves together," James, 1975, p. 57) along with the commitment to the joint relation of the instrumental and adaptation.

Pragmatism's focus on variational change and variational novelty, also follow from a preference for pluralism and diversity over unity (James, 1975, p. 79). In the discourse of pragmatism, and especially in James' writings, concepts of "unity," "order," "form," and "pattern" tend to be interpreted as denoting the fixed and unchanging, in the sense of an Absolute Transcendentalism (James, 1975, p. 280) or an essentialism. When this is the horizon of understanding, change in fact necessarily becomes restricted to the sphere of diversity. If it is only in the sphere of diversity and pluralism that there is "some separation among things, . . . some free play of parts on one another, some real novelty or chance" (p. 78), then change must be restricted to this sphere. For pragmatism, it is in the sphere of pluralism and diversity that "the world is still in process of making" (p. 289).

The suggestion, that pragmatism can be read as representing the instrumental perspective of the relational developmental philosophical grounding falters upon this restrictive identification of unity with the static and fixed, and of diversity with the active and changing. In

the broad relational developmental tradition, activity and change are not split off and thus encapsulated. Unity and synonyms of unity—including "the universal," "the transcendent," "order," "system," "form," "pattern," "organization," and "structure"—have been understood throughout the Leibnizian-Hegelian tradition as ontologically active and changing. As emphasized throughout this chapter, the Leibnizian-Hegelian tradition grants the same ontological reality to diversity and synonyms of diversity—including "the concrete," the "immanent," "disorder," "plurality," "content," and "function." From the expressive and transformational point of view within this tradition, structures function (act) and change and self-organizing systems operate (act) and change. From the instrumental and variational point of view within this tradition, action is variational (diversity, plurality, and individual differences) and changing.

A related problem concerns the ambivalent posture that pragmatism takes toward the notion of order or unity itself. If implicit, in the writing of the pragmatists, it is clear, and explicit, in Stephen Pepper's (1942) distillation of the presuppositions of the pragmatists that disorder or diversity is a fundamental category of pragmatism-contextualism. However, because pragmatism offers itself as not denying any category that has a practical value ("I call pragmatism a mediator and reconciler. . . . She has in fact no prejudices whatever," James, 1975, p. 43), it cannot deny order, unity, organization, pattern, or structure. Pragmatism does, however, approach these concepts from a certain distance and distrust. Most important, in some readings pragmatism tends to interpret order and unity as an end to be attained, rather than as a legitimate ontological real. In this case, order is *treated,* if not directly conceptualized, as Appearance. Such a reading of pragmatism splits the dialectical relation between the transcendent and the immanent or unity and diversity found in both Gadamer and Taylor. When this split occurs, pragmatism takes on the flattened character suggested in the postmodern approach of Richard Rorty. As the philosopher Thomas McCarthy (1991) points out, "Rorty's epistemological behaviorism is a variant of the contextualism common to most postmodernist thinkers" (p. 20). It entails "a radically contextualist account [that] . . . amounts to flattening out our notions of reason and truth by removing any air of transcendence from them" (p. 14–15).

This split reading of pragmatism is not necessarily canonical however. Pepper, in a work following his well-known *World Hypotheses,* acknowledges the significance of *integration* in contextualism. He argues relationally that the integration the pragmatist should stress "is an integration of conflicts" (1979, p. 411); hence, a dialectical integration. He also warns the contextualist against the danger of an overemphasis on the contingent, the accidental, and the variable. For Pepper, the contextualist has been "so impressed with evidences of historical change and cultural influences and the shifting contexts of value that he cannot easily bring himself to accept any degree of permanence" (p. 414). Pepper chides the constricted contextualist by arguing that "there is much more permanence in the world than the contextualist admits" (p. 414). Similarly, Hilary Putnam has elaborated an extensive contemporary relational reading of pragmatism. Putnam sometimes refers to this reading as "internal realism" and sometimes as "pragmatic realism" (1987, 1990, 1995). In either case, the—"realism" is the commonsense realism discussed earlier—neither the Realism of mind (idealism), nor the Realism of world (materialism). The "internal" and "pragmatic" features of his system assert the position of a pragmatism that includes both the expressive and the instrumental.

Finally, that pragmatism need not be read as a split tradition, which suppresses order and change of form, can even be gleaned from the writings of one of the founders of pragmatism:

> There is in nature . . . something more than mere flux and change. Form is arrived at whenever a stable, even though moving, equilibrium is reached. Changes interlock and sustain one another. Whenever there is this coherence there is endurance. Order is not imposed from without but is made out of the relations of harmonious interactions that energies bear to one another. Because it is active . . . order itself develops. It comes to include within its balanced movement a greater variety of changes. (Dewey, 1934, p. 14)

If pragmatism is read as joining order to disorder, and joining activity and change to both structure and function as this quote from Dewey and the work of Putnam and others suggest, then pragmatism enlarges the philosophical grounding of the relational developmental tradition, and it enlarges the field of developmental inquiry. Illustrations of the impact of this expanded grounding of pragmatism are found, for example, in Damon and Hart (1988) with respect to social development, Nucci (1996) on moral development, and in the works of Varela et al. (1991) and Wapner and Demick

(1998) for cognitive development. Piaget (1985)—considering the relation between his earlier investigations of operational knowing (expressive-transformational) and contemporary explorations of procedural knowing (instrumental-variational)—found in this new arena "a possible synthesis of genetic structuralism, the focus of all of our previous work, with the functionalism found in the work of J. Dewey and of E. Claparede" (p. 68).

The aim of this section has been to establish a broad epistemological-ontological grounding for an inclusive understanding of development as formal (transformational) and functional (variational) changes in the expressive-constitutive and instrumental-communicative features of behavior. This has been done by following the historical thread of the Leibnizian-Hegelian tradition and noting the locations where this thread splits-off toward exclusivity. Ultimately, the illustrations given do not aim to categorize particular writings. Rather, they suggest the consequences that follow for the domain of developmental inquiry when a particular path is taken. In the concluding section, the epistemological-ontological grounding, the relational developmental metatheory, developmental systems, developmentally oriented embodied action metatheory and the integrative concept of development become the interwoven context for a discussion of the nature of the scientific understanding and explanation of developmental phenomena. This section centers on issues of methodology, where methodology is understood broadly as metamethods for empirical scientific inquiry. Methods, in the narrow sense of specific techniques for designing, conducting, and evaluating empirical research, are considered within the context of alternative methodologies.

In an important sense, the discussion to the present point has constructed our developmental landscape, and populated it with certain types of psychological subjects (expressive-instrumental), who change in certain ways (transformationally-variationally), and act in a biological-cultural world that both creates and is created by them. Now, the task is to inquire into how best to investigate the changing character of these persons and this world. This is the task of methodology.

METHODOLOGY: EXPLANATION AND UNDERSTANDING

The focus to this point has been developmental inquiry as a broad-based knowledge-building activity. Now, we turn more specifically to developmental psychology as an empirical science. The historical dialogue has arrived at a common agreement that whatever else it may be, any empirical science is a human activity—an epistemological activity—with certain broad orientations and aims. The historical dialogue has further led to common agreement that the most general aim and orientation of empirical science is the establishment of a *systematic* body of knowledge that is tied to observational evidence (Lakatos 1978b; Laudan 1977; Nagel, 1979; Wartofsky, 1968). Any empirical science aims at building a *system* of knowledge that represents *patterns* of relations among phenomena and processes of the experienced world. These patterns constitute explanations of the phenomena and processes under consideration. Further, to be properly empirical, the explanations must have implications that are *in some sense* open to observational-experimental assessment.

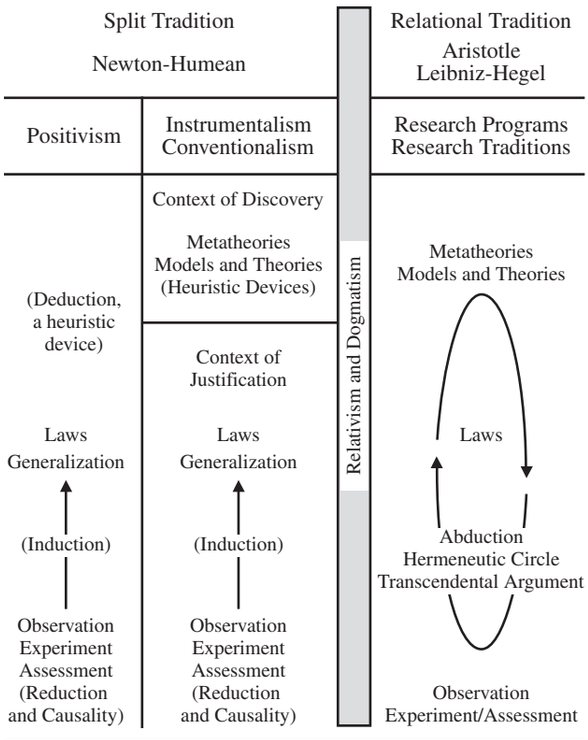
If science aims toward order, it begins in the flux and chaos of the everyday experience that is often termed common sense (see earlier discussion of commonsense level of observation, Figure 2.1, and see also, Nagel, 1967, 1979; Overton, 1991c; Pepper, 1942; Wartofsky, 1968). As the philosopher Ernst Nagel (1967) has described it, "All scientific inquiry takes its departure from commonsense beliefs and distinctions, and eventually supports its findings by falling back on common sense" (p. 6). This commonsense base is what Gadamer refers to as the "anticipatory meanings" of preunderstanding (see earlier discussion of the hermeneutic circle).

For the science of developmental psychology, this starting point includes actions that are commonly referred to as perceiving, thinking, feeling, relating, remembering, valuing, intending, playing, creating, languaging, comparing, reasoning, wishing, willing, judging, and so on. These actions, and the change of these actions, as understood on a commonsense level of experience or discourse (see Figure 2.1), constitute the problems of developmental psychology. They are problems because, although they represent the stability of practical everyday life, even the most meager reflection reveals they appear as inconsistent, contradictory, and muddled. Refined, critically reflective theories and metatheories, including systems, embodiment, cultural, biological, information processing, Piagetian, Gibsonian, Vygotskian, Eriksonian, Chomskyian and the rest, all represent attempts to explain (i.e., to bring order into) the contradictory, inconsistent, muddled features of these various domains of inquiry.

There is little disagreement among scientists, historians of science, and philosophers of science about where science begins—in common sense and the contradictions that show up when we begin to examine common sense—and where it leads—to refined theories and laws that explain. Science is a human knowledge building activity designed to bring *order and organization into the flux of everyday experience.* Disagreement emerges only when the question is raised of exactly how, or by what route, science moves from common sense to refined knowledge. *This issue—the route from common sense to science—constitutes the methodology of science.* Historically, two routes have been proposed, and traveled. One emerges from the Newtonian-Humean split epistemological-ontological tradition. Those who follow this route are directed to avoid interpretation, and to carefully walk the path of observation and *only* observation. On this path, reason enters *only* as an analytic heuristic; a tool for overcoming conflicts by generating ever more pristine observations, free from interpretation. The second route emerges from the Leibnizian-Hegelian relational tradition. Those who follow this route are directed toward a relational dialectical path on which interpretation and observation interpenetrate and form an identity of opposites. On this path, interpretation and observation, become co-equal complementary partners in conflict resolution.

The following discussion discusses these two pathways (see Overton 1998 for a more extensive historical discussion). We begin from the Newtonian split tradition of mechanical explanation and move to a contemporary relational methodology. This evolution of these scientific methodologies including the empiricist variants of positivism, neopositivism, instrumentalism, and conventionalism as well as relational metamethod is outlined in Table 2.1.

TABLE 2.1 Scientific Methodologies



Split Mechanical Explanation

Mechanical explanation continues the splitting process by dichotomizing science into two airtight compartments, *description and explanation.* There are three steps to mechanical explanation. The first is considered descriptive and the second two are considered explanatory.

Step 1: Reduction Description

The first step of mechanical explanation entails addressing the commonsense object of inquiry and *reducing* it to the absolute material, objective, fixed, unchanging, foundational elements or atoms, that are, in principle, directly observable. Terms like *reductionism, atomism, elementarism, and analytic attitude,* all identify this step. In psychology, for many years the atoms were "stimuli" and "responses." Today, they tend to be "neurons" and "behaviors" or "contextual factors" and "behaviors" or "inputs" and "outputs"—the story line changes, but the themes remain the same within this metamethod. In keeping with the framework of empiricism and materialism, the broad stricture here is to ultimately reduce all phenomena to the visible.

Briefly, consider one impact of this first step on developmental inquiry. Immediately, "transformational change," "stages" of development, and the "mental organizations," or "dynamic systems" that change during development become suspect as being somehow derivative because they are not directly observable. At best under this storyline, transformations, stages, and mental organization can only function as summary statements for an underlying more molecular really Real. The drive throughout this step is toward the ever more molecular in the belief that it is only in the realm of the molecular

that the Real is directly observed. This is particularly well illustrated in the recent enthusiasm for a "microgenetic" method (e.g., D. Kuhn et al., 1995; Siegler, 1996) as a method that offers "a *direct* means for studying cognitive development" (Siegler & Crowley, 1991, p. 606, emphasis added). In this approach an intensive "trial-by-trial analysis" reduces the very notion of development to a molecular bedrock of visible behavioral *differences* as they appear across learning trials.

It is important to recognize that the aim of Step 1 is to drive out interpretations from the commonsense phenomena under investigation. Under the objectivist theme, commonsense observation is error laden, and it is only through ever more careful *neutral* observation that science can eliminate this error, and ultimately arrive at the elementary bedrock that constitutes the level of "facts" or "data" (i.e., invariable observations).

Step 2: Causal Explanation

Step 2 of mechanical explanation begins to move inquiry into the second compartment of compartmentalized science—*explanation.* Step 2 consists of the instruction to find the invariant relations among the elements described in Step 1. More specifically, given our objects of study in developmental psychology—behavior and behavior change—this step directs inquiry to locate antecedents. These antecedents, when they meet certain criteria of necessity and sufficiency, are termed "causes" and *the discovery of cause defines explanation within this metamethod.* The antecedents are also often referred to as *mechanisms,* but the meaning is identical.

This is another point at which to pause and notice an important impact of metatheory. Because of the particular metatheoretical principles involved, the word "explanation" comes to be defined as an antecedent-consequent relation, or the efficient-material proximal cause of the object of inquiry. Further, science itself comes to be defined as the (causal) explanation of natural phenomena. It is critically important to remember here that Aristotle had earlier produced a very different metatheoretical story of scientific explanation. Aristotle's schema entailed *complementary relations* among four types of explanation rather than a splitting. Two of Aristotle's explanations were causal in nature (i.e., antecedent material and efficient causes). Two, however, were explanations according to the pattern, organization, or form of the object of inquiry. Aristotle's "formal" (i.e., the momentary pattern, form or organization of the object of inquiry) and "final" (i.e., the end or goal of the object of inquiry) explanations were explanations that made the object of inquiry *intelligible* and gave *reasons* for the nature and functioning of the object (Randall, 1960; Taylor, 1995). Today, the structure of the atom, the structure of DNA, the structure of the solar system, and the structure of the universe are all familiar examples of formal pattern principles drawn from the natural sciences. Kinship structures, mental structures, mental organization, dynamic systems, attachment behavior system, structures of language, ego and superego, dynamisms, schemes, operations, and cognitive structures are familiar examples of formal pattern principles drawn from the human sciences. Similarly, reference to the sequence and directionality found in the Second Law of Thermodynamics, self-organizing systems, the equilibration process or reflective abstraction, the orthogenetic principle, or a probabilistic epigenetic principle, are all examples of final pattern principles (Overton, 1994a).

Both formal and final pattern principles entail interpretations that make the phenomena under investigation intelligible. Both, within the Aristotelian *relational* scheme, constitute legitimate explanations. However, within the *split* story of mechanical explanation, as guided by reductionism and objectivism, formal and final principles completely lose any explanatory status; explanation is limited to *nothing but* observable efficient (i.e., the force that moves the object) and material (i.e., the material composition of the object) causes. At best, within the mechanical story, formal and final principles may reappear in the descriptive compartment as mere summary statements of the underlying molecular descriptive "Real" discussed in Step 1. In this way, transformational change and dynamic psychological systems become eliminated or marginalized as necessary features of developmental inquiry.

Step 3: Induction of Interpretation-Free Hypotheses, Theories, Laws

Step 3 of mechanical explanation installs *induction* as the foundational logic of science. Step 3 instructs the investigator that ultimate explanations in science must be found in fixed unchanging laws, and these must be inductively derived as *empirical generalizations* from the repeated pristine observations of cause-effect relations found in Step 2. Weak generalizations from Step 2 regularities constitute interpretation-free "hypotheses." Stronger generalizations constitute interpretation-free theoretical propositions. Theoretical propositions joined

as logical conjunctions (and connections) constitute interpretation-free theories. Laws represent the strongest and final inductions.

Deduction reenters this story of empirical science as a split-off heuristic method of moving from inductively derived hypotheses and theoretical propositions to further empirical observations. In twentieth-century neopositivism, a "hypothetico-deductive method" was introduced into the Newtonian empiricist metamethod but this it was simply another variation on the same theme. The hypothesis of "hypothetico" has nothing to do with interpretation, but is simply an empirical generalization driven by pristine data that then served as a major premise in a formal deductive argument. Similarly, when the mechanical explanation termed "instrumentalism" moved away from the hypothetico-deductive stance to the employment of models, models themselves functioned merely as the same type of interpretation-free heuristic devices (see Table 2.1).

Another important variation on this same theme was the so-called covering law model of scientific explanation. This was introduced as a part of neopositivism by Carl Hempel (1942) and became the prototype of all later explanations formulated within this metatheory. According to the covering law model, scientific explanation takes a deductive (i.e., formal) logical form; particular events are explained when they are logically subsumed under a universal law or law-like statement (i.e., a highly confirmed *inductive empirical generalization*; Ayer, 1970; Hempel, 1942). The covering law model was particularly important for developmental inquiry because it treated historical events as analogous to physical events in the sense that earlier events were considered the causal antecedents of later events (Ricoeur, 1984).

Here, then, is the basic outline of the quest for absolute certainty according to the Newtonian and later empiricist stories of scientific methodology: Step 1, reduce to the objective (interpretation-free) observable foundation. Step 2, find the causes. Step 3, induce the law. As noted, variations appear throughout history. In fact, it would be misleading not to acknowledge that "probability" has replaced "certainty" as the favored *lexical item* in the story as it is told today. Induction is itself statistical and probabilistic in nature; however, this change represents a change in style more than substance, as the aim remains to move toward 100% probability, thereby arriving at certainty or its closest approximation. This type of fallibilistic stance continues to pit doubt against certainty as competing alternatives rather than understanding doubt and certainty as a dialectical relation, framed by the concept of *plausibility*.

Positivism and Neopositivism

Since its origin in the eighteenth century, mechanical explanation has been codified in several forms as specific methodologies or metamethods. Each of these represents a variation on the theme, but none of them have changed the basic theme itself. In the middle of the nineteenth century, mechanical explanation began to be formalized into a general strategy designed to demarcate empirical science from nonscience. It was at this time that the "age of metaphysics" came to an end. The ending was defined by philosophy's turning away from imperialistic dogmatic applications of broad philosophical systems, and directing its reflections toward what were called the "positive" sciences. Auguste Comte, writing a history of philosophy at the time, coined the term "positivism" when he described a division of three ages of thought: an early theological age, a metaphysical age that was just passing, and an age of positive science (see Gadamer, 1993; Schlick, 1991). The positive sciences were understood as those that located inquiry in the "given" or "positive." This positive sphere was identified as the sphere of "experience" rather than a sphere of the transcendental *a priori*. However, under the continuing influence of the "silent" metaphysics of the Newtonian-Humean tradition of empiricism and materialism, the "given" of experience became defined, not as commonsense observations or a commonsense level of discourse, but as observations that had been purified (i.e., reduced) of all interpretative features (i.e., reduced to "data" and more specifically, a type of data termed "sense data"). Thus, the positive sciences came to be those that were grounded in the Newtonian methodology, and positivism came to consist of the rules that further codified that methodology (see Table 2.1).

Following Comte, positivism was articulated across the remainder of the nineteenth century and into the early twentieth century by John Stuart Mill, Richard Avenarius, and Ernst Mach. In the 1920s and 1930s, what came to be termed neopositivism assumed a new posture in the philosophical work of the Vienna Circle, composed of such principal figures as Moritz Schlick, Rudolf Carnap, Herbert Feigl, Gustav Bergmann, Otto Neurath, Kurt Godel, and A. J. Ayer (see Smith, 1986). This "logical" positivism—which Schlick preferred to call "consistent empiricism" (1991, p. 54)—grew in the

context of the legacy of the Newtonian-Humean tradition that was now coming to be called analytic philosophy. At this point, analytic philosophy was taking its "linguistic turn" away from traditional epistemological questions of how the Real is known and replacing these with questions of what it means to make the language claim that the Real is known. In this context, logical positivism concerned itself not with knowing the Real but with the nature of statements that claim to know the Real (Schlick, 1991, p. 40).

Logical positivism focused on the reductionist and inductive features of Newtonian mechanical methodology. These were presented as the descriptive features of science, and as they go hand in hand with (causal) explanation as formulated in the covering law model, science from a positivist point of view is often characterized as the *description and explanation of phenomena.* This reductionistic focus ultimately led to the articulation of two complementary criteria for the demarcation of science from nonscience (Lakatos, 1978a, 1978b; Overton, 1984). First, a proposition (e.g., a hypothesis, a theoretical statement, a law) was acceptable as scientifically meaningful *if, and only if,* it could be reduced to words whose meaning could be directly observed and pointed to. "The meaning of the word must ultimately be *shown,* it has to be *given.* This takes place through an act of pointing or showing" (Schlick, 1991, p. 40). The words "whose meaning could be directly observed" constituted a *neutral observation language*—completely objective and free from subjective or mind-dependent interpretation. Thus, all theoretical language required reduction to pristine observations and a neutral observational language. Second, a statement was acceptable as scientifically meaningful *if, and only if,* it could be shown to be a strictly inductive generalization, drawn directly from the pristine observations. Thus, to be scientifically meaningful, any universal propositions (e.g., hypotheses, theories, laws) had to be demonstrably nothing more than summary statements of the pristine observations themselves (see Table 2.1).

Although logical positivism was formulated primarily within the natural sciences, its tenets were exported into behavioral science through Bridgman's (1927) "operationalism." The reductionism of positivism culminated in A. J. Ayer's (1946) "Principle of Verifiability." According to this principle, a statement is scientifically meaningful to the extent that, in principle, there is the possibility of direct experience (pristine observation) that will verify or falsify it. Bridgman's operationalism extended this principle by not only setting the criteria of scientific meaning, but also identifying the specific nature of this meaning: Within operationalism, the meaning of a scientific concept resides in the application of the concept (i.e., in the definition of the concept in operational or application terms).

Neopositivism reached its zenith in the 1940s and 1950s, but ultimately both the friends and the foes of positivism recognized its failure as a broad demarcationist strategy. It failed for several reasons:

1. It became clear, as demonstrated in the work of Quine (1953) and others (e.g., Lakatos, 1978b; Popper, 1959; Putnam, 1983), that rich theories are not reducible to a neutral observational language.
2. There was a demonstrated inadequacy of induction as the method for arriving at theoretical propositions (Hanson 1958, 1970; Lakatos, 1978a; Popper, 1959).
3. It became evident that the covering law model that it introduced was highly restricted in its application (Ricoeur, 1984) and faulty in its logic (Popper, 1959).
4. It was recognized that there are theories that warrant the attribution "scientific" despite the fact that they lead to no testable predictions (Putnam, 1983; Toulmin, 1961).

Instrumentalism-Conventionalism

With the failure of neopositivism, there arose out of the Newtonian-Humean tradition a revised methodology called *instrumentalism* or *conventionalism* (Lakatos, 1978b; Laudan, 1984; Kaplan 1964; Overton, 1984; Pepper, 1942; Popper, 1959). This demarcationist strategy accepted the failure of reductive-inductive features of positivism and admitted the introduction of theoretical interpretation as an irreducible dimension of science (see Table 2.1). However, metatheories, theories, and models were treated as mere *convenient or instrumental heuristic devices for making predictions.* Thus, theories in instrumentalism were restricted to the same predictive function that formal deductive systems (the covering law model) performed in neopositivism. Popper (1959) added a unique dimension to instrumentalism through the claim that theories and models should become acceptable in the body of science, *if and only if,* they specify observational results that, if found, would disprove or falsify a theory.

Instrumentalism opened the door for interpretation to reenter science but hesitated in allowing it to become a full partner in the scientific process of building a systematic body of knowledge. The movement to a dialecti-

cally defined full partnership of interpretation and observation required a radical change; one that would (a) abandon the splitting and foundationalism that had established pristine observation as the exclusive final arbiter of truth and (b) free up the notion of scientific explanation that was fossilized by this splitting and foundationalism. This move to a Libnizian-Hegelian relational alternative path from common sense to refined scientific knowledge emerged in the 1950s and it continues to be articulated today.

The concepts that constitute this relational methodology arose from diverse narrative streams including analytic philosophy, the history and philosophy of the natural sciences, the philosophy of behavioral and social sciences, and hermeneutics. Despite their often complementary and reciprocally supportive nature these narratives have frequently failed to connect or enter into a common dialogue. Yet, their cumulative effect has been to forge at least the outline of an integrated story of scientific methodology that moves beyond the split Cartesian dichotomies of natural science versus social science and explanation versus understanding, observation versus interpretation, and theory versus data.

Here briefly are some of the central characters in the 1950s emergence of this new metamethod: The later Ludwig Wittgenstein (1958)—whose seminal book *Philosophical Investigations* was first published in 1953—represented analytic philosophy, and he was followed by his pupil Georg Henrik von Wright and later Hilary Putnam. Hans-Georg Gadamer (1989)—whose *Truth and Method* was first published in 1960—represented the hermeneutic tradition and later came Jurgen Habermas, Richard Bernstein, and Paul Ricoeur. Steven Toulmin (1953)—whose *Philosophy of Science* was published in 1953—and N. R. Hanson (1958)—whose *Patterns of Discovery* was published in 1958—represented the natural sciences. They were later followed by Thomas Kuhn, Imre Lakatos, Larry Laudan, and, most recently, Bruno Latour. Elizabeth Anscombe (1957)—whose *Intention* was published in 1957, as were William Dray's (1957) *Laws and Explanation in History,* and Charles Frankel's (1957) *Explanation and Interpretation in History,* represented the social sciences as did Peter Winch (1958) and Charles Taylor (1964).

Relational Scientific Methodology

The story of the development of an integrated relational methodology of the sciences is obviously detailed and complex (see Overton, 1998, 2002). I outline its main features by focusing primarily on some of the major contributions of several of these central figures. These include Wittgenstein (1958) and *Philosophical Investigations,* Gadamer (1989) and *Truth and Method,* Hanson (1958) and *Patterns of Discovery,* von Wright (1971) and *Explanation and Understanding,* and Ricoeur (1984) and *Time and Narrative.*

Wittgenstein and Gadamer provide the basic scaffolding for the construction of this relational methodology. Wittgenstein's fundamental contribution entailed opening the door to the recognition that it is a profound error to treat the activities of science as providing veridical descriptions of a foundational Real. More positively, Wittgenstein's contribution lies in his suggestion that science is the product of some of the same human actions that underlie the conceptual constructions of our "form of life" or our *lebenswelt.* Gadamer's contribution was a systematic demonstration that this move beyond objectivism and foundationalism did not necessitate a slide into relativism.

Hanson's (1958) analysis of the history of the physical sciences was significantly influenced by Toulmin and by the Wittgenstein of *Philosophical Investigations.* In this work, Hanson drew three conclusions about the actual practice of the physical sciences as distinct from the classical rules described by neopositivism and instrumentalism. Hanson's conclusions themselves articulate a blueprint for the new relational methodology. The conclusions were: (a) There is no absolute demarcation between interpretation and observation, or between theory and facts or data. This was captured in his now famous aphorism "all data are theory laden." (b) Scientific explanation consists of the discovery of patterns, as well as the discovery of causes (see also Toulmin, 1953, 1961). (c) The logic of science is neither a split-off deductive logic, nor a split-off inductive logic, but rather, the logic of science is abductive (retroductive) in nature.

Interpretation and Observation

Hanson's first conclusion, that "all data are theory-laden," became the core principle of the new relational methodology: If there is a relational reciprocity between observation and interpretation, then the analytic idea of reducing interpretation to a foundational observational level makes no sense. In place of the analytic reductionism described in Step 1 of mechanical explanation, relational methodology substitutes a complementarity of analysis and synthesis. Analysis and the analytic tools of empirical science are reaffirmed in this principle, but there is a proviso that it simultaneously be recognized

that the analytic moment always occurs in the context of a moment of synthesis, and that the analysis can neither eliminate nor marginalize synthesis.

This feature of the new relational methodology was further supported and extended by two features of Gadamer's "philosophical hermeneutics." The first was his insistence that the alternating to-and-fro motion exhibited in play presents a favorable ontological alternative to Cartesian foundationalism. It is this ontological theme of to-and-fro movement that grounds and sustains the relational methodology. As a consequence, scientific activity—regardless of whether that activity is in the natural or the behavioral or the social sciences—becomes grounded in the to-and-fro (Escherian left hand-right hand) movement of interpretation-observation.

Gadamer's second contribution consists of his articulation—following Heidegger—of the hermeneutic circle described earlier. In this articulation, the hermeneutic circle comes to describe the basic *form* of how interpretation and observation move to and fro; that is, the cycle that opens to a spiral describes the basic structure of the new scientific methodology.

Inquiry moves in a circular movement from phenomenological commonsense understanding of an object of inquiry to the highly reflective and organized knowledge that constitutes scientific knowledge. The whole—the general field of inquiry, such as human development—is initially approached with the meanings or "prejudices" that constitute both commonsense observations and background presuppositions including metatheoretical assumptions. These anticipatory meanings are projected onto the phenomenon of inquiry. As a consequent, they form an early stage in inquiry. However, the object of inquiry is not merely a figment of projection, but is itself an internally coherent whole; the object of inquiry reciprocally operates as a corrective source of further projections of meaning. In this circle, interpretation identifies what will ultimately count as observations, and observations determine what will count as interpretation. To paraphrase Kant, interpretation without observations is empty; observation without interpretation is blind.

Through this circle of projection (interpretation) and correction (observation; Escherian left hand-right hand) inquiry advances; the circle remains open and constitutes a spiral. It was the dialectic cycle of interpretation and observation that later grounded Thomas Kuhn's (1962, 1977) notion of interpretative *paradigms* in the natural sciences and Lakatos's (1978a, 1978b) and Laudan's (1977, 1984, 1996) later discussions of the centrality of ontological and epistemological background presuppositions in any *research program* or *research tradition* (see Table 2.1).

Causality and Action Patterns

Hanson's second conclusion—that pattern and cause have always operated as explanations in the physical sciences—subverts the split stories of a clear-cut line of demarcation between the natural and social sciences. If natural science inquiry has—throughout the modern period—centrally involved both pattern and causal explanation, then understanding and explanation need not be dichotomous competing alternatives. Pattern or action-pattern explanation (Aristotle's formal and final explanation), which entails intention and reasons, and, causal explanation (Aristotle's material and efficient explanation), which entails necessary and sufficient conditions, here become relational concepts (Escherian left hand-right hand). Explanation then—defined as "intelligible ordering" (Hanson, 1958)—becomes the superordinate concept that joins dynamic patterns and cause. In place of detached causes described in Step 2 of mechanical explanation, relational methodology thus substitutes this concept of intelligible ordering.

The challenge within this relational methodology is to establish a justifiable coordination of the two modes of explanation. Von Wright (1971) presents a richly detailed and complex effort in this direction, and Ricoeur (1984) later builds upon and expands this effort. Both focus on explanation in the behavioral and social sciences. Von Wright and Ricoeur each suggest that the coordination be made along the lines of an internal-external dimension. Internal here refers to the domain of the psychological person-agent or psychological action system. External refers to movements or states. Following from a critical distinction made earlier by Anscombe (1957), any given behavior can be considered internal under one description and external under another description. Thus, any specific behavior may be, to quote von Wright (1971) "intentionalistically understood as being an action or otherwise aiming at an achievement, *or* . . . as a 'purely natural' event, i.e. in the last resort, muscular activity" (p. 128).

Within this framework, causal explanations—understood as Humean causes defined by the logical independence or contingency relationship between cause and effect—account for external movements and states. Action-pattern explanation (i.e., action, action systems, intention, reason) accounts for the meaning of an act.

On a moment's reflection, the situation described here is quite clear. Imagine the following behavior of two figures: Figure A moves across a space and a part of Figure A comes into contact with Figure B. In this situation, we have states and movements, and causal explanation is quite appropriate. The intervening states that identify the movement can readily be considered a series of sufficient and necessary conditions leading to the last state in the series. This can be easily demonstrated via various experimental designs.

While this explanation could be satisfactory if the figures were inorganic objects, the situation changes when the figures are identified as persons. In this latter case, it is unlikely that you will be satisfied with the causal explanation because you have been given no real psychological sense of the meaning of these movements. If, however, after identifying the figures as people you further learn that the movement of Figure A to B is the action of a man who walks across the room and caresses his wife's cheek, explanation begins to operate in the context of action, intention, reasons, and broadly meaning. The two moments of explanation—causal explanation, on the one hand, and action-pattern explanation, on the other—explain different phenomena. They have distinct referents; *movement and states* in causal explanation and *meaning* in action-pattern explanation. Because they have different referents—different *explananda*—they are compatible. However, they don't replace each other. Action isn't a cause of movement, it is a part of movement. Cause cannot explain action, action is required to initiate movement.

There are a number of implications that can be drawn from this analysis of the coordination of explanatory types. One is that it demonstrates that, in principle, it is not possible to explain phenomena of consciousness via brain or neurobiological explanations. Consciousness is internal as defined above; consciousness is about psychological meaning and must be explained by actions-pattern explanation. The brain is external, it is about states and movements, not psychological meaning. Neurobiological causal explanation complements action-pattern explanation, but can never present "the mechanism" of consciousness.

A second important implication is that when one again considers the distinction between person-centered and variable inquiry, it becomes clear that action-pattern explanations are the focus of the former and causal-explanations the focus of the latter. Piaget's theory, for example, represents a person-centered theory. "Person" (child-adult), "agent" (system, i.e., the "epistemological subject"), "action," "embodiment," and "intention" are core concepts that identify Piaget's focus on development. Piaget implicitly recognized the coordination of explanatory types and focused his efforts on explanation via formal action-pattern (schemes, operations) and final action-pattern (the equilibration process, reflective abstraction). Many, if not all, of the misunderstandings of Piagetian theory that Lorenço and Machado (1996) have articulated are derived from the fact that attacks on Piaget theory have invariably come from those who remain locked into the neopositivist story of exclusive causal explanation.

There are other implications to be drawn from a relational coordination of explanatory types, but a most important question that arises is that of exactly how action pattern explanation is operationalized. Students from their first science courses are trained in experimental methods designed to sort out the causal status of variables. When it can be shown, under controlled conditions, that an added variable (antecedent, independent variable) reliably leads to the behavior of interest (consequent, dependent variable), this demonstrates that the variable is the sufficient cause of the event. This provides the rationale for training and enrichment experiments often found in developmental psychology. If it can be shown, under controlled conditions, that when a variable is subtracted or removed and the event does not occur, the variable is the necessary cause of the event. This provides the rationale for deprivation experiments. Correlations are also discussed in this context, and while it is made explicit that correlation isn't causation, the same message treats correlation as a step in the direction of causal explanation.

But inductees into scientific methods receive little instruction concerning action-pattern forms of explanation, except perhaps to be told from an implicit neopositivist or instrumentalist perspective that it would be inappropriate speculation. To understand how action-pattern explanations can be made in a legitimate scientific fashion, it is necessary to turn to Hanson's third conclusion about the actual operation of science.

Abduction-Transcendental Argument

Hanson concluded that neither split-off induction nor split-off deduction constitutes the logic of science. Each of these enters the operation of science, but Hanson argued that the overarching logic of scientific activity is abduction. Abduction (also called "retroduction") was originally described by the pragmatist philosopher Charles Sanders Pierce (1992). In a contemporary version

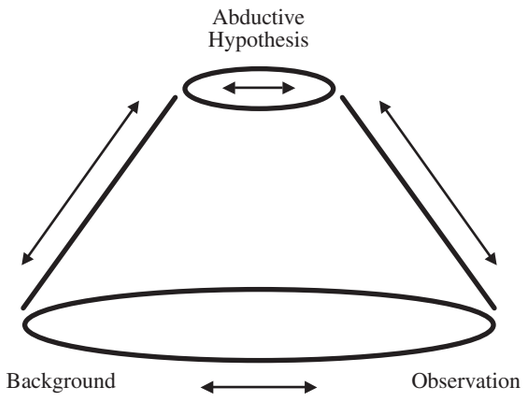


Figure 2.10 The abductive process.

this logic is termed "inference to the best explanation" (Fumerton, 1993; Harman, 1965). Abduction operates by arranging the observation under consideration and all background ideas (including all metatheoretical principles and theoretical models) as two Escherian hands (Figure 2.10). The possible coordination of the two is explored by asking the question of what, given the background ideas, must necessarily be assumed to have that observation. The inference to—or interpretation of—what must, in the context of background ideas, necessarily be assumed, then constitutes the explanation of the phenomenon. This explanation can then be assessed empirically to ensure its empirical validity (i.e., its empirical support and scope of application). An important relational feature of this logic is that it assumes the form of the familiar hermeneutic circle by moving from the phenomenological level (the commonsense object) to explanation and back in an ever-widening cycle that marks scientific progress (see Figure 2.11). The difference between this and the earlier described hypothetical-deductive explanation is that in abduction all background ideas, including metatheoretical assumptions, form a necessary feature of the process, and the abductive explanations themselves become a part of the ever widening corpus of background ideas.

The basic logic of abduction operates as follows:

1. Step 1 entails the description of some highly reliable phenomenological observation (O is the case).
2. For step 2, with O as the explanandum, an inference or interpretation is made to an action-pattern explanation (E). This results in the conditional proposition "If E is the case, then O is expected."
3. Step 3 entails the conclusion that E is indeed the case.

Examples of this abductive action-pattern explanation—or more specifically the one I describe next—are found

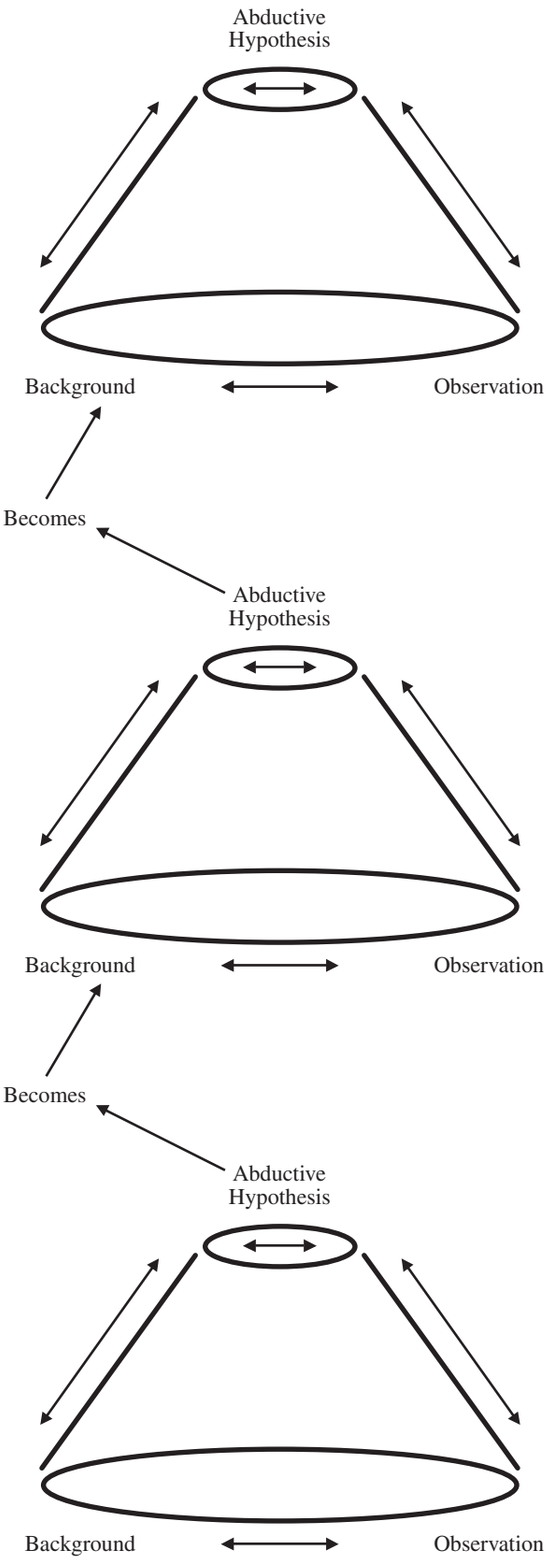


Figure 2.11 Scientific progress through abduction.

in virtually any psychological work that assumes a centrality of emotional, motivational, or cognitive mental organization. Piaget's work is particularly rich in abductive explanation. Consider the following example:

> There is the phenomenal observation (O) that it is the case that certain persons (i.e., children generally beyond the approximate age of 7 years) understand that concepts remain quantitatively invariant despite changes in qualitative appearances (conservation).
>
> Piaget then infers (E) a certain type of action system having specified features including reversibility (concrete operations). Thus, the conditional "If (E) concrete operations, then (O) conservation, is what would be expected."
>
> And the conclusion, given the O, "Therefore, concrete operations explains the understanding of conservation."

As Fumerton (1993) points out, it is obvious that if the conditional in Step 2 is read as material implication, the argument would be hopeless as it would then describe the fallacy of the affirmed consequent (i.e., the circle would be closed and it would represent a form of vicious circularity). Quite correctly, Fumerton recognizes that the "If . . . then" relation asserts some other sort of *connection.* Specifically, the connection is one of meaning "relevance" between E & O, where relevance is defined in terms of the intelligibility of the relation between E and O (Overton, 1990).

There must also be criteria established that would allow us to choose among alternative Es, the "best" E. But this is no major hurdle because many of the traditional criteria for theory or explanation *selection* that have been available can, with profit, be used here. These criteria include scope of the explanation; the explanation's depth, coherence, logical consistency; the extent to which the explanation reduces the proportion of unsolved to solved conceptual and/or empirical problems in a domain (Laudan, 1977); and the explanation's empirical support and empirical fruitfulness. Note here that scope, empirical support, and fruitfulness themselves bring the circle back to the observational world and thus keeps the cycle open. Action-pattern explanation or theory, in fact, determines what will count as further observations and the empirical task is to go into the world to discover whether we can find these observations. Thus, the cycle continually moves from commonsense observations and background presuppositions to action-pattern explanations, returning then to more highly refined observations and back again to explanation.

A form of abduction was brought to prominence by Kant and has recently been elaborated by Charles Taylor (1995; see also Grayling, 1993; Hundert, 1989) and used in the arena of cognitive development by Russell (1996). This is the *transcendental argument* and its form is:

1. (We) have a (reliable) phenomenological experience with characteristic *A*.
2. (We) could not have an experience with characteristic *A* unless mind has feature *B*.
3. *Therefore,* mind necessarily has feature *B*.

The transcendental argument is designed to answer the how possible questions (von Wright, 1971) with respect to consciousness or the organization of mind. Given some highly reliable phenomenological observation or phenomenological experience, like conservation, what must we necessarily assume (i.e., what kind of action-pattern explanation) about the nature of our consciousness or the nature of mind? What are the necessary conditions of intelligibility? Again, we begin with the explanandum, make a regressive argument to the effect that a stronger conclusion must be so if the observation about experience is to be possible (and being so, it must be possible). And this then leads to the stronger conclusion.

This then is the answer to the question of how one does pattern explanation in the behavioral and social sciences. The procedure for doing action-pattern explanation is found in abduction and the rules of the transcendental argument, and in the criteria that establish a particular abductive-transcendental explanation as the best or most plausible of alternative explanations. Rozeboom (1997) provides a richly detailed operational analysis of this process along with practical advice on statistical and research strategies associated with the process.

In conclusion, there is much more to the story of the new relational methodology. Much of this story is detailed in the elaboration of research methods and measurement models as the specific techniques for designing, conducting, and evaluating the empirical inquiry that adjudicates the best explanations, where these explanations may assume the various shapes of transformational, variational, expressive, instrumental, normative, and individual difference features of developmental change. The work of Rozeboom (1997) is an example, but there are a number of others who have been active in pursuing new tools for modeling and assessment of these diverse features of development. Even beginning to list these would be the work of a new chapter and, consequently, I mention only an excellent summary discussion of some of these new tools found in the work of Fischer and Dawson (2002).

Within this relational context, where interpretation and observation function as a complementary identity of

opposites, the broad issue of the validity of our scientific observations also becomes a central issue. Validity has always been a concern of scientific methodology, but in the split understanding of science, validity had nothing to do with interpreted meaning. In that story, validity became a content issue dependent to a great degree on the outcome of experimental design. In the relational story, the validity of our scientific observations, or what Messick (1995) terms "score validity," becomes a complementary process involving, on the one Escherian hand, the distinctive features of construct validity as it involves interpretative meaning, and, on the other Escherian hand, content validity as it involves denotative meaning (see Overton, 1998 for an extended discussion).

CONCLUSIONS

This chapter has explored background ideas that ground, constrain, and sustain theories and methods in psychology generally, and developmental psychology specifically. An understanding of these backgrounds presents the investigator with a rich set of concepts for the construction and assessment of psychological theories. An understanding of background ideas in the form of metatheories and metamethods also helps to prevent conceptual confusions that may ultimately lead to unproductive theories and unproductive methods of empirical inquiry. The ideas in the chapter are presented in the context of Hogan's (2001) earlier mentioned comment:

> Our training and core practices concern research methods; the discipline is . . . deeply skeptical of philosophy. We emphasize methods for the verification of hypotheses and minimize the analysis of the concepts entailed by the hypotheses. [But] all the empiricism in the world can't salvage a bad idea. (p. 27)

The ideas in this chapter are also presented in the service of ultimately proving wrong Wittgenstein's (1958) comment that "in psychology there are empirical methods and conceptual confusions" (p. xiv).

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