The Dynamic Development of Thinking, Feeling and Acting over the Lifespan

Michael F. Mascolo
Merrimack College

&

Kurt W. Fischer
Graduate School of Education
Harvard University

These are exciting times for developmental psychology. In the last several decades, advances in theory and research have produced profound changes in the ways in which we understand human action and development. These changes involve a reversal of many long-held assumptions about the nature of psychological functioning. The most salient of these involve refutations of the legacy of strong dualities that have long constrained progress in the study of human behavior and development. These include strong distinctions such as mind/body; emotion/reason; biology/psyche; organism/environment; inner/outer; behavior/mental process; individual/culture; and similar dualities (Overton, 2006). The most exciting developments have come from the recognition that the elements and contexts of human activity cannot be understood independent of each other. Instead, human development occurs in medias res – in the middle of everything. When taken seriously, the implications of this idea are vast. Instead of operating as separate modules, thought and emotion; experience and action; biology and agency, person and environment; and other ostensibly opposing processes, are highly dependent upon each other. In this chapter, we elaborate a model of human development that takes seriously the idea that the structures and processes of human action operate as dynamic processes that take diverse forms and trajectories as they develop in medias res.

A recurring theme that has emerged in developmental theory and research over the past several decades is the profound lack of independence of the systems that make up human action as well as the systems and contexts within which human action is embedded (Gangestad & Simpson, 2007; Gottlieb, Wahlsten & Lickliter, 2006; Lerner & Overton, 2008). Instead of postulating sequences of internal cognitive processes
without reference to brain, body and social context, psychologists have examined the *embodied* nature of thought and action (Gibbs, 2006; Gallagher, 2005; Overton, Mueller, & Newman, 2007; Thompson, 2007). Thought has its origins in actions that occur within the medium of the body and which operate within physical and social contexts (Johnson, 1998; Noe, 2004). Instead of studying cognition and emotion as separate and distinct psychological modules, psychologists, philosophers and neuroscientists currently maintain that emotion plays a necessary role in the organization of all human action (Freeman, 2000; LeDoux, 2002; Mascolo, Li & Fischer, 2003). Instead of viewing individual persons as entities that can function independent of physical and social contexts, current theory and research support the idea that person and context operate as distinct parts an interlocking system (Clark, 1997; Fischer & Bidell, 2006; Gottlieb, 2007; Lerner, 2005; Overton, 2006).

This emergence of these approaches has important implications the ways in which we address central questions about human development. First, consider the foundational question: *What is it that develops in psychological development.* Emerging perspectives proceed with an appreciation of how seemingly different psychological functions co-develop and influence each other over time. For example, Campos and his colleagues (Campos, Anderson, Barbu-Roth, Hubbard, Hertenstein, Witherington, 2000; Lejeune, Anderson, Campos, Witherington, Uchiyama, & Barbu-Roth, 2006; Uchiyama, Anderson, Campos, Witherington, Frankel, Lejeune, et al., 2008) have show that early locomotor experience – and not simply visual experience -- plays a key role in the development of visual proprioception (i.e., the perception of self-motion in response to visual motion cues). Eight-month-olds with experience walking or creeping exhibited
higher rates of postural adjustment and emotionality to the induction of motion parallax than did pre-locomotor infants. There are many examples of similar effects in the developmental literature. These findings underscore the co-participation of multiple organismic systems in the development of any given psychological structure. Calling into question the practice of analyzing discrete psychological processes, these findings suggest a need to analyze development in terms of increasingly integrative couplings among ostensibly distinct psychological processes (Ayoub & Fischer, 2006; Sneed, Hamagami, McArdle, Cohen, & Chen, 2007; Witherington, 2007; Overton, 2007).

*How do psychological structures undergo developmental change?* Human development is dynamic; it does not occur according to fixed plans whether those plans are regarded as genetic, psychological or cultural in origin (Fogel, Lyra & Valsiner, 1997; Thelen & Smith, 2006; van Geert, 1993). To understand the processes by which development occurs, we can no longer focus not on individual forces, or even multiple forces acting independently; instead, it is necessary to analyze how biology, action and context interact within a *relational developmental system* (Gottlieb, 2008; Lerner, 2006; Lerner & Overton, 2008; Overton, 2006; Oyama, 2000;). For example, Gottlieb (Gottlieb, 2008; Gottlieb Wahlstein & Lickliter, 2006) has shown numerous examples of the ways in which anatomical and behavioral structures in different species take different forms depending upon local rearing conditions. For example, the capacity to respond selectively to maternal calls in mallard ducks is dependent upon having been exposed to the duck’s own or to another duck’s vocalizations in utero; sex determination in varieties of reptiles is influenced by incubation temperature; genetically identical parasitic wasps that gestate in different animal hosts develop different anatomical
structures. Thus, if development occurs in medias res, it follows that it is not possible to predict the shapes of development simply from knowing initial conditions. To identify the shapes of development, one must examine developmental trajectories as they emerge for particular configurations of psychological processes under particular developmental conditions (Gottlieb, 2002; Lewonton, 2000).

In what follows, we begin by (a) offering a model of the integrative nature of human action and experience. Articulation of such a basic framework is necessary if we are to understand the integrative nature of “what develops” in human development. We define integrative psychological structures as a basic unit of conceptual and empirical analysis. Psychological structures consist of dynamic integrations of motive-relevant meaning, feeling and motor action as they emerge within particular behavioral domains and contexts. We then (b) examine how a theory of skill development (Fischer, 1980; Fischer & Bidell, 2006; Mascolo & Fischer, 2005) can illuminate the ways in which psychological structures develop over the lifespan. Skill theory (Fischer, 1980) provides conceptual and empirical tools for identifying the shifting structure of any given system of acting, thinking and feeling as they take shape within particular psychological domains and social contexts. We then track developmental changes in psychological structures within specific psychological domains. We focus first on (c) age-related and developmental changes in representations of what makes life meaningful over the course of adulthood. The question of what makes life meaningful is an integrative one. As a result, its analysis can help illuminate the integrative nature of individual development over the lifespan. The discussion then shifts from the analysis of macro-developmental changes over long periods of time to more focused analyses on how (d)
the microdevelopment of integral psychological structures in moment-by-moment face-to-face interactions *between* people. In so doing, we extend our analysis of the development of psychological structures in *individual* actors to a discussion of methods for assessing the dynamic structure of *joint* action between individuals over time (Basseches & Mascolo, 2009; Fogel, Garvey, Hsu, & West-Stromming, 2003) (see also Nesselroade & Molenaar, and McArdle, this volume, for extended discussions of lifespan methods). The port of entry for this discussion is the analysis of developmental changes in representational and emotional aspects of psychological structures that occur over the course of psychotherapy in adulthood. We conclude the chapter with (e) a discussion of challenges elaborating integrative models of lifespan development.

**Foundations of an Integral Theory of Dynamic Development**

Psychological structures are motive-relevant *integrations* of meaning, affect, and experience that have their origins in *action*. The concepts of *action* and *activity* – common to the seminal developmental theories erected by Baldwin, Dewey, Piaget, Vygotsky and others -- bring together the various processes that we call *psychological* into a single unit. While the term *action* is often used as a synonym for “overt behavior” or movement, the concept of action *transcends* the distinction between inner experience and outer movement. To concept of action implies some capacity for *agency* or *control*; an action is a type of *doing* (Burke, 1966; Taylor, 1970). Analysis of even the simplest actions reveals properties that incorporate but extend well beyond mere movement.

Actions are (a) intentional processes (in the sense that they are “directed toward” or are “about” something) (Searle, 1983; Zahavi, 2005); (b) goal-directed (Miller, Galanter & Pribram, 1960) and (c) mediated by meaning (Wertsch, 1998). However, the meanings
that mediate action are not simply “cognitive” or “intellectual” affairs. Instead, (d) emotion and (e) bodily experience play central roles in the organization of the varied components action (Brown, 1994; Damasio, 1994; Freeman, 2000). Figure 1 provides a schematic diagram of the integrative structure of action. We illustrate the integral nature of action through analysis of the everyday act of drinking a cup of coffee.

First, actions are intentional processes in the sense that they are either performed on something, directed toward something, or are about something, real or imagined (Merleau-Ponty, 1962; Searle, 1983; Vedeler, 1991). Actions and their objects are represented at Points (a) and (b) in Figure 1. In the case of drinking a cup of coffee, coordinated actions of reaching, grasping and drinking are performed on the coffee. The coffee is the object of the person’s act of drinking. The relation between action and object is an intimate one; actions and their objects mutually constitute each other, whether those actions are sensorimotor acts of drinking a cup of coffee or social activity such an engaging in a conversation over coffee. For example, when grasping a mug, one must extend one’s arm and accommodate one’s hand and fingers around the mug’s contours. In this way, the physical structure of the mug constrains structure the act of grasping (Bateson, 1973; Gibson, 1979; Rosey, Golomer & Keller, 2008). Simultaneously, the act of grasping the mug is organized by the goals and meaning that the mug has for the person – specifically, the idea that the mug operates as a vehicle
for bringing the coffee to the mouth. Thus, action is always *action-on-objects*; a change in object necessitates a change in actions performed on the object, and vice-versa.

Second, and perhaps more important, psychological activity is mediated by *meaning* and *experience*. Perhaps more than any other element, it is the participation of *meaning*, broadly defined, that makes any given process a *psychological* one. To speak of a psychological process is to speak of a process that is mediated by the meaning that events have for an experiencing organism. The 5-week-old’s smile upon recognizing her mother; the 20-year-old’s anticipation of the kick that will come from her next sip of coffee; and the 40-year-old’s fear that spending too much time cultivating a career will interfere with his marital relationship are mediated not by events *per se* but by the *meaning* that events have for experiencing persons. The role of meaning in mediating action is represented at Point (c) of Figure 1. It is important to understand that meaning does not *precede* action; psychological acts are mediated by meaning.

Third, acting is a form of *doing*. The concept of action implies some degree of *agency* on the part of the person performing the action; persons exert some degree of control over representational, experiential and motor processes. The capacity to exert control implies that action is goal directed or otherwise motivated. Agency and goal directedness are represented in Figure 1 by the arrow depicted at Point (d). Research clearly indicates a capacity of primitive forms of goal-directedness from birth onward (de Casper & Carstens, 1980; Sullivan & Lewis, 2003). Thus, to exert control over the act of grasping a coffee mug implies the presence of a goal-- namely to bring the coffee to the mouth. The coordinated acts of reaching, grasping, lifting and sipping are all subordinated to this particular goal, which itself may be subordinated to a still higher-
order goal (e.g., having a conversation over coffee). In this way, actions function as hierarchically nested control structures (Mascolo, Fischer & Neimeyer, 1999).

**The Role of Emotion in Human Action**

Although psychological acts function as control structures, they are not simply cognitive processes. Any action necessarily involves an integration of cognitive, conative and emotional processes. Current theory and research underscore the idea that emotion plays central roles in selecting, amplifying, and organizing attention, consciousness, thinking and action (Keltner & Gross, 1999; Lewis, 1996; Freeman, 2000; Tomkins, 1984). In addition to these intrapersonal functions, emotion also serves social, moral and cultural functions (Keltner & Haidt, 1999; Mascolo & Fischer, 2007; Tangney, Stuewig, & Mashek, 2007). It follows that affective processes must operate as part of the basic architecture of human action.

It is helpful to think of emotional states with reference to three broad classes of components (Mascolo, Fischer, & Li, 2003). Emotions are composed of motive-relevant *appraisals* (Lazarus, 1991; Scherer, 2005), a core bodily experience or *phenomenal tone* (Bermond, 2008; Scherer, 2004) and characteristic *motor expressions and motive-action tendencies* (Frijda, 1987). Appraisals refer to embodied assessments of the relation between perceived events and a person’s motives, goals and concerns (Frijda, 1986; Scherer, 2004). Different emotional states reflect variations in the ways in which individuals appraise events relative to their motives and desires (Ellsworth & Scherer, 2003). Positive emotions accompany motive-consistent appraisals; negative emotion arises when events clash with goals, motives and concerns. Although appraisals are often conceptualized as “cognitive” processes, they are always *motive-relevant*; they
are assessments of how events relate to what one desires, wants, expects, etc. Appraisals reflect changes in the fate of one’s motives (Roseman, 1984). Thus, although appraisals involve cognitive processes, the cognitive aspects of appraisal function in the service of a person’s motives. As a result, appraisal processes that operate in emotion are fast-acting, non-conscious and non-deliberate (Barrett, Ochsner, Gross, 2007). With development, event-appraisals become increasingly mediated by higher-order meanings (Mascolo, Fischer & Li, 2003; Sroufe, 1996).

Feeling tone refers to the phenomenal experience of an emotional state. Most laypersons report that different experiences of emotions have different characteristic feeling tones. While it is often difficult for people to describe their felt states, when they do, they often resort to telling stories about the circumstances under which feelings arose (Sarbin, 1989), describing the events that precipitate them (e.g., “It felt as if I were punched in the stomach”), or invoking metaphor (Davitz, 1969; Kovecses, 2000). For example, the experience of anger is often described in terms of “heat” (“I felt hot”) and “pressure” (“I felt like I was going to explode”). Motive-action tendencies consist of voluntary, involuntary and communicative actions that function in the service of the appraisals involved in the emotional experience. Different classes of motive-action tendencies reflect what a person typically wants to do and what a person has a tendency to actually do within the emotional experience in question. These include both voluntary and involuntary actions. Motive-action tendencies are functional. They operate in the service of the motives implicated in the appraisals that participate in an emotional state. For any given category of emotion, action tendencies encompass characteristic patterns of facial, vocal, postural, and instrumental activity.
The tripartite structure of appraisal-affect-action processes is represented in Figure 1 in terms of the interlocking circles within the broad arrow signifying action. There is no single or fixed sequence in the construction of any particular emotional experience. Appraisal, affect and motor action regulate each other in real time; each is always operative in continuously modulating each other’s functioning over time (Lewis, 1996; Mascolo & Harkins, 1998; Scherer, 2006). In any given context, appraisal processes – the vast majority of which proceed without conscious awareness -- continuously generate, modify and modulate the production of affect and action; different affective patterns are generated by different types of appraisal activity. At the same time, however, affect amplifies, organizes and selects these same appraisals for conscious attention (Brown, 1994; Phelps, Ling & Carrasco, 2006; Tomkins, 1984). At any given point in time, motive-relevant appraisal systems are active in monitoring event-related information from thousands of different sources (e.g., different classes of visual, auditory, vestibular, tactile, bodily inputs, etc.) at a variety of different levels of meaning (i.e., homeostatic regulation; bodily feedback; higher-order meanings, etc.). Only a small minority of these appraisal processes result in conscious awareness.

For example, most drivers have had the experience of “automatic driving” -- operating a car for long periods of time without being aware of one’s driving. During such an episode, if a child were to run into the road, the child’s presence would immediately be drawn to conscious awareness. “Without thinking”, the driver would maneuver the car in order to avoid hitting the child. This common example illustrates the typically non-conscious ongoing appraisal processes; at any given moment, appraisal processes monitor the status of full range of a person’s goals, motives and
Dynamic Development of Integral Structure of Action concerns. Change in the relation between events and a person’s important motives and concerns result in affective changes: The person may experience bodily changes that are described with terms like fear, terror or horror. Most important for the present discussion, affective changes thereupon select, organize and amplify one’s motive-relevant appraisal for conscious awareness while simultaneously activating broad classes of adaptive action. In this case, before the driver in the example provided is able to respond to the situation in terms of higher-order deliberative activity, the emotional state of fear amplifies and selects the appraisal “a child is in danger” for conscious awareness while simultaneously activating action tendencies that function to remove the danger to the child. In this way, affect plays a central role in the selection and organization motive-relevant appraisals for conscious awareness, attention and action. Affect operates as an actual part of any given action structure.

Completing an Integral Conception of Action

The emotion process is depicted in Figure 1 in terms of the three interlocking ellipses identified at Point (d). At any given moment, appraisal processes monitor relations between perceived events and a person’s goals, motives and concerns. An individual’s goals, motives and concerns undergo profound developmental change over the course of life. By the time an individual reaches adulthood, a person’s motivational system is constituted by a broad range of goals, motives and concerns. Appraisal processes are continuously operative in monitoring the flow of events with reference to a person’s motive hierarchies. The emotional selection and organization of goal-directed consciousness is represented in Figure 1 in terms of the arrow indicated at point (e). Conscious control over meaning, experience and motor action is depicted in
terms of the activity of higher-order executive functions depicted in Figure 1 at points (f) and (f’). It is through the operation of executive processes that individuals exert coordinative control over meaning, experience and motor movement. Conscious control over action occurs as one is able to bring structures of meaning, experience and movement into correspondence with those goals, motives and concerns that have been organized in consciousness through the generation of affect (e) (Scherer, 2004). Of course, the capacity for higher-order cortical control does not emerge *ex nihilo*; it is organized by lower-level processes (including affect) that function outside of awareness. Thus, human action functions as a complex, integrated and dynamic process.

**The neuro-biological grounding of an integrated model of action.** Although they are still in their infancy, the fields of cognitive (Gazzaniga, Ivry, & Mangun, 2008), affective (Davidson, 2000; Panksepp, 1998) and social (Cacioppo, Visser & Picket, 2005; Harmon-Jones & Winkielman, 2007) neuroscience has produced research providing the psychobiological grounding supporting the basic process model of human action depicted in Figure 1. The neurobiological grounding of a model of action would identify interconnected systems of brain structures and processes that mediate the production of meaning and experience in action. Neuroscience has evolved well beyond the point attempting to localize complex psychological processes within single brain areas (Cacioppo, Visser & Picket, 2003). According to Panskepp (1998), “There are no unambiguous ‘centers’ or loci for discrete emotion in the brain that do not massively interdigitate with other functions, even though certain key circuits are essential for certain emotions to be elaborated” (p. 147). Similarly, particular brain areas have multiple functions. For example, many areas that mediate particular modes
of cognitive processes have also been implicated in emotional and motor functioning (Cozolino, 2006; Davidson, 2000; Phelps, 2005). As such, the biological substrata that mediate psychological activity are best understood as products of the activation of neural systems that are distributed throughout the brain (Thompson, 2007).

A first step to elaborating a model of the social brain can be informed by MacLean’s (1990) conception of the triune brain. MacLean (1990) represents the anatomy of the brain in terms of three phylogenetic layers that have their origins in different phases of evolution. These systems include the reptilian (i.e., inner core), paelomammalian (i.e., limbic system) and neomammalian (i.e, cortex) brain systems. These systems are sometimes loosely understood as three nested brains, each higher level brain wrapped around each lower level brain. The reptilian brain, the evolutionary oldest system shared by snakes and reptiles, consists of the inner core of the brain (e.g., thalamus and basal ganglia). The reptilian brain plays a role in regulating hunger, thirst, bodily homeostasis, fight/flight responses, and similar processes. The paelomammalian brain, shared by dogs, cats and rats, corresponds to the structures of the “limbic system”, a system of structures that are thought to play a leading role in mediating emotion. The neomammalian brain consists of the cortex, shared by primates and great apes, which is most developed in humans. The cortex mediates the higher-order functions of planning, deliberation, complex thought, executive functioning, conscious inhibition of action, etc. The concept of the “triune brain” is almost certainly an oversimplification, but it is a helpful heuristic in understanding the gross functions of different brain areas. Although structures in the entire brain are relevant to production of emotion, the structures of the limbic system play a dominant role in mediating the
production of emotion and motor behavior.

As indicated in Figure 1, executive functions and the production of higher-order symbolic representations are largely mediated by activity in the frontal and pre-frontal cortex of the brain (Cozolino, 2006). Pathways that mediated motive-relevant appraisal processes are nested throughout cortical and cortico-limbic areas of the brain. In any given context, sensory information is filtered through the sensory thalamus. From this point, processing moves in two different directions (LaBar & LeDoux, 2003). A fast-acting pathway links directly to the amygdala, which is involved the assessing the emotional salience of motive-relevant events. A slower moving path directs processing toward the pre-frontal cortex, which plays an important role in higher-order meaning analysis and in mediating links between salient goals and possible actions. The fast-acting pathway is most important for immediate adaptive action. The amygdala plays an important role in assessing the emotional significance of events (e.g., the biological equivalent of “good for me/bad for me”). The amygdala has rich interconnections with the hippocampus, which plays a central role in the representation and consolidation of episodic memory structures. In emotion, the hippocampus appears to function to connect representations of particular environmental contexts with the emotional salience of those events. Once activated, the amygdala modulates the arousal and attention functions of the prefrontal cortex. In this way, the fast-acting emotional processing performed by the amygdala plays a role in directing attention toward the source of a stressful event. This process organizes and facilitates conscious processing of emotionally salient aspects of a person’s environs (Cacioppo, Visser, & Picket, 2006; Phelps, 2005; Labar & LeDoux, 2003).
At the same time, the amygdala activates the hypothalamus which is involved in mediating a suite of affective and behavioral processes. The hypothalamus functions as the apex of the hypothalamus-pituitary-adrenal axis (HPA) which is instrumental in the release of stress hormones, including cortisol. During times of stress, the hypothalamus stimulates the pituitary gland (located below the hypothalamus) to secrete ACTH (adrenocortocorticotropic hormone). ACTH activates the adrenal cortex which secretes stress hormones, including cortisol, which functions to increase blood pressure and glucose metabolism needed to support an individual’s adaptive reaction to stress. Similarly, during stress, the hypothalamus also plays a role in activating the sympathetic nervous system. Further, through connections that pass through the central gray, supported by sympathetic nervous system activity, the amygdala activates particular classes of emotional motor behavior, including the fight or flight response (LaBar & LeDoux, 2003). Recent research, however, suggests limitations in the traditional characterization that fight or flight responses function as foundational fear responses. Research suggests that low levels of amygdala activation are associated with freezing behavior, whereas higher levels of activation are associated with the fight or flight response. Freezing under relatively lower levels of danger may allow the organism to more fully assess the situation in order to weigh different options for responding to the situation (Cozolino, 2006).

The picture that emerges from current affective and social neuroscience is one that depicts affective processes as broadly distributed throughout multiple levels of neural organization (Pessoa, 2008; Winkielman & Cacioppo, 2006). Lower-level limbic and cortico-limbic systems mediate fast acting, non-conscious affective processing of
motive-relevant events (Labar & LeDoux, 2003). Cortical functions are implicated in more deliberate, higher-order acts involving executive control (Zelazo & Cunningham, 2007). In any given context, conscious awareness is organized by the non-conscious activation of affect-producing neural pathways (Mitchell & Phillips, 2007). Higher order executive functions, mediated by the frontal cortex, exert downward control over thought, feeling and muscle action (Lewis, 2005). The interaction between cognition and affect is mediated by systems of massively interconnected cortico-limbic pathways (Phelps, 2005; Winkielman & Cacioppo, 2006). With development, through such interconnected circuitry, emotional reactions come to be mediated by increasingly higher-order meanings and event appraisals, while implicitly activated affective processes continue to organize higher-order thought and action (Lewis & Todd, 2007). Thus, contemporary neuroscience supports the view that psychological structures are simultaneously affective and cognitive events. They arise through the dynamic coupling of cognitive and affective processes as they adjust to each other in contexts that have implications for the fate of one's motives.

**The Dynamic Development of Integral Psychological Structures**

Psychological structures consist of dynamically integrated configurations of meaning, experience and affect that operate within particular domains and social contexts (Fischer & Bidell, 2008; Mascolo, 2008). To speak of the development of psychological structures is not the same as speaking of the development of a person. There are no general or “all purpose” psychological structures. While they undergo massive development over the lifespan, psychological structures consist of localized skills that are tied to particular situational demands, psychological domains and social
contexts (Fischer, Bullock, Rotenberg & Raya, 1993). Knowing that a forty-year-old is
able to operate at high levels of functioning while leading a meeting at work does not allow
one to predict that same person’s level of performance when conducting and
emotionally-laden family meeting at home. Developmental trajectories can only be
predicted reliably within specific tasks, task domains and contexts.

As defined in dynamic skill theory, (Fischer, 1980; Fischer & Bidell, 2006;
Mascolo & Fischer, 2005), within particular domains and contexts, psychological
structures develop over the lifespan through 13 levels that begin shortly after birth and
continue to undergo transformation until an individual reaches about 25-30 years of age.
As indicated in Figure 2, the process of development occurs through a reiterative series
of two nested growth cycles (Fischer, 2008). The first consists of a longer term growth
cycle involving the progression of skills through a series of broad-based developmental
 tiers. A tier consists of a particular mode or quality of action or thought. There are five
broad tiers of development: Reflexes refer to pre-adapted action elements (e.g. sucking
on an object placed in the mouth); sensorimotor actions refer to smoothly controlled
actions on objects (e.g. reaching for a bottle); representations consist of symbolic
meanings about concrete aspects of objects (e.g., “Mommy likes candy”); abstractions
consist of higher-order representations about intangible and generalized aspects of
objects and events (e.g., “Conservation refers to the concept that the quantity of
something remains the same despite a change in its appearance”). Abstract principles
are high-level abstract conceptions that tie together multiple abstract systems. Abstract
principles are rare in development, and occur in people with high levels of education,
experience and/or specialization in a given field.
The second shorter-term growth cycle recurs within each longer-term cycle. Within each of broad tier of development, skills develop through a series of four levels. These levels of individual skill development include single sets, mappings, systems and systems of systems. Within the short term growth cycle, higher levels within a tier arise as persons are able to coordinate one or more lower-level skill elements. Figure 3 describes the short-term growth cycle in terms of a series of mapping relations involved in forming a cube. Mappings involve the coordination of two or more single sets; they are represented in Figure 3 in terms of a single line connecting two points. Systems arise from the coordination of two or more mappings; they are represented in terms of the mapping of two lines onto each other to form a square. Finally, a system of systems emerges as two systems are mapped onto each other. This is represented in Figure 3 in terms of the mapping of two two-dimensional squares onto each other to form a three dimensional cube. The coordination of two systems into a system of systems is the equivalent of the first level of a tier of skill development. This is indicated in Figure 3 by the statement of equivalence between the skill structure representing a system of systems (Level 5) and the skill structure identifying the first level of the next broad tier in terms of a single higher-order set (Level 5/1).

Within any given tier of development, a single set refers to a single organized reflex, action, representation or abstraction. For example, within the representational tier, which begins to emerge around 18-24 months of age, a toddler can coordinate
multiple systems of action into a single symbolic representation. At this level, a child can begin to make one thing stand for another. For example, in contexts that support the construction of such actions, a child can use a doll or a block to stand for a person in pretend play. Alternatively, she can begin to represent the meaning of words (sound sequences) that refer to absent objects. At its most basic level, a single representation corresponds to the meaning of a single concrete declarative sentence (e.g., “Mommy is mad”, “Do it myself!”, or “The milk spilled”):

\[
\begin{align*}
\text{Mommy} & \quad \text{Mad} \\
\text{Me} & \quad \text{"do it myself!"} \\
\text{Milk} & \quad \text{spilled}
\end{align*}
\]

Mappings refer to coordinations between two or more single sets. A mapping arises when an individual constructs a skill by putting together two lower level single sets. Within the representational tier, in contexts that support a child’s attempts to do so, a 3 ½ to 4 year old child can begin to map one single representation onto another single representation to form a representational mapping. Using a representational mapping, a child can represent the concrete relation between two basic ideas. The preschooler can represent relations between two or more ideas in terms a variety of possible concrete relations, including cause/effect, part/whole, big/little; reciprocity, contiguity, temporality and so forth. For example, a 4 year-old child can construct a representation of herself in terms of concrete social comparisons (e.g., “I can run into the water [beach] just like all the big girls do!”). At this level, a child can compare the height of two glasses of water and understand that the level in a tall beaker is higher than the level of a short beaker. Alternatively he can understand that a coffee mug of is wider than a water glass. Representational mappings are indicated as follows:
**Systems** arise when an individual is able to bring together two lower-level mappings into a single, seamless skill. A system thus consists of the mapping of at least two mappings. Within the representational tier of development, beginning around 6-7 years of age, with contextual support, a child is able to bring together at least two lower-level skills at the level of representational mappings into a single integrated representational system. For example, in a traditional conservation task, a 4 or 5 year-old, using representational mappings, can compare the amount of water contained in a tall, thin glass to the amount of water poured from an identical glass into a short and wide glass. Using representational mappings, the younger child is able to compare relative height of the level of water contained in the two glasses (e.g., “the water in the tall glass is higher than the water in the short glass”). Alternatively, the child can compare the width of the two glasses (e.g., “the tall glass is thinner than the short glass”). However, it is not until the child is able to represent both of these mapping relations simultaneously that she can solve the traditional water conservation task. Thus, beginning around 6-7 years of age, with the capacity to construct representational systems, a child can coordinate these two lower-level mapping relations to understand that when water is poured from a tall, thin glass to a short and wide one, *changes in height from tall to short are made up for by changes in width from narrow to wide*. 
Using representational systems, a child is able to represent a variety of such concrete, systematic relations. For example, a child can construct an understanding that “Joey is better than I am in music, but I am better than Joey in soccer”, or “Mom will be mad when she sees the note from my teacher, so I better put it under my mattress so that she can’t find it”, or “I like playing with Sarah because we can play with dolls, but it’s also not fun because she can be so bossy.”

Within any given tier of development, the final level produced within the short term growth cycle consists of systems of systems. A system of systems arises through the process of coordinating two or more systems level skills into a single integrated skill. The production of a system of systems serves a dual function. Within a given tier of development, a system of systems constitutes the final level of the short-term growth cycle; simultaneously, a system of systems is the equivalent of the first level of the next broad tier of development. For example, in the representational tier of development, a system of representational systems is the equivalent of the first level of the next broad tier of development – abstractions. Beginning around 10 or 11 years of age, in contexts that support their construction, a pre-adolescent can begin to represent the relation between two concrete representational systems conceptions in terms of a single, intangible, generalized abstract concept. For example, using representational systems, children can construct skills for understanding conservation in a variety of different concrete domains – conservation of number, mass, volume, etc. However, constructing a generalized concept of conservation requires abstracting what is common or typical
across concrete instances of conservation. Using \textit{single abstractions}, under favorable conditions, a pre-teen can represent what is common to concrete examples of conservation of volume and conservation of mass in terms of an abstraction such as, “Conservation is the idea that the quantity of something remains the same despite a change in its appearance”.

Such a conception represents the meaning of conservation in a general and intangible way, free of any specific concrete content. However, facility with the use of abstractions requires the capacity to apply abstract ideas to particular concrete content. Given the appropriate degree of experience and support, the capacity to construct single abstract sets provides the foundation for the development of different generalized concepts within different domains of psychological activity, whether they be conceptions related to morality (e.g., “justice”, “mercy”), identity (e.g., “I want to be popular”), scientific concepts (e.g., energy; variable), politics (e.g., democracy, nation), and so forth.
Particular skills continue to develop through four levels as the short term growth cycle reiterates through the abstract tier. Building upon multiple single abstract sets, beginning around 14-15 years of age, given appropriate contextual support, teens begin to coordinate two single abstract sets into an abstract mapping. At the level of abstract mappings, individuals can represent the relations between at least two abstractions. For example, an American teenager can represent the relation between two different conceptions of self, such as “I’m relaxed with friends that I know well, but I’m nervous when I’m around the popular kids.” Alternatively, a teen who is studying physics can construct a higher-order understanding of the relation between mass and energy:

\[
\begin{align*}
\text{ME} & \quad \text{around} & \quad \text{CLIQUE} \\
\text{insecure} & \quad \text{popular}
\end{align*}
\begin{align*}
\text{MASS} & \quad \text{can change} & \quad \text{ENERGY} \\
\text{Amount of matter} & \quad \text{into} & \quad \text{Capacity to do work}
\end{align*}
\]

Abstractions and abstract mappings are not confined to the mid-teen years. In older individuals, abstract mapping can be used to organize conceptions of identity-related issues that accompany one’s social position. For example, a 40 year-old can use an abstract mapping to represent relations between goals related to career and family.

\[
\begin{align*}
\text{CAREER} & \quad \text{balance} & \quad \text{FAMILY} \\
\text{make contribution} & \quad \text{with} & \quad \text{nurture/support}
\end{align*}
\]

Further, higher-order abstractions and abstract mappings are not de-contextualized modes of thought that are available only to the highly learned; abstract mappings have real world consequences and are used by people in a variety of different domains of life. For example, an accomplished cook or chef understands abstract conceptions of how ingredients can be adjusted to make just the right type of muffins. The structure of the chef’s thinking may be represented as follows:
Beginning at around 17-19 years of age, under conditions that support their development, young adults are able to coordinate two or more abstract mappings into an *abstract system*. At this level, an individual can represent relations between abstract relations. Abstract systems operate at a high level functioning and signify advanced development within particular psychological domains. At this level, an individual can construct an abstract and integrated conception of the relation between two differentiated aspects of one abstract idea and two similarly differentiated aspects of a second abstract idea. For example, at the level of abstract systems, a 20-year old college student can construct a sophisticated abstract plan to map out her desired career in law. In order to *become a lawyer in a prestigious firm*, the student plans to *specialize in college* so that she can attend a good law school. However, knowing that schooling alone is insufficient, the student plans to *delay starting a family* in order to devote herself full time to her ambitions, which involve *forming networks of connections* to people in the legal field. This abstract system can be represented as follows:

Abstract systems are highly developed psychological structures. They involve the systematic integration of multiple abstractions, each of which is founded upon and incorporates a rich network of concrete meanings. As highly developed as these structures are, the highest level of psychological structures begins to emerge in
adulthood beginning at around 23-24 years of age in the form of single abstract principles. *Single principles* arise in highly educated and/or experienced individuals with their capacity to coordinate two abstract systems level conceptions into a system of abstract systems. Single principles constitute the final broad tier of development, and are the product of the final iteration of the short-term growth cycle that occurs in the abstract tier. We elaborate further on abstract principles later in the chapter.

**The Central Role of Context in the Construction of Psychological Structures**

Psychological structures are the products of individual adaptation to particular social and environmental demands. As a result, psychological structures are not static properties of single individuals, but instead are *dynamic* products of persons-in-context. A change in situational demand, psychological domain or social context necessitates a change in the structure and content of skilled action. The act of running 100 yards as quickly as possible will depending upon whether or not one is running on the beach, uphill at a high elevation, or on a rubberized track using spiked running shoes. Contexts differ in the extent to which they support an individual’s attempt to produce skilled activity (Mascolo, 2005; Morrow & Rogers, 2008; Rosey, Golomer, Keller, 2008). Contexts involving *high support* provide assistance that supports an individual’s actions (e.g., modeling desired behavior; providing cues, prompts or questions that prompt key components to help structure children’s actions). Contexts involving *low support* provide no such assistance. Level of contextual support contributes directly to the level of performance a person is able to sustain in deploying a given skill. A person’s *optimal level* refers of the highest level of performance one is capable of achieving, usually in contexts offering high support. A person’s *functional level* consists of their
everyday level of functioning in low support contexts. In general, a person’s optimal level of performance under conditions of high support is several steps higher than his functional level in low support contexts (Fischer, Bullock, Rotenberg & Raya, 1993; Fischer & Pipp, 1984). Figure 4 depicts developmental variation in a child’s story telling in a variety of high and low support conditions. In the context of elicited imitation, a child is asked to imitate a complex story modeled by an adult. In elicited imitation, the child’s story functions at a level that is several steps higher than when he or she tells stories in free play, or is asked to tell his or her best story – both conditions of low support. Minutes later, when an adult prompts the child by stating the key components of the story, the child again functions at optimal level. Then after a few more minutes low support conditions result in reduction of the child’s performance to functional level again. These fluctuations in skill level occur in the same child on the same task across varying conditions of contextual support separated by mere minutes.

----------------------------------------------

Figures 4 About Here

----------------------------------------------

The importance of environmental support in organizing the structure of skilled activity is not limited to children. Environmental support increases the level of performance in skilled activity across the lifespan (Luo & Craik, 2008; Parks & Shaw, 1993). More important, environmental support becomes increasingly important in structuring the production of everyday and skilled activity in older individuals (Sharps, Martin, Nunes, Neff & Woo, 2004). A particularly compelling example comes from assessing the capacity of pilots to understand air traffic control communications over the
course of adulthood (Morrow, Ridolfo, Menard, Sanborn, Stine-Morrow, Magnor, Herman, Teller, & Bryant, 2003). Pilots in younger, middle-aged and late adult years listened to air traffic communications describing the route of a plane through airspace. Level of environmental support was manipulated by either allowing or not allowing participants to take notes during the communication. The variable of interest was the capacity of the participants to repeat back the message. Without the benefit of notes, the capacity to repeat back air traffic control communications declined with advancing age. However, the decrement in performance was eliminated when pilots were allowed to take notes. We interpret these data as indicating that environmental support is not simply an adjunct to task performance; it is part of the process of skilled activity itself. Further, these data suggest that during late adulthood, environmental support plays an increasingly important role in structuring meaningful skilled activity for many tasks.

Contexts involving high and low support differ from contexts involving scaffolded support (Gauvain, 2002; Mascolo, 2005; Wood, Bruner & Ross, 1976). In contexts involving high or low support, the individual alone is responsible for coordinating the elements of a given skill. For example, an adult may model a complex story for a child who then produces the story without further assistance; a pilot repeats back the air traffic control message just provided to her. In contrast, in scaffolded contexts, a more accomplished other assists the person by performing part of the task or by otherwise structuring a person’s actions during the course of skill deployment. Within scaffolded interactions, an individual is able participate at levels that surpass her optimal level (Fischer, Yan & Stewart, 2003; Mascolo, 2005). When a mentor assists a graduate student in composing a master’s thesis, the student is able to produce a thesis at a
higher level of quality than he could have accomplished without such assistance. Skill development occurs as individuals differentiate and coordinate higher-order skills and meanings from their participation in joint activity with others (Rogoff, 1993; Mascolo, Pollack & Fischer, 1997). By pulling a learner’s performance beyond that which she can sustain alone, scaffolding awakens and directs the process of development.

The process of scaffolding occurs throughout the lifespan (Yan & Fischer, 2002, 2007). In adulthood, scaffolding occurs in contexts ranging from mentor-mentee relationships (Dennen, 2004); learning novel skills (Murray & McPherson, 2006), novel learning in organizational contexts (Hoare, 2005; Kristensen, 2004), psychotherapy, and coaching (Basseches & Mascolo, 2009). Emotional scaffolding and support is an important aspect of the types of supportive social interactions that occur between caregivers and persons with dementia (Cavanaugh, Dunn, Mowery & Feller, 1989; Rabins, 1998). As is well known, the primary deficits in individuals with Alzheimer’s disease involve difficulties in memory and thought. Human factors researchers have shown that there are many ways to design the physical and social environments to support the memory functions of persons living with Alzheimer’s disease (Charness & Holley, 2001; Cohen & Day, 1993). These include populating a person’s environs with redundant cuing, such as familiar objects, photographs or even auditory and olfactory cues such as familiar music or cooking smells. Schafer (1985) suggested that caregivers adopt the strategy of adapting the physical and social environment to the familiar behaviors of the Alzheimer’s patient rather than attempt to foster novel skills, especially at later phases of the disease (Charness & Holley, 2001).

**Emergent Webs of Development**
Traditional models of development generally conceptualize development in terms of a series of homogeneous stages, whether those stages are taken to reflect different levels of cognition (Piaget, 1983), identity formation (Erikson, 1950), or personality (Freud, 1926). Although there are a variety of important transitions and milestones in ontogenesis (e.g., primary and secondary intersubjectivity in infancy; social referencing; the semiotic function; puberty, etc.) decades of research suggests that development is not characterized by changes in singular, broad-based, homogeneous competencies. Instead, within particular social contexts, psychological structures develop within particular psychological domains (Fischer & Bidell, 2006; Mascolo, 2008b; Turiel, 1989). For example, Piaget designed a series of logical tasks (e.g., conservation, seriation, transitivity, class inclusion) designed to reflect the onset of concrete operational thinking – the capacity to manipulate representations in a logically consistent and systematic way. Although all such tasks were thought to reflect a single broad system of psychological competence, there are dramatic differences in the ages at which individual children are able to succeed at these different tasks (Gelman & Baillargeon, 1983). Children can solve some conservation tasks years before they are able to solve class inclusion tasks. There is even variability in the age at which children perform different versions of the conservation task (e.g., number, mass, or volume).

Table 1 depicts trajectories in the development of skills in three basic domains: mathematical skills, narrative understanding, and artistic skill. The trajectories depicted in Table 1 illustrate the principle of systematic development within domains: Although skills develop through the same abstract sequence of structural transformations across different conceptual domains, skills in different conceptual domains develop along their
own trajectories. Even if one controls for social context, is not possible to predict the level of skill development that a person will exhibit in one target domain from knowing a person’s level of performance on any single task or set of tasks in another target domain. The age of emergence of skills at similar levels of structural complexity show only weak correlations between conceptual domains. Such findings underscore the idea that “what develops” in psychological development is not the “person-as-a whole”, but instead increasingly integrated local skills within particular contexts and domains.

-----------------------------

Table 1 about Here

-----------------------------

Much research conducted in the latter part of the 20th century tended to treat psychological domains as if they were rigidly bounded areas of activity. Developmental psychologists have been able to track stable developmental orderings within the areas of moral understanding (Kohlberg, 1981); understanding of social conventions (Turiel, 1989); social perspective taking (Selman, 1980); mathematical thinking (Saxe, 2004), and so forth. However, just as meaning-mediated actions are dynamic rather than fixed, so are the psychological domains and contexts with which psychological structures operate (Ayoub & Fischer, 2006; Mascolo, 2008). The trajectories depicted in Table 1 identify transformations in skills within rather bounded domains of psychological activity. Although there are many contexts that call for skills within such encapsulated domains (e.g., academic study), the domains and contexts in which we operate in everyday life are not so neatly structured. Over the course of a day, the skills that we employ to meet the demands of any given context require the integration of
meaning, knowledge and feeling from a wide variety of diverse areas. The domains and social contexts in which we function are not static structures existing in a pre-defined reality. Instead, they reflect emergent systems of meaning and practice that arise within particular social and cultural contexts, motivated by social and economic need, and – especially in current times -- mediated by increasingly novel technologies.

For example, consider the task of teaching a course in psychology. What set of tasks, meanings, skills and skill domains do we employ when we teach such a course? The most obvious consists of the knowledge and skills that constitute the specific discipline or psychological area that we are teaching. On a superficial level, it might seem that teaching psychology constitutes a clear and distinct domain of activity. However, the act of teaching requires the coordination of skills in a myriad of domains that extend beyond the formal discipline of psychology. It requires the capacity to speak to a particular audience of students; to assess their level of engagement; to design and assess the outcomes of various teaching and learning activities; to provide feedback on papers and in discussion; to calculate grades; to manage disputes and emergent problems; to fight with the Dean for resources, and so forth. There are few pure domains of action. Any particular pedagogical act involves the coordination of skills and meanings from multiple partially overlapping spheres of activity.

Coordinating across these different spheres of activity, over time, one might feel that one has identified a stable if emergent skill set to define the domain of “teaching psychology”. However, as the time of this writing, many skills used to teach psychology a mere 10 years ago would appear to require dramatic revision (Espiritu, 2007). The age of the internet has ushered in novel technologies that both support innovation and
produce new challenges (Davis & Fill, 2007). Online and hybrid courses have proliferated (Hahs-Vaughn, Zygouris-Coe & Fiedle, 2007; Quilter & Weber, 2004). The skills that one requires to teach an effective online course are dramatically different from those that undergird face-to-face classes (Palloff & Pratt, 1999). Some learning goals are facilitated in an online format; others made more difficult (Tutty & Klein, 2008). Viewed in this way, the seemingly stable domain of teaching psychology becomes exposed as a dynamic and emergent one. In this way, skill domains are dynamic and emergent processes that mutually constitute each other over time.

Traditional accounts have portrayed development in terms of a linear series steps (Erikson, 1950; Freud, 1926; Piaget, 1983) much like a ladder or staircase. However, in light of all of the above, rather than viewing development as if it were a ladder, staircase or set of distinct silos, it is more helpful to view development in terms of an emergent developmental web (Fischer & Bidell, 2006; Fischer, Yan & Stewart, 2003). Figure 5 depicts a model of the developmental web. The developmental web represents development in terms of a series of partially distinct pathways that, depending upon developmental circumstances, move in different diverging or converging directions. Higher-order psychological structures emerge from the integration or coordination of lower-level structures that develop along partially distinct trajectories. The splitting and converging of developmental trajectories is not something that can be specified or predicted a priori. As described above, skill theory provides a universal yardstick for gauging the developmental trajectories of particular skills. However, the specific skill structures, pathways and timing that emerge in ontogenesis cannot be predicted beforehand (Valsiner, Fogel & Lyra, 1997). Development takes
different paths depending upon local developmental conditions (Gottlieb & Lickliter, 2007; Thelen & Smith, 2006). In this way, development emerges as a process of “laying down a path in walking” (Thompson, 2007, pp. 166).

The developmental web differs from a developmental ladder in at least six fundamental ways (Fischer, Yan & Stewart, 2003):

1. The web highlights local variation of activity within global order: the developmental ladder tends to marginalize variation by regarding it as an indication of error or individual differences;

2. The web can be used to represent developmental order and variability of individuals or groups; because it represents a series of steps along a universal dimension, the ladder tends to focus attention of the performance of groups;

3. Use of the web presumes that an individual can function at multiple levels at any given point in time the ladder metaphor assumes that a skill operates on only a single step or rung at any given time;

4. The web distinctions multiple tasks, domains, social contexts and their relation; the ladder represents tasks and domains along a single unidirectional dimension;

5. The developmental web is defined in terms of a complex network of connections among developmental strands and trajectories; the ladder has no
provisions for representing interconnections among diverse developmental strands;

6. The web represents the multi-directional nature of development, including forward progression and backward transitions; the ladder metaphor assumes a single unidirectional progression in developmental levels over time.

The developmental web can be used to represent development in different ways. The strands that compose the web can reflect the development of different domains of psychological structures within individuals; alternatively, the trajectories can represent alternative pathways taken by different individuals or groups of individuals. Within the developmental web, an individual cannot be said to operate at a single level of development, even for particular skills. As indicated throughout, the developmental level of a persons’ skills vary both as a function of domain and social context. Across domains, a pilot may function at very high levels in the domain of receiving and using air traffic control communications or performing mathematical calculations. However, it is possible that this same pilot may function at dramatically lower level of development in the domain of taking care of an infant child, tending bar or fixing a lawn mower. Equally important, within individuals, a person’s skill level varies as a function of social context.

As indicated in Figure 4, the level of performance that a child is able to achieve when telling a story varies according to whether the child is operating in the context of low-, high-, or scaffolded support. In light of such data, it is not appropriate to say that an individual functions at a single developmental level – even for a particular skill. Instead, it is more appropriate to say that an individual’s skills function at a range of levels depending upon context, domain, time of day, emotional state, and other variables.
The *developmental range* is indicated in Figure 5 by the shaded region on the developmental web. As indicated, along any given strand of development, there are four basic regions corresponding to different levels of stability in the construction and consolidation of any given skill. Automatized skills been overlearned in such a way that their deployment requires little or no conscious attention, effort, conscious control or processing resources (Bargh & Hussein, 2002). They are represented in terms of the bold lines depicted lower-level processes along any given strand of the developmental web. For example, many of the tasks involved in driving a car are automatized in such a way that it is not only possible to perform a variety of tasks while driving, drivers often cover long stretches of road without having been consciously aware of their driving actions (Mascolo, Fischer & Neimeyer, 1999). In some cases, automatized skills are deployed involuntarily in such a way that once begun, they cannot be inhibited.

Reading is an example of such an automated task. The profound robustness of the Stroop color word task attests to the involuntary nature of the fast-acting process of reading color names over the slower process of naming the colors in which color names are printed (Brown, Joneleit, Robinson, & Brown, 2002). Skills that operate at a person’s functional, optimal and scaffolded levels are indicated in Figure 5 in terms of non-bolded, heavily dotted lines, and lightly dotted lines respectively.

To illustrate, imagine the process of learning to drive an automobile with a manual transmission. When a novice teenager or adult embarks upon the process of learning to drive, she brings with her a series of highly automatized skills that can be deployed without effort and often without awareness. These tend to include overlearned sensor-motor skills such as turning a wheel, depressing a pedal, or pushing
Dynamic Development of Integral Structure of Action

a stickshift. After several weeks of instruction, the novice’s functional level might include the capacity to drive around a large, empty parking lot. The novice’s functional level – the level of skill in the absence of contextual support -- would include a series of representational and motor skills, including the capacity to shift gears, maneuver the clutch and depress the accelerator at the same time; to steer the car to make broad, slow and perhaps jerky turns around corners. This same individual would be able to function at a higher level in the context of high levels of contextual support. For example, if, before starting her practice, her instructor reminded her to “stop at the stop sign between Parking Lot A and B”, the student would be more likely to avoid her habitual error of failing to attend to the stop sign. Finally, this same student would be able to function at a still higher level in the context of scaffolded support. For example, the instructor may offer continuous verbal feeback to scaffold the novice’s attempt to perform a 3-point-turn. Over time, as the driver achieve more coordination, the instructor would gradually relax the scaffolding provided. Conditions of high support, co-construction with others, and scaffolding are at least as important in the construction and consolidation of novel skills in adults as they are in children.

The developmental web can also be used to represent individual differences in trajectories of development between different groups. Drawing upon a large literature on temperament-caregiver interaction, Mascolo and Fischer (2007) described six pathways in the development of emotion-based personality dispositions in adolescence and adulthood. These paths are depicted in Figure 6. Each pathway is defined with reference to relations between a child’s temperamental dispositions and social experience over time. *Normative* pathways (A, B and C) result in the capacity self-
regulation and competent social relations. Children who exhibit generalized positive affect and the capacity for high levels of effortful control (Eisenberg, Hofer, Vaughan, 2007; Rothbart 2007), and who are cared for by sensitive and authoritative parents are more likely to develop through the Positive-Normative pathway (A). The Negative-Normative path (B) involves children with dispositions toward negative affect (i.e., irritability, frustration, etc.) but with a high capacity for attentional focus. Despite their affective dispositions, given their capacity for self-regulation, they can learn to regulate their emotion when given consistently firm but non-hostile parental discipline. The Inhibited/Normative path (C) occurs in children who exhibit “fearful” (Kochanska, Forman, Aksan, & Dunbar, 2005) or “inhibited” (Kagan & Snidman 2004) emotional biases. Because such children are disposed to attend to parental prohibitions, gentle discipline is often sufficient to promote rule induction (Kochanska, 1997).

------------------------------------------

Figure 6 about Here

------------------------------------------

The model also specifies three non-normative developmental pathways. Children who are temperamentally disposed to negative affect and poor self-regulation are at risk for developing externalizing and anti-social behavior in adolescence and adulthood (Eisenberg, Hofer, & Vaughan, 2007; Loeber & Stouthamer-Loeber, 1998; Tremblay, 2000) or behavior reflecting a shame-anger dynamic (Ferguson, Eyre & Ashbaker, 2000; Scheff & Retzinger, 1991). Given their relative inability to regulate aggression, such children are more likely to engender harsh or extreme discipline, thus promoting both shameful affect and angry aggression. Children who are disposed
temperamentally toward “fearful/inhibited” affect and who are the recipients of harsh or affectively insensitive discipline are disposed to develop tendencies toward internalizing emotion-regulation strategies and self-conscious social interaction (Pathway E, Inhibited-Internalizing). Recent research also shows that in some circumstances (e.g., when children are humiliated or raised in violent homes) temperamentally inhibited children may also develop toward the externalizing pathway and become highly aggressive (Pathway F, Victim-Aggressor; Watson, Fischer, & Andreas & Smith, 2004).

The Dynamics of Developmental Trajectories

Psychological structures are capable of undergoing developmental change throughout the entire lifespan. However, psychological skills show different trajectories over time depending upon the nature of the skill and the circumstances under which those skills emerge and are assessed. Research from a variety of sources converges to indicate that, within particular domains and contexts, developmental changes in an individual’s functional and optimal levels of skill show different growth curves over time. Within any given domain of functioning, a person’s functional level consists of the level of performance that one spontaneously exhibits in everyday tasks without the benefit of high support or scaffolding. Optimal level performance occurs in the context of high contextual support (e.g., well-defined and familiar tasks; practice; priming of memory for task elements, etc.) and occurs far less frequently than functional level performance. Within a given domain of activity, a person’s spontaneous, everyday functional level performance is generally several levels lower than his optimal level performance. Figure 7 shows a characteristic growth curves tracking changes in optimal and functional developmental level from pre-adolescence through early adulthood. As
indicated in Figure 7, over time, functional level performance tends to be characterized by slow, gradual and continuous growth, whereas optimal levels exhibit stage-like spurts and plateaus. Over time, growth curves for functional and optimal level performance diverge with age (Fischer, Kenny & Pipp, 1990; Kitchener, King & DeLuca, 2006).

The role of brain development in the emergence of optimal level performance. This divergence arises because changes in functional and optimal level performance depend upon different growth processes and developmental conditions. What is the source of the developmental spurts and plateaus that characterize growth curves in tracking optimal level performance within particular domains of activity? The emergence of optimal level performance is supported by three basic sets of processes. These include (a) biological changes, including measurable discontinuities in brain growth, synaptic density, head size, shifts in activity in different brain regions; (b) the activity of the individual actor, who, in the creation of any given psychological structure, must actively and effortfully perform acts of coordination that “put together” components of any emerging skill to meet task demands; and (c) high levels of contextual support, as indicated above. A series of findings supports the proposition that developmental changes in the brain play a central role in supporting the emergence of new levels of optimal level performance within particular domains of activity. Evidence for this assertion comes in the form of similarities between trajectories of brain growth and development and growth curves tracking the emergence of optimal level psychological
skills. Research on the development of cortical (electroencephalogram or EEG) activity, synaptic density, and head growth provides evidence for discontinuities in brain growth for at least 12 of the 13 levels of skill development listed in Figure 2. Little research exists to test hypothesized brain-behavior relations for the 13th level.

In infancy, discontinuities in EEG power arise at approximately 3 to 4, 6 to 8, 11 to 13 months, and 2 years (Hagne, Persson, Magnusson, & Petersen, 1973). For example, in a study of relative power for occipital EEG in Japanese infants, Mizuno, Yamauchi, Watanabe, Komatsushiro, Takagi, Linuma, K., et al. (1970) found spurts at approximately 4, 8, and 12 months. These ages are similar to those found for psychological development in infancy. Bell and Fox assessed the relations between growth functions for EEG activity and the development of object search, vocal imitation, and crawling skills in infancy. They found that for many individual infants between 8 and 12 months of age, connections between specific cortical regions involving planning, vision, and control of movement exhibited a surge while the infants were mastering crawling. The surge disappeared after they had become skilled crawlers. During childhood and adolescence, clusters of discontinuities arise at approximately 2, 4, 7, 11, 15, and 20 years (Somsen, van ‘t Klooster, van der Molen, van Leeuwen, & Licht, 1997; Thatcher, 1994). A classic Swedish study assessing changes in relative EEG power with age produced evidence of spurts at approximately 2, 4, 8, 12, 15, and 19 years (Hudspeth & Pribram, 1992; John, 1977; Matousek & Petersén, 1973).

Additional converging evidence comes from studies on the development of EEG coherence (Thatcher 1994). EEG coherence is a measure of the correlation between wave patterns from different cortical regions. High EEG coherence indicates that two regions have similar EEG wave patterns. Similarity in EEG wave patterns suggests that
the cortical regions in question are interconnected and communicating with each other. In his study of the development of EEG coherence, Thatcher (1994) described evidence documenting discontinuities in EEG coherence at age regions associated with transformations in optimal level skill performance. With development, coherence for any pair of EEG sites typically oscillates up and down. These oscillations show growth cycles that move through cortical regions in a regular pattern. The oscillations demonstrate discontinuities that relate to shifts in levels of psychological skills. That is, shifts in optimal level of psychological skill occur around the time that oscillation patterns show abrupt shift to a different period. These occur at approximately 4, 6, and 10 years. These patterns of brain growth suggest correspondence between phases of brain growth and transformations in optimal level psychological performance.

Still further, the cycles of coherence reported by Thatcher (1994) suggest not only a series of discontinuities in brain growth and development, but also a growth cycle indicating different patterns of connectivity among cortical regions for each level (Fischer & Rose, 1994; Immordino-Yang & Fischer, in press; Thatcher, 1994). Surges and drops in connectivity as measured by change in EEG coherence cycle through brain regions in systematic and repetitive patterns. The growth cycle moves in a systematic pattern around the cortex, showing a full cycle of interconnectivity for each level of psychological skill. The connections typically begin in the frontal cortex and involve long-distance connections between frontal and occipital regions for both hemispheres. The growth cycle then moves systematically around the cortex, extending through the right hemisphere and then through the left. For the right hemisphere, growth patterns first establish global, long-distance connections and then
contract to establish more local ones. In contrast, in the left hemisphere, growth begins by establishing more local connections before it moves toward the consolidation of more distant ones. Growth moves systematically through different cortical areas until it consolidates networks throughout the cortex.

Within the representational and abstract tiers of development, transformation from one level of skill to another (e.g., from single sets to mappings, etc.) seems to be supported by the production of new systems of neural networks that link different brain regions. Matousek and Petersen (1973) examined changes in EEG activity for each of four cortical brain regions (viz., frontal, occipital/parietal, temporal, and central) in children and adolescents. Their results suggested that for the representational (2-10 years of age) and abstract tiers (10-20 years), transitions to different levels within a developmental tier are marked by cyclic changes in brain activity in different cortical regions. Within this cycle, a new tier emerges with a maximal spurt in the frontal cortex; the first level is marked by a maximal spurt in the occipital-parietal region; one in the temporal region marks the second level, and one in the central region marks the third. Another maximal surge in the frontal region marks the onset of the next broad tier of development. These changes illustrate the systematic relations between movement through skill levels and cyclic changes in brain activity.

**The Meaning of Development over the Lifespan**

Under high support conditions, adults begin to gain the capacity to construct skills at the level single abstract principles – the highest level of skill functioning – beginning around 23 to 25 years of age. Does this mean that optimal level development ceases at age 25? That no meaningful developmental changes occur
after age 25? When does development stop and decline begin? Although these questions appear on their face to be reasonable ones, they only have meaning under the presupposition of certain conceptions of development -- for example, that development consists of an age-related sequence of broad stages of psychological functioning. If this were so, it might make sense to say that individuals enter a final period of development at a particular point in time. However, as argued throughout this chapter, development is dynamic and does not proceed in a linear fashion. There are many types of changes that occur over the lifespan. Not all of these changes can properly be regarded as developmental changes. For example, the mere fact that some events (e.g., the onset of Alzheimer’s disease) occur at later periods of life does not mean that the transition to those events mark periods of development. To understand the nature of development over the course of the lifespan, it is necessary to differentiate the concept of development from a series of related and overlapping concepts, such as change, growth, age-related change, history and the life course. Having done so, it will become possible to identify how developmental change occur within the context of various other types of changes that occur over the lifespan.

The concept of development is used in different ways by different theorists. To say that a structure or process is undergoing development certainly implies that it is undergoing some sort of change. However, the mere fact that something is changing does not imply that it is undergoing development (Overton, 2006). Change simply implies reference to any type of alteration over time: one can alter the position of one’s hand in space; ice can melt into water; hair grows over time. Although each of these events reflects a type of change, none is an example of development. Having longer
hair, for example, does not mark a developed state than having shorter hair. Thus, while development involves change, it cannot be reduced to change alone. Similarly, in psychology, the concept of development is sometimes used to refer to age-related changes. From this view, developmental changes consist of transitions in psychological functioning that arise systematically at different ages across the lifespan. From this view, the task of the life span psychologist is to track transitions in psychological processes from one period of time to the next. The main problem with this conception of development, of course, is that not all ordered or age-related changes that can be regarded as developmental changes. Researchers who study aging routinely report examples of the decline in psychological capacities with advancing age. While such declines may be age-related, the mere use of term decline suggests a movement away from some high point of psychological functioning, however defined.

The concept of development differs from the concepts of change and age-related change in its implication of progression. To say that a psychological process is undergoing development implies change toward a higher level of functioning, however defined. In this way, developmental changes must be judged -- either implicitly or explicitly -- with reference to some conception of the optimal outcome, endpoint or form of the psychological process in question. Further, to say that in development involves movement to a higher level of functioning implies some type of change in the structure or hierarchical organization of the developing function. Thus, to say that the capacity to construct narratives undergoes development requires some conception, however tacit, of what would constitute fully developed acts of narrative construction. It is this latter point that differentiates the concept of development from the concept of growth. At
base, the concept of growth implies a difference in quantity or amount; to say that a flower, a coral reef or a salary grows is to speak of an increase in quantity. Thus, yet again, while developmental process often involve growth, development implies more than growth. Development implies some type change in the structure of the entity as it moves in directions defined by some conception of the optimal outcome(s) or form(s) of the entity in question.

The 13 levels of skill depicted in Figure 2 provide a yardstick for tracking developmental change defined in terms of structural transformation in patterns of thinking, feeling and acting within particular domains and context. From this view, to speak of the development of psychological skills is to speak of transformations in the structure of action from less differentiated lower-level actions to increasingly differentiated and hierarchically integrated forms of acting, thinking and feeling. In this sense, the developmental progression postulated by dynamic skill theory reflects a more precise articulation Werner’s (1948; Werner & Kaplan, 1962/1984) orthogenetic principle of development. The orthogenetic principle states that when development occurs, it moves from more global and undifferentiated states to increasingly differentiated, integrated and hierarchically integrated states. The levels and tiers specified by skill theory reflect increasingly levels of differentiation and hierarchical integration of skill components.

When addressing the issue of the nature of psychological change over the lifespan, it is important to differentiate the overlapping concepts of development, on the one hand, and history and the life course, on the other. An analysis of an individual’s life history often proceeds as a causal-temporal accounting (narrative) of the sequence
of events that make up an individual’s life. A satisfying account of a person’s life course provides an explanation of how a person’s life, character or psychological attributes came to be the way that they are or were. The narrative accounting of lives overlaps considerably with developmental analyses (Elder & Shanahan, 2006; Roy & McAdams, 2006); both are concerned with identifying the processes and pathways through which psychological processes and outcomes take shape over time. However, identifying the pathways through which psychological events move is not the same as tracking developmental changes in those events. A narrative accounting of such a person’s life course can illuminate the processes and pathways through which an individual experiences shifts in jobs, careers, relationships, attachments, beliefs, health, and other conditions en route to, say, a state of contented retirement. However, such analyses are silent when it comes to the question of developmental level. Over any given period of time, the developmental level of a person’s psychological structures and processes in particular contexts and domains may rise, fall, remain the same, or show any number of movements toward or away from any given developmental outcome. Thus, while historical and narrative analyses document what happens over time, developmental analyses document how psychological structures and processes undergo transformation in the direction of higher-order structures. The distinction between what happens over time and movement toward a higher level is revealed in the use of terms to refer to the developmental status of events as they change over time. It is only with reference to some conception of a developmental endpoint that we can properly speak of progression or advance, regression or decline, backward transitions, deviations, lateral change, and so forth (Fischer & Granott, 1995; Mascolo, Li, Finke & Fischer,
Thus, although developmental changes take place within historical time, historical changes are not necessarily developmental changes.

The distinction between change-over-time (historical changes) and developmental changes can be illuminated through an analysis of microdevelopment of skilled action over time (see Yan & Fischer, 2007). Granott (1993, 2002) reported the results of a study in which groups of adults worked together to perform a task of joint problem solving. Adults observed the behavior of a Lego robot – called a “wuggle” -- which was programmed to respond to changes in light, shadow, sound and touch. Their task was to figure out and explain how and why the wuggle operated. In analyzing videotaped interactions among pairs of participants, Granott (1993) classified the complexity of each partner’s actions and explanations of the wuggle’s movements. An analysis of changes in the skill complexity of one dyad (Ann and Donald) is provided in Figure 8. Over the course of 27 minutes and 148 interchanges, Ann and Donald worked together to explain how the wuggle operated. Although both Ann and Donald were intelligent adults capable of functioning with high levels of skill, as they began to collaborate, the complexity of their actions fell to levels that were comparable to actions at the sensorimotor tier of development. The dyad’s actions were characterized by particular descriptions (representations) of particular observations of the concrete movements (akin to sensori-motor actions) of the wuggle. Given their hybrid nature, Granott referred to these sensorimotor-like skills as actions. A single action (Sm1) might include a description of the act of seeing the wuggle move or hearing a sound made by the wuggle. An action mapping (Sm2) might include noticing that hearing a loud sound goes with seeing the wuggle change movement. Action systems (Sm3)
involved combinations of several movements or sounds into a single observation. Finally, *single representations* (Sm4/Rp1) result from coordinating several action systems. Abstracting across observations of how the wuggle moved in response sound, the dyad constructed a representation that “The wuggle reacts to sound”.

A series of important findings resulted from Granott’s (1993) study. First, as indicated above, even though Ann and Donald were capable of operating at extremely high levels abstract functioning, when they began to work on the novel problem of figuring out how the unfamiliar Lego robot operated, the dyad’s level of functioning fell to very low levels. Granott referred to such shifts to lower levels of functioning as *backward transitions*. Backward transitions or regressions seem to arise when people are trying to construct novel skills in unfamiliar domains, when they attempt to simplify a task by breaking it down into parts, or when it is otherwise possible to construct some parts of a larger task before moving on to construct other such parts. In an extremely novel domain of action (like Ann and Donald’s), an individual’s level of performance can fall to very low levels – even to sensorimotor actions. Constructing skills for a new and unfamiliar task required the dyad to “begin at the beginning”. As indicated in Figure 8, over the course of the first 60 interchanges, the dyad moved gradually through the action tier and into the representational tier.

However, at interchange 65, however, the dyad experienced an unexpected event. A wire fell out of the wuggle. In their attempt to repair the wuggle, the dyad
placed the wire in the wrong hole. As a result, the wuggle began to behave differently. As the dyad resumed their joint problem solving, their novel and still unstable skills for representing the movement of the wuggle failed. The dyad experienced a second backward transition; the level of their explanations returned again to the first level of the action tier of development. The dyad had to “start over again” and make new observations of the wuggle’s novel behavior. Over the next several minutes, the dyad rebuilt their understanding of the wuggle’s behavior, moving through the action and representational tiers, and finally onto construct abstract tier of development. The dyad experienced additional backward transitions as they continued were asked to perform novel tasks related to the wuggle’s behavior.

The changes in skill complexity depicted in Figure 8 shows the importance of differentiating historical changes in what occurs over time from developmental progressions. As indicated in Figure 8, historically, the level of complexity of Ann and Donald’s skilled performance fluctuated over time. The growth curve is non-linear and characterized by both increases and decreases in complexity, developmental progressions and backward transitions. Some of the backward transitions occurred as the dyad moved from one aspect of the task to another; others occurred as the dyad focused on a single task component (e.g., representing the wuggle before, and then after the changing of the wire). The upward and downward fluctuations are not simply random; instead, they function in the service of the dyad’s attempt to construct higher order skills. In this way, forward and backward transitions reflect important and perhaps even universal aspects of the process of development – the construction of higher-order skills by coordination lower-level elements.
As individuals reach the years of late adult development, they experience decline in a wide variety of psychological functions, including processing speed, memory functioning (especially under conditions of low support), capacity to inhibit thought and action, and so forth. However, decline in some psychological functions and domains does not imply decline in all areas (see Bialystok & Craik, this volume, and Blair, this volume for extended discussions of declines and advances during late adult development). For example, although speed of processing may undergo gradual decline in late adult development, individuals often embark upon new developmental projects during their retirement years. Despite decline in particular memory functions, adults in the late mature years show advances in reflective thinking and the capacity for “wisdom” (see Sternberg, this volume). Further, among older adults, novel developmental pathways emerge as adaptive reactions to the decline in other areas. Thus, when we adopt psychological structures as the unit of developmental analysis, it becomes easier to see how development occurs throughout the lifespan through the process of adapting to novel demands and challenges.

**Developmental Changes in Life Goals over the Adult Years**

How do overarching life goals undergo developmental change over adulthood? In contrast to traditional developmental (Erikson, 1958; Freud, 1926; Piaget, 1983) and life-phase approaches (Gould, 1980; Levinson, 1978), development does not occur in a linear series of homogeneous stages throughout the lifespan (Clark & Caffarella, 2000; Fischer & Bidell, 2006; Valsiner, 1993). Different cultures parse the life course in different ways for different people. For example, unlike in Western societies, in traditional India, during the last phase of life, many Brahmin men leave the family in
search of spiritual fulfillment (Mascolo, Rapisardi & Misra, 204). Even within the same culture, the nature, form and timing of life transitions varies across groups. As cultures change, the developmental tasks associated with different life phases also shift. With economic and demographic changes, for example, many retired individuals in the United States have faced the challenge of returning to work (Love, 2008). Many adults who have encountered economic difficulty have found it necessary to return to their parents’ homes for some period of time. In contrast, in the economically burgeoning India, the tradition of extended families is unraveling (Sharma, 2003). Thus, there is no single normative trajectory of change or development across the lifespan.

Over the course of life, a person’s processes are psychologically channelized by those tasks and developmental goals that are most adaptive, salient or meaningful at a particular phase of life. In keeping with the distinction between historical and development change described above, some of these changes will be historical changes – shifts from one culturally-embedded life theme to another; whereas others will be developmental changes. Although there is no single trajectory in the emergence of life goals, to the extent that life goals undergo genuine development, they will move in the direction of increased differentiation and hierarchic integration. Over time, context-specific skills and meanings will become increasingly intercoordinated to form more generalized and encompassing higher-order structures. For example, lower-level structures (e.g., making a cup of coffee; talking about the weather) can increasingly come under the regulative control of higher-order goal structures (e.g., being a good host to one’s guests). Over time, higher-level psychological structures can function as higher-order goals (e.g., be a good host) that drive social action in particular social
contexts (e.g., *making coffee for one's guests*). In this way, the task of tracking changes in central life goals is tantamount to charting changes in core self-defining meanings that individuals use to organize and regulate self and social activity.

Figure 9 identifies the results of a cross-sectional study in which 409 English-speaking individuals from the United States and UK responded to an online questionnaire. Participants were asked to enter written responses to the question “What do you experience as the most important thing in your life right now”, to explain why the event in question was important to them, and to provide a concrete example. Responses were classified into a series of core life goals, including education (i.e., attending school or college), family (i.e., relationships to parents, children, siblings), love relationships (i.e., relationships to spouse, boyfriends, girlfriends), career, friends, health (i.e., concern about maintaining health) and reflection (i.e., reflections about the life course, one’s legacy, spiritual connections beyond the self). Figure 9 identifies the percentage of respondents indicating core life goals for each of five age groups. The top panel of Figure 9 identifies the most frequent themes indicated within each different age group. Goals and themes related to *family* were the most frequently indicated theme for *all* age groups (the proportion of participants nominating family themes is identified on the secondary *y* axis using an expanded scale). Nonetheless, the importance of family increased gradually over the first three cohorts, reaching a peak among 36-45 year olds—around the time when parents are busy raising children.

-----------------------------------------------

Figure 9 about Here

-----------------------------------------------
Beyond these overarching investments in family, over the five cohorts, the most salient life goals included school for 18-25 year-olds, love relationships for 26-35 year-olds, family for 36-45 year-olds, reflection for 46-55 year-olds and health, love relationships and reflection for individuals 56 and over. These dominant concerns are sensible for individuals in Western culture. Late adolescence and early adulthood is the time that most individuals attend high school and college. As indicated in Figure 9, education-related goals drop off precipitously after age 25. Earlier to early-mid adulthood is a time when individuals typically seek partners for love relationships. As indicated in Figure 9, after reaching a peak between ages 26 and 35, the percentage of individuals nominating love-related goals decline somewhat, but remains relatively over the final three age cohorts. The percentage of individuals who nominate reflection-related goals increases precipitously in the 46-55 cohort, around the time when many individuals report so called “midlife crises” (Lachman, 2004). At this point, many individuals become concerned about their generativity, their life work and connecting to social or spiritual realms outside of the self. Health concerns are nominated by relatively small proportions of people in each cohort with the exception of the 56+ cohort. Although friendship-related goals (not indicated in Figure 9) were higher amongst 18-25 year-olds, they were rarely elevated to the status of most important concerns for any age group. Surprisingly, career-related goals (not indicated in Figure 9) never emerged as a singly dominant motive for any cohort. It is possible that career goals were subordinated to family goals in the lives of participants in this study.

Figure 9 tracks age-related shifts in life goals across five different cohorts. However, without assessing the level of complexity of shifting life-goals over time or
cohort, such changes cannot be regarded as genuine developmental changes. To assess developmental changes in the structural complexity of life goals, a subsample of 200 individuals was selected for further analysis. Participants in this subsample completed an extended version of the task described above; they described, justified and provided examples of the first, second and third most important things in their lives. They were also asked to describe principles that would explain how their life-goals that they had described were related to each other. We refer to the representations of each participant’s life goals as a core goal structure. The level of complexity of each participant’s core goal structure was identified in terms of the developmental levels indicated in Figure 2. In this online questionnaire, because there was no opportunity for an investigator to ask follow-up questions that would probe the depth of a person’s goal structure, participants are best regarded as operating at their functional rather than optimal or scaffolded levels of performance. Consistent with this assertion, the level of complexity of core goal structures increased gradually with each age cohort, taking the shape of the functional rather than the optimal level curve depicted in Figure 7.

Figure 10 provides examples of core goal structures at give different level of complexity. The bottom panel portrays an 18-25 year old male’s core goal structure for whom school, work and relationships constitute important goals. For this individual, school, work and relationships are all organized around the generalized value of taking responsibility, which functions at the level of single abstractions (Level 10/Ab1). Panel 2 depicts the protocol of a 26-35 year old female. This individual identified family, personal goals, and securing financial assets as fundamental goals. Operating at the level of abstract mappings (Level 11/Ab2), this individual represents her life goals in
terms of a paradoxical relation between two primary concerns: although _family_ comes before _personal goals_ (i.e., becoming a nurse) and _making money_, one nonetheless needs to money and personal fulfillment _in order to_ make one’s family happy. Panel 3 displays the protocol of a 40-year-old male who is at a point of transition in his life. The individual's protocol functions at the level of abstract systems (Level 12/Ab3). The respondent's goal structure is organized in terms of multiple integrated comparisons between his current station in life and his future sense of who he wants to be. Specifically, this individual wishes to _complete his current position_ before moving onto to _a career and lifestyle that will bring him happiness_; simultaneously, the respondent maintains the importance of being _flexible and adjusting his sense of who he wants to be_ as he confronts the _stabilities and changes involved in getting older._

Panel 4 of Figure 10 depicts a rare example of a core goal structure that operates at the level of abstract principles (Level 13: Ab4/Pr1). Abstract principles are the highest level of functioning postulated by dynamic skill theory (Bidell & Fischer, 2006; Mascolo & Fischer, 2005). The protocol is that of a 55+ year-old female with a graduate level education (Master’s Degree). This individual's protocol is characterized by a high degree of integration over a series of highly differentiated values, goals and meanings. The principle of _living a spiritual life_, represented in terms of the metaphor of _a fortunate traveler_, structures the various elements of her life goal representation. For this individual, _faith in God_ provides a structure that _overlays her entire life_. Her
faith gives her a sense of *surety, acceptance and love*; helps her to *define values and priorities, deal with loss*, and to perceive *beauty and meaning* in her everyday experiences in the world. This last point is reflected in her relationships with other people, namely her family and friends. Given the certainty, acceptance and capacity to love that stems from her faith, the respondent is able to *give and receive support* to a *hierarchy of friends*; to *enjoy* the time she spends with her children; and to *appreciate her son with loving acceptance of his serious disabilities*. In her protocol, this respondent described a series of concrete examples of the ways in which she is able to put her core goals into *praxis*. Two such examples (i.e., enjoying spending time on a cruise with her sons; enjoying power walks with a close friend) are provided in Figure 10 in the form of skill diagrams depicting activities at the level of representational systems (Level 9/Rp3). The respondent’s descriptions of these concrete activities flow easily from the abstract idealizations that she describes. This is an important feature of her core goal structure. Within any given level of functioning, core goal representations operate as *hierarchically organized control structures*; lower-level actions and meanings function in the service of higher-order meanings, values and goals. There is a high level of integration and coherence between the abstractions that make up the respondent’s core goal representation and the concrete examples provided to illustrate them. This degree of coherence suggests a high capacity to regulate concrete behavior in terms of abstract ideals – that is, to put abstract principles into practice. With advancing development, individuals are increasingly able to put higher-order enduring beliefs into concrete practice (Blass, 1991; McNamee, 1977). Thus, higher-order abstractions need not function as “mere conceptualizations”. Like the lower-level actions and concrete
meanings from which they ultimately arise, higher-order abstract concepts function as control structures. With development, individuals are increasingly able to draw upon high-level abstractions to exert regulative control over their everyday actions.

**Changes in emotional aspects of psychological structures over the adult years.** Core goal structures are not simply conceptual structures; they are embodied structures that are built from the constructive integration of lower-level actions and concrete meanings over long periods of time. Affective changes over the lifespan have been studied in a variety of ways. Although research on affective changes over the lifespan has produced many conflicting results (Consedine & Magai, 2005), findings suggest some general conclusions. At the most basic level, researchers have examined age-related changes in the experience of positive and negative emotional experiences over the lifespan. Trajectories in the frequency of positive and negative affect over the lifespan take different shapes as a function of gender, personality dispositions, socio-economic status, and other variables (Gruenewald, Mroczek, Ryff, Singer, 2008; Mroczek & Kolarz, 1998). Over the lifespan, reports of positive emotions are dramatically higher than reports of negative emotions. Between the ages of 20 and 75, in Western samples, there appears to be a modest increase in the frequency with which people report positive emotion, and a gradual decrease in the frequency with which people negative affect (Mroczek, 2001). With respect to negative emotion, Schieman, (1999) has suggested that older individuals are less likely to find themselves in situations that produce experiences of anger and related emotions; other studies suggest that decrements in anger among older individuals are mediated by differential use of emotion coping strategies (Blanchard-Fields & Coats, 2008; Charles &
Carstensen, 2008). In their review of research on emotional expressivity, Consedine and Magai (2005) have suggested that, contrary to conventional wisdom, research suggests that emotional expressivity remains robust and may even increase with age. A variety of studies have examined age-related changes in complexity of emotional experience with age. Malatesta and Izard (1984) have demonstrated that in comparison to younger women, older women exhibited more complex blends of emotion-related facial activity when recounting memories of emotional experiences, suggesting an increase in the complexity of emotional expression in older individuals.

While much research addressing age-related changes in emotional experience has examined quantitative differences in emotion over time (Consedine & Magai, 2005), some researchers have examined how emotion undergoes qualitative transformation throughout childhood (Sroufe, 1996; Mascolo & Griffin, 1998), adulthood and late adulthood (Labouvie-Vief, 2003; Strayer, 2002). Labouvie-Vief and her colleagues (Labouvie-Vief, & Diehl, 2000; Labouvie-Vief, Diehl, Jain, & Zhang, 2007) have examined development changes in what they call affective optimization and affective complexity over the lifespan. Affective optimization consists of an emotional regulation strategy involving the maximization of positive affect and the minimization of negative emotion in connection to emotionally challenging circumstances. Affective complexity consists of the capacity to differentiate, experience and coordinate multiple emotions at the same time. Labovivie-Vief and her colleagues have shown different trajectories in the development of affective optimization and affective complexity across the lifespan. Affective complexity increases over time, peaking between at about middle age, and begins to decline from about age 60 onward. In contrast, affective optimization shows
gradual increases over the adult years, leveling off but not declining after about age 80 (Labouvie-Vief, & Diehl, 2000; Labouvie-Vief, Diehl, Jain, & Zhang, 2007). These findings corroborate a suite of findings that suggest that there both quantitative and qualitative changes in emotional life over the lifespan. With development, individuals become able to construct (a) complex combinations of emotional states (Malatesta & Izard, 1984; Ready, Varvalho & Weinberger, 2008), (b) higher-order experiences of emotion (e.g., pride, resentment, patriotism, contentment) (Mascolo & Fischer, 1995; Zinck & Newen, 2008) and (c) complex and nuanced emotional regulation strategies (Diehl, Coyle & Labovivie-Vief, 1996; Riediger & Freund, 2006; Schulz, Heckhausen & Locher, 1991). For example, when confronted with stressful life events, younger individuals are more likely to exhibit “primary” coping reactions (i.e., attempts to directly solve the problem); in contrast, older individuals are more likely to adopt “secondary” coping strategies (i.e., managing emotion and accepting events over which they have little control (Diehl, Coyle, Labovivie-Vief, 1996; Riediger & Freund, 2006).

Thus, as integrative and embodied processes, psychological structures do not simply have cognitive or representational content, they are also organized in terms of significant emotional content. Table 2 identifies four dominant emotional themes contained the core goal structures in participants in the study described above: Happiness, Love, Emotional Support; and Emotional Coping. Three levels of emotional complexity were defined for each emotional theme as indicated in Table 2. Figure 11 displays the proportion of participants in each age cohort who made reference to each of form and level of emotional content in their core goal structures. As indicated in each panel of Figure 11, the frequency with which participants made reference to
higher-order forms of emotion increased with age for each of the four emotional themes. The upper left panel displays age-related and developmental changes in reports of *happy themes*. Reference to simple happy states (Level 1) peaked between ages 26 and 35, but were frequent in all age groups. Enduring feelings of contentment and fulfillment (Level 2) emerged between ages 26 and 45 and showed a mild decline after age 46. At this time, participants began to make reference to more highly developed modes of happiness such as taking joy in moment-by-moment experiencing; actively choosing to be happy, finding joy in connecting to the world (Level 3). The upper right panel displays changes in *love-related themes*. Again, the most frequently cited theme involves simple statements of love for various objects (people, family, activities, etc.). The proportion of participants who make reference to object love (Level 1), mutual/enduring love (Level 2) and love as an active process (Level 3) gradually increases with age. Mutual/enduring love begins to emerge between 26 and 35 years of age, whereas love as an active process begins to emerge after age 45.

References to *emotional support* and *caring for others* showed dramatic differences over time. An extremely common theme in the protocols of 18-25 year-olds involved feelings of being supported by others – particularly parents. Over and over again, the youngest cohort made reference to the ways in which family was “there” for them and supported them through their primary activities. The frequency with which participants made reference to feelings of emotional support declined gradually with
increasing age. In contrast, references to caring for others increased with age. References to taking care of specific loved ones (Level 1) emerged among 18-25 year-olds and peaked between age 36 and 45. Caring for specific \textit{classes} of people (e.g., teachers caring for students; professionals caring for clients; Level 2) began to emerge among 26-35 year-old cohort and peaked between 46 and 55 years of age. Finally, references to caring for both individuals and broad classes of people as a duty or way of life (Level 3) began to emerge with the 46-55 year-old cohort, and increased in individuals over 55 years of age. The lower right quadrant of Figure 11 displays changes in styles of \textit{emotional coping} as represented in the core goal structures of participants. Descriptions of emotional coping involved reference to ways of addressing situations that were described as explicitly stressful or challenging. As indicated in Figure 11, descriptions non-adaptive coping strategies (i.e., giving up; not knowing how to manage stress) and dependency on others during stress (Level 1) declined with age, and was only evident among 18-25 year-olds. References to proactive emotional coping strategies (Level 2) were evident in all age cohorts. Reference to a \textit{balance between acceptance and assertion} as an emotional coping strategy began to emerge only later in life, beginning with the 46-55 year-old cohort, and increasing thereafter.

Overall, these data suggest in development, core goals structures undergo both emotional as well as representational transformation. With age, individuals increasingly made reference to a range of higher-order emotional experiences (i.e., cognitive-affective differentiation; emotional complexity) and to modes of regulating emotion in ways that reflect a balance between acceptance and agency in the world (i.e., affective optimization; the coordination of primary and secondary emotion regulation strategies).
Indeed, among very highly developed goal structures, it is sometimes difficult to differentiate representational, affective and regulatory aspects of a person’s reflections; any given statement involves a highly integrative melding of meaning, affect and social understanding. Such higher-order integrations reflect a sense of “feeling whole within the self” and “feeling connected to the world” that some view as representative of healthy adult development (Sinnott & Berlanstein, 2006).

**Adult Development through Social Relationships**

Earlier in the chapter, we argued for the need to identify an integrative unit of psychological analysis. We suggested that the concept of *situated meaning-mediated action* can function as such a unit. As indicated in Figure 1, the concept of action brings together a series of essential psychological processes, including agency, meaning, experience, affect, motor movement, and so forth. From this view, thinking, experiencing and movement are understood either as aspects of ongoing action or as forms of contextualized action. Throughout this chapter, we have emphasized the importance of social context as part of the process of structuring human action. In this section, we extend the model of individual action developed earlier to elaborate a more comprehensive model of the person-environment system (Magnusson & Stattin, 2006).

Having done so, we then extend the conceptual and empirical tools described thus far for the analysis of individual action and development to elaborate a system for assessing the dynamic structure of joint activity. In so doing, we describe tools for analyzing how individual psychological structures develop within the context of meaning-mediated interactions with others. We illustrate these principles through an
analysis of the micro-development (Siegler, 2006; Granott & Parziale, 2002) of meaning and emotion over the course of single session of psychotherapy.

**Extending a Model of Integral Action: The Coactive Person-Environment System**

Figure 12 incorporates and builds upon Figure 1. Like Figure 1, the model begins with a representation of individual action (A) on physical and psychological objects (B). The components of individual action are represented in Figure 12 at point (A1). Figure 12 extends Figure 1 though its depiction of the fundamentally embedded nature of individual action within socio-cultural context (E). In so doing, Figure 12 augments Figure 1 by representing three additional propositions:

1. In social interaction, social partners (A, C) co-regulate (f) each other’s actions, thoughts and feeling;

2. Face-to-face co-regulation is mediated by the use of cultural tools, most notable among them being language and other symbol systems, broadly defined;

3. Higher-order experiences of self are co-constructed in discursive interactions with others; in any given discursive context, self-awareness emerges as primary conscious activity (A) -- which normally is focused on external objects (B) -- loops back and takes itself as its own object of awareness (A2, A3).

Once constructed, higher-order representations of self function as goal-structures that individuals use to regulate thinking, feeling and action in particular social contexts.

The coactive systems view goes beyond the everyday idea that the social environment “has an effect” on individuals. The main point of the coactive person-environment system is that the elements of the person-environment system do not function independently of one another. This statement calls for a shift in the ways in
which we often think about the analysis of causality psychology. The various elements of the person-environment system are not “factors” or “forces” that exert individual or collective “effects” on an individual (Rogoff, 1990). Because control over action is *distributed* among elements of the person-environment system, at any given moment, even subtle shifts in relations among system elements can lead to significant transformation in an individual’s action. In what follows, we elaborate further on the ways in which Figure 12 elaborates a coactive model of social interaction.

**Social Interaction is Co-Regulated**

The co-regulation of action in face-to-face social exchanges is indicated at point (f) in Figure 12. The concept of co-regulation can be illuminated through an analysis of human communication systems. The process of communication is often represented mechanistically in terms of individual senders forwarding discrete and bounded messages back and forth to each other. Such a process is characteristic of discrete state communication systems (Fogel, 1993; Semin, 2007; Trevarthen, 1998). From this view, a discrete message originates within a single individual and is encoded and then sent through a fixed communicational channel (e.g., as in telegraph, mail or e-mail). After the individual sends the message, it remains fixed and cannot be changed throughout the process of transmission. After the correspondent receives the message, she must decode it. Only *after* she has decoded the message can she switch roles from receiver to sender, and continue the exchange. This form of communication is typical of those which involve the use letters sent through the mail, email, telegraph and related mechanical exchanges of information.
Face-to-face communication, however, does not proceed in this way. Face-to-face exchange provides an example of a continuous process communication system (Fogel, 1993; 2005). In ordinary interaction, interlocutors are simultaneously active as both senders and receivers. As one person speaks, the other person provides continuous feedback in the form of verbal and non-verbal indicators (e.g., nodding of the head, changing facial expression, direction of gaze, and even the time allowed to elapse before speaking). As a result, the “message” is not fixed and is free to change in the very process of communication. In social interaction, meanings are jointly constructed as social partners co-regulate each other’s actions, thoughts and feelings. In this sense, co-regulation refers to the process by which social partners simultaneously and continuously adjust their ongoing actions, thoughts and feelings to each other (Fogel, 1993; Mascolo & Fischer, 1998). It follows that within co-regulation, the actions of the other are part of the process of the self’s actions, and vice-versa.

Current research suggests that infant-caregiver dyads are able to establish rudimentary forms of intersubjectivity soon after infants are born. Intersubjectivity can be defined in terms of the capacity for shared or coordinated action or experience within episodes of joint action (Matusov, 1996; Rommetveit, 1979; Trevarthen, 1993). Support for this proposition comes from many sources. Melzoff and Moore (1978, 1979) have produced evidence that neonates are capable of matching facial actions modeled by others. By two months of age, infants and their caregivers engage in emotionally-charged turn-taking involving sequences of smiling, cooing and related coordinated acts (Trevarthen, 1979; Trevarthen & Hubley, 1983). Through these richly co-regulated interchanges, infant and caregiver not only coordinate their facial and vocal actions,
they also coordinate the emotional experiences that arise within the facial and vocal
dance that occurs between them (Gallagher and Hutto, in press). The idea that that
infants enter the world capable of achieving primitive forms intersubjective activity is
bolstered by the recent discovery of “mirror neurons” (Gallese, Eagle & Migone, 2007;
Rizzolatti, 2005). “Mirror neurons” consist of neurons, initially discovered in the
prefrontal lobes of monkeys, which become activated both when observing behavior in
others and when executing the same action by the self. The existence of mirror
neurons suggests that a common neurological system underlies both the observation
and production of certain classes of motor behavior. Such common pathways provides
a foundation for understanding how infants are capable of entering into socio-emotional
interactions from the start of life: Although individual persons are separate and distinct
organisms, the mirror neuron system (or systems like it) provides a means for
experiencing correspondences -- however primitive at first -- between experience of
others and experiences within the self (Meltzoff & Brooks, 2007).

This findings suggest an *inversion* of traditional conceptions of the relation
between social and cognitive development. Whereas traditional approaches maintain
that intersubjectivity is a *derivative product* of cognitive development, recent research
suggests that psychological development *builds upon* a primordial capacity for
establishing intersubjectivity with others. Thus, whether we are talking about infants
(Fogel, Garvey, Hsu & West-Stromming, 2003; Trevarthen & Aiken, 2000) or adults
(Beebe, Knoblauch, Rustin, Sorter, Jacobs & Pally, 2005), development is made
possible by the capacity to establish intersubjectivity with others.
Higher-Order Social Interaction and Development is Mediated by the Use of Language and Symbol Systems

Higher-order operations are produced and maintained through the use of semiotic systems (Rommetveit, 1985; Wertsch, 1998). We use the term semiotic function to refer broadly to any form of representation, where representation refers to the capacity to make one thing stand for or refer to something else. In so doing, following a long tradition, we draw a distinction between signs and symbols. Sign systems are particularly important in mediating social interaction and higher-order psychological processes that have their origins in socio-cultural activity. Signs and symbols can be differentiated along a continuum. On one end of the continuum, signs (e.g., words, mathematical or musical notation, etc.) function as (a) generative systems that represent (b) arbitrary and (c) shared meanings. In contrast, on the other end of the continuum, symbols (e.g., images, pictures, objects that are used to stand for other meanings) are (a) non-generative, (b) are less arbitrary in the sense that they tend to resemble their referents in some way, and (c) represent personal rather than shared meanings. In what follows, we focus primarily on articulating the special properties of sign systems make the such useful vehicles of social interaction and enculturation.

First, signs are generative in the sense that given a finite number of elements and rules of combination (e.g., phonemes, letters, etc.) persons can generate an infinite number of meanings. For example, using the rules for combining the 26 letters of the English alphabet, one can construct an infinite number of possible meanings. Second, signs are arbitrary in the sense that the concepts and meanings to which they refer can be constructed in alternative ways based on purpose, history, and context. Words are
not used simply to refer to physical or concrete objects in the world. Instead, they represent systems of *meanings*. The meanings to which words and expressions refer are arbitrary in the sense that they *could be otherwise* depending upon the ways in which they are used (Wittgenstein, 1954; Mascolo, 2008a) to make social distinctions that serve *human* purposes. For example, the meaning of the term *mother* does not come from its correspondence a particular entity in the world, fixed or otherwise. The concept of mother has evolved over time to incorporate meanings that would be foreign to speakers of earlier generations (e.g., adoptive mother, stepmother; surrogate mother). The third feature of signs is that they represent *shared* rather than personal meanings. Unlike pictures or images, words represent meanings that are shared within a linguistic community. Thus, it is through the use of language that we are able to construct and re-construct novel meanings that mediate thinking, feeling and action.

In light of these special properties, language organizes human action at multiple levels. At the level of *culture*, language functions as a dynamic repository of shared and contested meanings that have evolved as means of solving personal and collective problems; at the level of *social interaction*, in light of its capacity to represent shared meanings, language plays a central (but not exclusive) role in mediating the co-construction and exchange of meaning between people. Given its generative properties and capacity to represent arbitrary meanings, language makes it possible to construct an infinite number of social meanings by drawing upon a finite number of meaning elements. Language thus functions as the quintessential medium for communicating, transforming and co-creating *novel* meanings in social interaction. Once novel meanings are created in social action, language provides the vehicle through which
such meanings can be disseminated throughout a linguistic community. Cultural change occurs as novel meanings, practices and artifacts are disseminated, accepted and transformed by members of a given linguistic community.

At the level of *individual action*, language is used for purposes extend beyond communicative functions. From their participation in joint activity with others, individuals internalize, appropriate and use language and other semiotic vehicles to *think* with (Wertsch 1998), to *regulate* their feeling and action (Diaz & Berk, 1992) and to direct their *participation* in (Rogoff, 1993, 2002) socio-cultural activities. It is largely through the use of language that individuals are able to profit from social interaction in the acquisition of higher-order skills and meanings that have their origins in cultural rather than individual history (e.g., mathematics; use of the internet; the formation of personal and professional relationships; identity construction within cultural contexts, etc.). The use of language to mediate action in individual actors is not, however, a static process. Sign-mediated meanings do not simply “pass through” individuals as if persons were merely conduits of cultural activity. On the contrary, individuals actively transform cultural meanings in the process of co-constructing and using them. Thus, although the individual minds are shaped by the cultural meanings conveyed in ordinary language, individuals are able to transform those meanings and externalize them in an attempt to advance their own personal and communal objectives.

**The Discursive Construction of Self and the Regulation of Action**

The third main issue highlighted in Figure 12 involves clarification of the concept and role of self in individual and joint action. We follow a long tradition of regarding self as a type of *experience* (Mead, 1934; Sarbin, 1952; Zahavi, 2005). In so
doing, we differentiate between primary and secondary modes of self-experience. The primary experience of self consists of a type of pre-reflective background experience that accompanies primary or core conscious activity on objects (Damasio, 2000; Mascolo, 2004; Zahavi, 2005). Primary conscious activity is a form of pre-reflective awareness directed toward external objects in the world. In primary conscious activity, because one’s full attention is focused on the object of one’s activity, it is common for people to get “lost in the experience” (Csikszentmihalyi, 1998); a person is primarily aware of the external object rather than of his own experience. However, despite the primary focus on the “external” in primary consciousness (e.g., what our interlocutor is saying; the movie we are watching; the passage in the book we are reading), it is nonetheless sensible to speak of an implicit or pre-reflective experience of self (Damasio, 2000; Emde, 1983; Zahavi, 2005). Looming in the background is an implicit and pre-reflective awareness of our body in space, emotional feeling tone, a sense of the agency of acting. It is likely even very young infants experience a subjective sense of self in this way (Damasio, 2000; Emde, 1983; Stern, 1985). Primary experience of self is indicated at point A1 in Figure 12.

The secondary form of self-experience is a reflective and most often mediated experience of self-consciousness. Self-consciousness occurs as act of self-reflection and is indicated at point A2 in Figure 12. Self-consciousness occurs as primary conscious activity loops reflexively back onto itself and takes itself as its own object (Mead, 1934; Mascolo & Fischer, 1998). It follows that there are multiple levels and forms of conscious experience, of which we have differentiated only two broad categories. As a higher-order process, secondary self-awareness begins to emerge in
the middle of the second year of life with the onset of the semiotic function. It is at this time that children begin to use both signs and symbols to construct explicit representations of self. Throughout development, in everyday interactions, one’s interlocutors use language to draw a person’s attention to aspects of her own functioning. Imagine a supervisor who instructs her new employee: “When you interact with customers, you represent not only yourself, but also the ABC Corporation. Be sure to greet your customers with a pleasant telephone voice”. The supervisor has not only called the employee’s attention to himself, but also, through the vehicle of language, offered a socio-moral category in relation to which the employee is asked to define himself. Over time, higher-order representations of self are constructed as individuals appropriate the language of their social community to identify experiential states, to regulate their actions, and to form social identities. The use of language to mediate the higher-order construction of self is indicated in Figure 12 at points A2 and A3.

With development, the secondary, higher-order construction of representations of self is of vital importance to understanding the regulation of action. With development, representations of self come to operate as high level goals or reference standards that direct and drive social action (Baumeister, 1998; Carver & Scheier, 2002; Mascolo & Fischer, 1998). Tangney (2003) has suggested that valued representations of self function as a kind of moral guide to action. Kagan (1996) has suggested that the quest to create and conform to personally-valued images of self operates as the most important motivational force in human action. With higher-order development, the desire to live up to valued conceptions of a worthy self can usurp even basic motives (e.g., hunger, thirst, safety, etc.). Dunning (2007) has reviewed research suggesting
that much consumer behavior arises in an attempt to bolster views of the self as capable, valued or moral. To the extent that the desire to experience the self in terms of valued socio-moral standards operates as a central human motive, representation of self plays an important role in the development and construction of psychological structures within any given social context.

**Tracking Individual Development within Joint Action: Relational Action Analysis**

If the patterns of acting, thinking and feeling produced in face-to-face therapeutic interactions are co-regulated, it is not possible to understand the developmental course of psychological structures by focusing only on individual actors. Instead, it becomes necessary to develop methods to analyze the ways in which meanings arise and are distributed with the broader person-environment system. Such a goal requires a shift in the unit of psychological analysis from the individual to the *joint activity* (Rogoff, 1990) or *social ensemble* (Granott, 1998, 2005). Mascolo (Basseches & Mascolo, 2009; Mascolo & Margolis, 2004) has developed a method for analyzing the *structure of joint action*, meaning and feeling in development. One can analyze the structure of joint action using a procedure called the *relational action analysis*. The basic principles for performing a relational activity analysis are simple. For any given unit of social interaction, a researcher (a) identifies the structure of action, thinking and feeling produced by each social partner; (b) identifies the form of co-regulated social interaction that occurs *between* social partners; and (c) tracks changes in the structure of the resulting joint over time. Using these procedures, it is possible to identify and chart changes in the *structure of joint action* and how novel forms of individual thinking, feeling and acting arise as a product of joint action as it unfolds over time.
The process of analyzing the structure of joint action proceeds by identifying *relational action structures*. Relational activity structures are represented visually using *relational action diagrams*. To illustrate, consider the difference between *individual skill structures* and *relational action structures*. The top panel of Figure 13 displays an individual skill diagram that depicts the structure skill elements for manipulating a hand-held jack-in-the-box. To manipulate a jack-in-the-box, a child must coordinate skill components at the level of compounded sensorimotor systems. She must be able to *hold the box* while *holding*, *looking at* and *turning* the crank *up and down* long enough *in order to see the jack pop*. While this skill is within the skill sets of most children over the age of two years, it is beyond the capacity for most 15-month-olds. When provided with a hand-held jack-in-the-box, a 15 month old might be able to hold the box, but could not simultaneously turn the crank. Having successfully gasped the box, a 15-month-old will often have to let go of the box as he attempts to turn the crank. However, if a caregiver holds the box for the child, an infant can begin to turn the crank up and down. In the context of joint action, the child exerts control over part of the task while the adult supports the child by performing the remainder of the task. The structure of this joint activity can be represented using a relational activity diagram.

-----------------------------------------------
Figure 13 about Here
-----------------------------------------------

The structure of the joint manipulation of the jack-in-the-box is depicted in the middle panel of Figure 13. As indicated in Figure 13, a relational action diagram is composed of several basic elements. The left and right side of the diagram depict the
specific structure of the meaning or action produced by each social partner in a given episode of social interaction. In this case, the structure on the left depicts an infant’s capacity to skills at the level of sensorimotor system (SM3) to coordinate acts of looking at the caregiver’s modeled action and using looking to guide turning the crank. The structure on the right represents the caregiver’s act of holding the box and modeling the act of turning the crank. The symbol located in between each partner’s meaning structure identifies the specific form of coactive scaffolding that occurs between the two social partners. Table 3 describes different forms and levels of coactive scaffolding and the symbols used to represent them within relational action diagrams. In this example, the caregiver provides multiple forms scaffolding by breaking down and performing part of the task (holding the box). However, the highest level of scaffolding involves modeling the act of turning the crank (Scaffolding Level 8). In so doing, as indicated in Figure 13, the mother MODELS the act while the child IMITATES.

In development, the production of novel meanings and experiences cannot be attributed to the actions of individual persons. Individual actors are often not capable of producing or sustaining emergent forms of action, thought or feeling in the absence of social partners. As a representation of joint activity, the relational action diagram depicts the dynamic structure and control over action as it is distributed throughout the dyad (Salomon, 1994). The action that emerges in social action is a dynamic product of the ensemble itself. By representing the ways in which the actions of social partners are constituted in relation to each other, a relational activity diagram provides a visual snapshot of how novel structures have their origins in co-regulated social interaction. Tracking relational action structures over time produces a visual representation of
changes in the structure of joint action and the processes by individual and joint meanings are created.

Table 3 and Figure 13 about Here

**Individual coordination within joint action.** What is the role of individual actors within the moment-by-moment co-construction of meaning in joint action? Within social interaction, individual development occurs within as individuals appropriate meanings and novel experiences from their participation in joint action with others (Rogoff, 1990; 1993). However, what do individual actors do when they appropriate meaning from their interactions with others (Mascolo, Pollack & Fischer, 1997)? For example, the process by which an infant imitates an action modeled by a caregiver (e.g., turning the crank on a jack-in-the-box) does not follow as a simple reproduction or internalization of the adult’s action. To imitate a modeled action, the imitator must actively coordinate elements of action and meaning in ways that approximate the modeled action. To do so, individual actors must draw upon and extend their existing skill repertoires in order to produce novel action; further, individuals must incorporate novel meanings and actions arising in joint action into their existing meaning and skill repertoires. It follows that individuals *transform* the meanings and actions that they acquire in the very act of appropriating them. How is this accomplished?

Fischer (1980; Fischer & Pipp, 1985) has proposed a series of transformation rules that describe how individual actors create higher-order structures through the coordination of lower-level skills and meanings. These transformation rules also
describe change processes that occur at the level of individual action. The term coordination is the general process of bringing into correspondence two or more previously unrelated meanings or actions. There are multiple forms of coordination. Several forms of coordination result in movement within a given developmental level of skill. Differentiation refers to the process of articulating a new meaning or action element in contradistinction to a previous or existing one. For example, an infant notices that moving the crank of a jack-in-the-box one way turns it up, whereas moving it a different way turns it down; in comparing two paintings, an adult is able to discriminate the realism characteristic in the work of the young Picasso from the abstraction in the work of Picasso later in his life. Shift of focus occurs when an individual changes the focus of his or her attention from one part of a task to another, without fully connecting to two parts. For example, having succeeded in grasping and lifting a jack-in-the-box, as a child shifts his limited attention to turning the crank, he may release the box. Shift-of-focus functions as an early form of juxtaposing skill elements that are beyond an individual's capacity for full coordination. Compounding occurs when an individual brings into juxtaposition two or more skill elements within the same developmental level of functioning. The process of building novel skill structures within joint action is illustrated in the bottom panel of Figure 13. This figure depicts the structure of joint activity between the same infant and caregiver whose actions are represented in the middle panel of Figure 13. The joint action structure represented the bottom panel occurred only minutes after the one displayed in the middle panel. There are two major differences in these joint action structures. First, in the latter structure, the caregiver provides a high level of scaffolding for the in the form of (a) hand-over-
hand guidance in assisting the child’s attempt to hold the jack-in-the-box while simultaneously turning the crank, and (b) the resulting increase in the child’s skill level. In the latter structure, using skills at the level of sensorimotor systems (SM3), given the caregiver’s scaffolding, the child has begun to use compounding to coordinate novel skill components (i.e., holding the box) with existing skills (i.e., visually-guided turning of the crank). Compounding differs from inter-coordination, which involves coordinating two or more skills at a lower developmental level to form a skill at a higher level or tier. Intercoordination is the only change process that moves a skill from a lower level to a higher developmental level. Intercoordination occurs, for example, when an infant is able to coordinate two previously independent sensorimotor mapping skills (e.g., looking at a crank in order to grasp it; turning the crank up and then turning the crank down) into a single and stable sensorimotor system for manipulating a jack-in-the-box (e.g., using looking to guide the coordinated acts of grasping and turning the crank up and down).

**Tracking Adult Development through Social Relationships: The Micro-Development of Self and Emotion over the Course of Psychotherapy**

To illustrate the ways in which a relational action analysis can be used to track micro-developmental processes as they occur in moment-to-moment social exchanges, we provide an analysis of transformations in emotionally-charged representations of self and other over the course of psychotherapy (Basseches & Mascolo, 2009; Mascolo, 2009). The case involves a single session of short term “anxiety-regulating” dynamic psychotherapy (McCullough, Kuhn, Andrews, Kaplan, Wolf & Hurley 2003; McCullough & Magill, 2009)¹ between a therapist and the *Lady Cloaked in Fog* (McCoullough, 1998)

---

¹ We would like to acknowledge our tremendous gratitude to Dr. McCullough and the Lady Cloaked in Fog for their generosity and courage in making videotapes of their work available for analysis.
-- a 44-year-old unmarried depressed woman who exhibited difficulty experiencing feelings of closeness. The Lady had experienced intractable depression all of her adult life, and had been in some form of therapy for the previous 24 years. Of the 64 sessions that constituted the early phases of the Lady’s treatment, we focus on changes that occurred in the pivotal 15th session. During this session, dramatic transformations occurred in the structure and content of the client’s emotionally-structured representation of self in relation to her therapist. At the beginning of the session, the dyad was able to identify a core emotional theme related to the client’s relationships with others, namely, “I matter onstage (when I’m at work, doing things for others) but not offstage (not at work; home alone)”. By the end of the session, the client was able to represent the therapist in terms of the metaphor of a “harbor light”. The client was able to represent herself as the captain of a ship at sea and the therapist as a harbor light – a beacon of care shining on shore whether or not the client was with her. When it was stormy or foggy, the client could “perk my head up” and see the harbor light beaming on shore. She could then decide whether to go toward the beacon of care, or just know it was there. This metaphor, built over the course of the session, provided the foundation for further development that occurred throughout the remainder of the client’s therapy.

-----------------------------------------------

Figure 14 about Here

-----------------------------------------------

Figure 14 tracks the development of the representational and emotional aspects of client’s psychological structures over the course of the pivotal session. The bottom panel displays changes in the complexity of the client’s meaning structures over the
course of the session. The top curve shows changes in the development of structural complexity of the client’s skill. The complexity of the client’s meaning structures began at the high level of abstract mappings (Level, 11, Ab2) and fluctuated between representational systems (Level 9/Rp3) and abstract mappings until the final episode in which the client coordinated the harbor light insight at the level of abstract systems (Level 11/Ab2). Whereas this curve charts changes the level of hierarchical complexity of the client’s representational activity, there are many configurations of meaning that can be formed at any given level of complexity. A second index of developmental change included the number of thematic elements contained in the harbor light insight that were coordinated by the client on any given conversational turn. Changes in the coordination of thematic elements reveal how the content of the harbor light insight developed over time. This curve clearly shows the ways in which the harbor light insight as built up gradually over time. Forward progression of certain aspects of the harbor light insight was followed by a series of backward transitions as the dyad encountered novel emotional and representational conflicts to address. While multiple configurations of meaning elements developed over the course of the session, an abrupt change occurred at conversational turn 114 when the various sets of components were coordinated into a single highly integrated insight. In what follows, we examine structural changes in the client’s construction of the harbor light insight.

The experience of emotion plays a central role in organizing the developmental course of meaning in development (Fischer, Shaver & Carnochan, 1990; Mascolo, Fischer & Li, 2003). This is especially the case in psychotherapy (Basseches & Mascolo, in press; Greenberg, Rice & Elliot, 1993; Toomey & Ecker, 2007). The top
panel of Figure 14 depicts changes in expressed emotion over the course of the harbor light session. Four categories of emotion were identified: Positive affect (i.e., smile, laughter, excited voice, statements expressing positive emotion); embarrassment/shame (i.e., smiling and gaze aversion; laughter inconsistent with events); anxiety/fear (i.e., tightening of muscles or posture; increase in bodily movement; increase in pace of speech and/or decrease in clarity of speech; gaze aversion; verbal expressions); and depression/sadness (i.e., Crying; tears; thin, constricted voice, as to cry; tremor; low/guttural voice; downturned lips; sitting heavily in the chair; long pauses/staring into space). As indicated in Figure 14, the client’s emotions evolved in five phases, each characterized by a different pattern of expressed emotion.

Over the course of the session, the therapist adopted the therapeutic strategy of repeatedly inducing emotional meanings and experiences were incompatible with the emotional meanings and experiences expressed by the client (see McCollough, 1998; Ecker & Toomey, 1997). In the first phase, the client’s emotions were organized primarily around sadness/depression as she articulated her sense of not mattering to others “offstage”. During the second phase, the client expressed occasions of positive affect she contemplated the prospect that she might matter to others (her present and previous therapist) when the client was “offstage” and not at work. Progress in imagining feeling cared for by the client’s therapists was interrupted by the client’s statement, accompanied by deep sadness, that feelings of care expressed by a therapist are “artificial”. The therapist responded to the client by enacting deep feelings of care for the client (i.e., “Do I seem artificial to you?”). The therapist’s expressed emotion had the effect of inducing both positive affect and embarrassment over feeling
cared for by the therapist. Throughout the session, the therapist adopted the strategy of responding to the client’s negative emotion with expressions of care intended to induce joyful experiences of feeling cared about by the therapist. This occurred repeatedly in both the third and fourth emotional phases of the session. In the third phase, the therapist’s expression of care functioned to challenge the client’s anxiety and sadness about the artificiality about the therapist’s care. By the fourth phase, as the client was able to accept the therapist’s expression of care as genuine, the client’s expressions of sadness dissipated completely. At this point, the therapist raised the possibility that the client could draw upon the therapist’s feelings of care outside of the therapy session (i.e., “I wonder if you can take me with you, and take these feelings with you”). This produced deep anxiety (but not sadness) in the client, which the therapist again addressed by explicitly enacting feelings of care to the client. At the end of the fourth phase, the therapist guided the client through the extremely painful emotional task of imagining how the therapist would feel about the client that night when she was home at dinner. Throughout the process, the client relied upon the therapist’s overtly supportive expressions of care to manage her deep feelings of anxiety, fear and embarrassment through the process: “This ability to look at you is a real, real barometer for me [to answer that question]”. With such support, the client was able to imagine that she would matter to her therapist that evening after the session. Soon thereafter, the client invoked the metaphor of the therapist as a “harbor light” who beamed care to the client whether or not the therapist was present or absent. During the last phase, in her elaboration of the “harbor light insight”, the client expressed considerable positive emotion, presumably reflecting feelings of security and closeness to the therapist.
There are several notable implications of these observed changes. First, the micro-developmental changes that occurred over this session were not simply representational or cognitive ones; there was meaningful emotional transformation over the course of the session. However, emotional transformation is not simply reflected in the superficial transition from predominantly negative to positive affect over the course of the session. Instead, it is manifested in the transformation of core emotional theme that organizes the client’s relationship to her therapist. The shift from not mattering “offstage” to “mattering to the therapist offstage” reflects a transformation in the client’s socio-emotional orientation toward others. Second, the emotional changes observed over the course of the client’s session were not simply adjuncts to the representational changes that occurred en route to the harbor light insight. On the contrary, the representational changes observed throughout the session were organized by and made possible by the emotional changes that occurred within the context of co-regulated interaction between the client and therapist. In this way, emotion is not only necessary for the formation of novel psychological structures in development; emotion is part of the process that defines a dynamic psychological structure.

**The discursive construction of individual meaning within joint action.**

Figure 15 provides the results of relational activity analyses of the four moments in the co-construction of the client’s “harbor light insight” -- the client’s emotionally-grounded representation that the therapist can function as a “harbor light” whose beacon of care shines for the client whether or not the client is “onshore” or “offshore”. The bottom right panel of Figure 15 contains an individual skill diagram that depicts the structure of the client’s “harbor light insight”, which functions at the high level of abstract systems
The relational activity analyses depicted in the first three panels illuminate the processes by which the structural changes in the client’s evolving representation emerged as a product of specific forms of co-regulated activity that occurred between the therapist and client. The top-left panel provides a representation of the starting point of the session, in which the following dialogue occurred:

C: Essentially me, my vote matters, but I don’t matter… the things I can do, and um, changes I can make and uh stuff I do to make the world a better place.

T: …But there is a part of you that doesn’t [feel you matter]. It’s important because your actions are you, too. But something you were saying, the core of you, the feeling of like of you, your feelings don’t matter…

C: Yeah. I guess that’s it. It’s like I, it’s like when I’m at work, I matter, and when I go home, am by myself, I don’t matter. It sort of on or off…On stage or off stage

Even in these few conversational turns, the client’s representation of her sense of mattering undergoes change. In C1, at the level of abstract mappings, the client articulates the main conflict between mattering and not mattering that undergirds the entire session. In responding to the client, the therapist abstracted across the examples that the client provided of “mattering” to create the interpretation: “your actions matter”. The client then abstracted across her own and her therapist’s statement to produce a more consolidated representation of her conflict in terms of mattering “onstage” but not mattering “off stage”. The movements that produced this higher-order representation of the conflict are represented in Figure 15.

The top-right panel of Figure 15 illustrates a simple yet important exchange involving the induction of emotion in the client. Throughout the session, the therapist
used the strategy of inducing emotional experiences that were incompatible with the client’s expressed emotions and meanings. Specifically, the therapist enacted feelings of “caring for” the client as a counter to the client’s sense that the client did not matter to others. In Episode 5, the client had just expressed anxiety (see above for criteria) about her sense that being cared for by a therapist is “artificial”. In response, the therapist, with a beaming face, asked, “Do I seem artificial to you?” This simple interchange induced embarrassment in the client, which signaled some degree of acceptance of the therapist’s expressed feelings, and provided a context for further development.

The bottom left panel of Figure 16 provides a simple example of how subtle interchanges that occur between social partners can produce profound transformations in emotionally-charged representations in individual partners. In this case, building upon her initial acceptance of the therapist’s expressions of care, the client continues to struggle with the idea that expressions of care in therapy are “artificial and bounded” and thus “not real”. This is represented in the left portion of the relational activity diagram. In response, the therapist states, “that’s right, our experience will be here.” In this utterance, the therapist differentiated two meanings that had up until this point were undifferentiated in the client, namely the distinction that a relationship that is “bounded” (“our experience will be here”) can produce “real” feelings of care. The client is able to use this distinction to restructure the conflict that she articulated just moments before.

**Developmental Theory and Research: Think Globally, Act Locally**

In his call for a developmental behavioral genetics, Gottlieb (2003) wrote:

The population view of behavioral genetics is not developmental. It is based on the erroneous assumption that a quantitative analysis of the genetic and
environmental contributions to individual differences sheds light on the developmental process of individuals. Any light shed on individuals development from a population view of behavioral genetics would be of a very general, nonspecific nature…Two reasons: (1) The finding of variance between individuals cannot be validly applied to an explanation of variation within individuals… (2) Because an understanding of the changes in individual development over the lifespan cannot be ascribed to singular causes (e.g., hereditary factors) operating in isolation: Understanding the development of individuals requires a relational concept of causality (p. 338).

Human psychological functioning and its development are dynamic. To the extent that psychological functioning consists of a type of activity, it must operate as a process that occurs over time. To study a process, it is necessary to examine how the elements of the process change over time in relation to each other within particular contexts. Traditionally, however, instead of thinking of psychological functioning in terms of systems of contextualized processes, theorists and researchers have understood human action in terms of a series of abstract and more-or-less static entities or structures. Examples of static units include the concepts like trait, general stages of operative competence, genetic plans, memories as stored representations, and so forth. Such units are static because they are assumed to reflect more or less fixed or stable attributes of individuals. To gain evidence for the existence of such static attributes, it is necessary to abstract across and ignore the dynamic variation that occurs across the multiple situations or contexts in which indicators of a presumed variable are observed.
The new developmental science is a dynamic one. Within this new and exciting paradigm, the development of psychological functioning can be seen in terms of the dynamic emergence of increasingly differentiated and integrated structures of meaning-mediated activity over time within particular physical and social contexts. Although human psychological functioning is composed of multiple component processes, no single component process is primary in the constitution of action; any psychological act necessarily involves some integration of all such processes. As dynamic processes rather than static entities, it is necessary to study integral human action in particular behavioral domains as it assumes successively different forms over time within particular contexts. As suggested by Gottlieb (2003), to capture nature of the process of development, it is necessary to go beyond the partitioning of variance within populations to the study of trajectories of growth and development in individual actors over time (Fogel et al., 2003; Piaget, 1953; Van Geert, 1994). In so doing, it is necessary to draw upon methods, many of which have been illustrated in this chapter, to analyze the moment-to-moment process by which discursive organism-environment interchanges create novel integrations of thinking, feeling and action over time. Toward this end, because they lend themselves to finely textured analysis of the moment-by-moment emergence of novel behavior, the study of microdevelopment will prove to be an invaluable analytic tool (Flynn & Siegler, 2007; Granott & Parziale, 2002). In the coming decades, although the study of development in medias res will require psychological theorizing of a global and integrative nature, empirical progress will be found in the application of theory and method to analyze the developmental course of human action in local domains and contexts over the lifespan.
References


Descartes, R. (1641). *Meditations on First Philosophy*.


*Developmental Review, 25*, 278-298


*Synthese: An international journal for epistemology, methodology and philosophy of science, 161*, 1-25.
## Table 1

**Developmental Transformations in Hierarchical Complexity in Three Domains**

<table>
<thead>
<tr>
<th>Number</th>
<th>Narrative</th>
<th>Drawing (Arts)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Abstract Principles</strong> (25 years +)</td>
<td>Principled Integration of Literary Forms and Genres. Principled articulation and integration of relations among multiple literary genres, methods, styles etc. into a stable and consolidated style or narrative system that organizes a given narrative.</td>
<td>Principled Consolidation of Style. Visual expression organized in terms of systematic principles that organize multiple dimensions of visual, expressive, methodological, conventional forms and content.</td>
</tr>
<tr>
<td><strong>Manipulations of Higher-Order Mathematical Structures and Objects.</strong></td>
<td>Relations among abstract structures of mathematical operations (e.g., detecting structural isomorphisms between groups of mathematical operations in disparate areas).</td>
<td></td>
</tr>
<tr>
<td><strong>Abstract Systems</strong> (18-21 years +)</td>
<td>Narratives Structured by Integrative Relations. Complex or interweaving narratives organized by relations among multiple qualities of characters and events; integrative use of higher-order literary devices.</td>
<td>Higher-Order Visual-Conceptual Integrations. Manipulation of multiple visual, conventional and/or methodological means to represent intangible, emotional or abstract content. Modification of</td>
</tr>
<tr>
<td><strong>Higher-Order Mathematical Relations.</strong></td>
<td>Capacity to manipulate abstract relations involving change over time (e.g., calculus as an integration of algebra, geometry and arithmetic); capacity to</td>
<td></td>
</tr>
<tr>
<td>Solve two simultaneous abstract relations; abstract algebraic proofs.</td>
<td>Abstract mappings (14-15 years+)</td>
<td>Solve two simultaneous abstract relations; abstract algebraic proofs.</td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>(e.g., anachrony, embedded narrative, higher-order tropes).</td>
<td></td>
<td>convention to express abstract, emotional and other visual content.</td>
</tr>
<tr>
<td>Capacity to coordinate the relation between two abstract variables (e.g., ( f = m \cdot a; a^2 + b^2 = c^2 ))</td>
<td>Visual-Conceptual Integration. Intentional use of variation in form, content or technique in the service of conceptual goal (use of distortion, color variations to represent emotional themes); abstract themes.</td>
<td></td>
</tr>
<tr>
<td>Single Abstractions (10-11 years)</td>
<td>Simple Algebraic Representations.</td>
<td>Conflict-Driven Multi-Lined Narrative. Complex stories involving characters with mental states, motives, organized plots and subplots driven by conflicts and attempts to resolve conflicts.</td>
</tr>
<tr>
<td>Incipient representation of single abstract variables representing quantity (e.g., ( 2x = 4 ))</td>
<td>Three Dimensional Scenes. Draws scenes with fore-, middle- and background in continuous space; realistic details; use of visual metaphor (drawing a teacher as a “witch”).</td>
<td></td>
</tr>
<tr>
<td>Representational Systems (6-7 years)</td>
<td>Mental Number Line. Understanding relations</td>
<td>Intentional Story Lines. Temporal-causal plot lines</td>
</tr>
<tr>
<td>Mental Reference Line. Child can draw identifiable</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
between numbers on a “mental” number line; capacity for addition and subtraction. By 8-9 years, multiplication and division.

involving characters with mental states and motives (e.g., “We went to the zoo, but then I got hungry so we took train to go buy some yummy hot dogs…”)

persons and objects placed within a particular location or scene (e.g., person and a house; flower under the sun), often with lines indicating ground or sky.

### Representational Mappings (3 ½ to 4 years)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Representation of relations between numbers; comparison of more vs. less.</td>
<td>Child relates multiple actions/events in time or cause-effect relation (e.g., “We went to the zoo and then we got a hot dog”)</td>
<td>Able to draw barely articulated figure or object (e.g., person), often hovering over bottom of page.</td>
</tr>
</tbody>
</table>

### Single Representations (18-24 months)

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Begins to count objects, slowly developing one-to-one correspondence, sequencing, and idea that last number counted represents total items.</td>
<td>Simple descriptions of individual events (e.g., “We went to the zoo”) without links to other elements. Adults move narrative forward (shift focus) using questions.</td>
<td>Scribbling and primate figures; child labels figure after rather than before completion.</td>
</tr>
</tbody>
</table>
Table 2

Levels of Emotional Complexity

<table>
<thead>
<tr>
<th>HAPPINESS</th>
<th>LOVE</th>
<th>EMOTIONAL SUPPORT</th>
<th>EMOTIONAL COPING</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>General Reference to Happiness</td>
<td>Self Loves Other(s)</td>
<td>Others Support Self</td>
</tr>
<tr>
<td></td>
<td>Having Fun</td>
<td>Partner; children; family; God, work; activity, thing; pet</td>
<td>Family, parents, partner, children etc.</td>
</tr>
<tr>
<td></td>
<td>Other/Job/Activity Makes Me Happy</td>
<td>Self Feels Loved by Other(s)</td>
<td>Taking Care of Specific Persons</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Putting Specific Others Before Self</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Happy About Life Trajectory or Station</td>
<td>Mutuality of Love Affection, respect, caring</td>
<td>Take Care of Specific Classes of People</td>
</tr>
<tr>
<td></td>
<td>Sense of Fulfillment Contentment, security satisfaction</td>
<td>Love within Enduring Relationship</td>
<td>Children at school; clients</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Appreciation of Deep Attributes of Other</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Event-Related Coping</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Optimism, perseverance, directly confronting problem</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Distraction/Discharge</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Avoiding object of stress; stress-</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td><strong>Happiness as Process</strong> Mindful experiencing; flow; choosing happiness moment-by-moment</td>
<td><strong>Love as Activity or Way of Relating to Others and World</strong></td>
<td><strong>Care for Embedded Processes, Entities or Events</strong> Humanity; planet; ecosystem; social activism (with reference to concrete action)</td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td></td>
<td><strong>Deep Peace</strong></td>
<td><strong>Love as a Process of Valuing, Experiencing Connection to World</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Happiness as Connection to World</strong> Exchange or connection with that beyond self</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Table 3
Levels and Forms of Coactive Scaffolding

<table>
<thead>
<tr>
<th>FORM AND LEVEL OF SCAFFOLDED SUPPORT</th>
<th>SYMBOL</th>
<th>Less Expert</th>
<th>More Expert</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sc1. Cue/Prompt (CUE, PROMPT).</strong> A cues or prompts existing skill in B. B deploys full skilled action without further support. Example. A: “Hello, Bob…” B: “and?” C: “Oh yeah, I shake hands”.</td>
<td>Sc1: Cue</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Sc2. Encouragement/Acknowledgment/Affirm (ENC, ACK, AFF).</strong> A reassures or encourages B’s ongoing efforts to perform task, or acknowledges B’s statement so to motivate continued action. Example. You can do it; it’s just like the last time.</td>
<td>Sc2: Ack/Enc</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Sc3. Restatement (RS).</strong> A restates B’s utterance to clarify or consolidate B’s meaning. B: “It’s too hard!” A: “You don’t think you can do it…”</td>
<td>Sc3: Ack/Enc</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Sc4. Distancing (QUES, EXP, PROBE).</strong> A creates cognitive demand that motivates novel constructive action to meet demand (open-ended questions; probes; expansions; requests for evaluation, inference, etc. Example. “What would happen if you told her that?”</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Sc5: Emotional Holding (SUPP).</strong> A empathically communicates willingness to share the burden of</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
managing intense feelings that result from B’s attending to painful experience. *Example.* B: “I’m really embarrassed to tell you this.” A: “Don’t worry, I’m here for you.”

<table>
<thead>
<tr>
<th>Sc6. Interpretation (INT).</th>
<th>A offers explicit explanation or way to understand the meaning of a given issue or event.</th>
<th>A: “I think she did that because she felt insecure.”</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sc7. Direction (DIR).</td>
<td>A actively directs B’s actions or instructs B on how to perform action or represent an event.</td>
<td></td>
</tr>
<tr>
<td>Sc8. Guided Enactment (MODEL, RP).</td>
<td>(a) A models (most often with direction) an activity that B imitates concurrently; (b) A and B engage in role play. <em>Examples.</em> (1) A models how to “shake hands” for a child; (2) A: “I’ll be your mother and you be you. Say how you feel”</td>
<td></td>
</tr>
<tr>
<td>Sc9. Physical Guidance (PHYS).</td>
<td>A uses <em>physical</em> direction or other types of physical support to directly modulate or organize B’s actions or experiences (e.g., hand-over-hand guidance; touching to regulate calming; providing physical pressure to foster sensory-integration; biofeedback, etc).</td>
<td></td>
</tr>
</tbody>
</table>
Psychological processes are understood as forms or components of meaning-mediated action (a). Psychological acts exhibit intentionality (aboutness), in the sense that they are directed toward some object, real or imagined. Psychological activity is mediated by meaning (point c). The structure of meaning in consciousness emerges from multiple sources. Non-conscious affect-generating processes (point d) function to select, amplify and conscious activity and attention (point (d). Simultaneously, in any given context, higher-order executive processes (f) exert downward and conscious control over the construction of meaning (f’) and the regulation of affect (f’). In this way, any psychological act involves the integration of cognitive, conative and affective processes at multiple levels of functioning.

Figure 1. The Architecture of Human Action. Psychological processes are understood as forms or components of meaning-mediated action (a). Psychological acts exhibit intentionality (aboutness), in the sense that they are directed toward some object, real or imagined. Psychological activity is mediated by meaning (point c). The structure of meaning in consciousness emerges from multiple sources. Non-conscious affect-generating processes (point d) function to select, amplify and conscious activity and attention (point (d). Simultaneously, in any given context, higher-order executive processes (f) exert downward and conscious control over the construction of meaning (f’) and the regulation of affect (f’). In this way, any psychological act involves the integration of cognitive, conative and affective processes at multiple levels of functioning.
Development proceeds through 10 levels of skills grouped into three tiers between 3 months and adulthood. The ages of emergence are for optimal levels (the most complex skill a person can perform within a social context) and are based on research with middle-class American and European children. They may differ across social groups. There is some evidence for an additional tier of pre-adapted action components corresponding to the first few months of life (see Fischer, 1980; Fischer & Hogan, 1989).
Figure 3. Levels of Skill Development within Tiers. Within any given tier, skills develop through four levels. The first level consists of single sets, such as single sensori-motor acts, representations or abstractions. Mappings emerge with the capacity to coordinate two single sets into a single seamless skill; an individual is able to map one single set onto another. A system arises with the capacity to intercoordinate mapping level skills into a single organized structure. Finally, a system of systems is constructed through the intercoordination of two systems level structures. In skill theory, a system of systems at one tier is the equivalent of a single set of the next broad tier of development. For example, a system of representation systems arises through the intercoordination of at least two representational systems level skills and is the equivalent of a single abstraction – the first level of the next tier of development.
Figure 4. The Developmental Range. Variation in optimal and functional level of skill in a story-telling task as a function of social context.
Figure 5. The Developmental Web.
Figure 6: Diverging and Converging Pathways in Socio-Emotional Development
Figure 7: Development of Optimal and Functional Levels of Skill over the Lifespan.
Figure 8: Micro-Development Graph: Ann and Donald.
Figure 9: Age-Related Changes in Core Life Goals over Adulthood. Age related changes in the proportion of participants who identified family, school, love relationships, health and reflection/generative as their most important goals over the course of the lifespan. Although family was by far the most frequently nominated category for all age groups, with increasing age, salient core life goals shifted from school (18-25 years), to love relationships (26-35 yrs), family (36-45 yrs), reflection-generativity (46-55 yrs), and health (55+ yrs).
Figure 10: Developmental Transformations in the Core Goal Structures in Adulthood. Core goal structures of four participants at four levels of development. The lower through upper panels depict protocols from an 18-25 year-old (single abstractions, L10/Ab1); 26-35 year-old (abstract mapping, L11/Ab2); 36-45 year-old (abstract systems, L12/Ab3) and 55+ year-old (single principles, L13/Ab4/Pr1). The upper panel depicts how higher-order principles regulate lower level goal structures.
Figure 11: Age-Related and Developmental Changes in Emotional Themes over Adulthood. For each emotional theme, the changes depicted reflect transformations in the form or quality of emotional dispositions rather than simply changes in the extent to which particular emotional themes were represented in participant protocols.
The Person-Environment System. The person-environment system is composed of five categories of interlocking processes. The base gray arrow (A) represents a person’s primary conscious activity. The gray circle toward which the base arrow points represents (B) the objects of intentional action. The intentional object of action can be either real or representational, and represents the focus of a persons’ attentional activity. Many interactions involve (C) another person or persons. In face-to-face interaction, individuals co-regulate each others actions both verbally and non-verbally. Higher-order co-regulation occurs using some form of mediational means (D) the most significant of which is language. All interaction occurs within a particular socio-cultural-historical context (E) consisting of socially shared meanings, practices and artifacts.

Figure 12. The Social Context of Development: The Person-Environment System
The top panel shows a task analysis for the skill of manipulating a hand-held jack-in-the-box. The task analysis indicates the structure of what an individual must do and know in order to manipulate the toy independently. The middle and bottom panels depict relational activity diagrams that show how control over elements of the jack-in-the-box task are distributed between a 15-month old child and his mother. Relational activity structures identify (a) the structure and level of complexity of each individual’s actions; (b) the form of co-regulated activity occurring between persons; (c) and the level of joint complexity exhibited by the dyad itself. The level of the child’s skill differs from Time 1 to Time 2 as a product of differences in the coactive scaffolding.
Figure 14: Co-Development of Representational and Emotional Activity over the Course of a Therapy Session. The bottom curves represent changes in the complexity of the client’s representation of her sense of mattering to her therapist over the course of the session. The gray curve reflects changes in the hierarchical complexity of the client’s utterances over the course of the session; the black curve identifies changes in the number of meaning elements that would eventually be coordinated into the “harbor light insight” at the end of the session.
Figure 15. Four Moments in the Development of a Client’s Representation of Self and Other.

Figure 15 depicts a series of relational activity diagrams and individual skill diagrams that chart developmental changes in a client’s representation of self and other over the course of a psychotherapy session. Relational Activity Diagrams are enclosed in rounded brackets; individual Skill Diagrams in square brackets. The first three quadrants identify the origins of a significant change in the client’s psychological structure (individual structures) as products of specific co-regulated exchanges between client and therapist (relational structures). The last panel shows the structure of the client’s representation of self and other that emerged from the session.