The previous chapters have traced cognitive, social, and linguistic developments between the years of 1 and 5 in human childhood with the aim of understanding how normally developing individuals make the transition from infancy to childhood. The basic underlying assumption of this effort is that to understand development, it is necessary to understand the developing system in all its complexity, including its organismic, experiential, social, and cultural history. This does not imply neglect of the separate parts of the developing system at particular phases of development. But as a theoretical enterprise it is important to see the pieces as parts of a whole that is an ongoing, historically constituted, forward-looking individual person within a social-cultural matrix. At this point, then, I return to the themes set out in the first section of the book.

**Becoming an Encultured Individual**

The destiny of human individuals (as stated in Chapter 1) is to enter into a cultural environment, complete with all the social institutions, symbolic forms, artifacts, activities, interpersonal scripts, rules, expectations, technologies, fashions, moral strictures, and so on. Not least of these are the languages of the groups within which participatory interactions take place. These languages — often two or more linguistic systems, always more than one social register (e.g., formal and informal, peer and adult) — become the vehicle of enculturation as well as the content and structure of internal representations and the tools of complex thinking. Thus to a large extent in the course of human childhood, between about 2 and 6 years of age, language and the surrounding culture take over the human mind. It is during these years that biology "hands over" development to the social world.
But not entirely. The developing individual has a history that predates the invasion of the linguistic world and extends beyond it. To a very significant extent the human mind — in terms of the basic neural structure in the brain—is tuned and shaped by experience in the world. Much of that tuning, of course, is general across individuals, in that the biological substrate expects certain environmental conditions, and develops in concert with them; but the particulars of these exchanges are unique to each individual. Thus with development each individual, beginning with common potentials and constraints of infancy, acquires a unique mentality that is carried into his or her interactions with the linguistic world. Each linguistic world is also unique, of course; thus the product of these interactions is always contingent and to some extent unpredictable.

The shaping of the prelinguistic mind of the infant takes place largely in terms of social experiences — through caretaking routines and play, as well as the simple sharing of social spaces with adults and other children. As Meltzoff (1990) stated, the infant appears to understand from the outset that "I am one of these, we are the same kind." The infant also comes to appreciate that one or some of these specific others are more important for love, sustenance, and security than are others. The specificity of the primary caretaker bond is an early key ingredient in the individuality of the infant's model of the world.'

The unstable balance between individuality and society is an inevitable product of the enculturation process. It is precisely because the human mind is so open to experience that it retains its individuality in the face of the overwhelming pressure to become a replica of society's mold. Each individual's experiential history dictates a different perspective on new encounters. But is individuality only an effect of history? Are human beings prisoners of their experience, as the radical behaviorists believed? The answer is no — this is the beauty of the human condition: Particularities from the beginning of life dictate that the same experience is incorporated in different ways by different individuals. And individuals maintain their own integrity even as they gain wisdom from the experience of others through their stories, instructions, explanations, and so on.

Infancy is the beginning of individuality, the tuning of the system to the particulars of the specific people and things of the individual's world. But, however impressive the analytic powers of the helpless infant have been shown to be, they are the foundation of experience, not the structure of thought or the "natural kind" of human cognition. On a different plane, the 3-year-old is an active, speaking, thinking creature; these thoughts and spoken words are based on a history as well as on present realities, and the constraints of that history determine to a large extent what the child understands in the present. The young child's brain implies the existence not only of a cognitive system, but also of a mind with expectations based on preconceived models of how the world is and should be, models that are as yet hardly modified by the ideas of others, simply because language is not developed sufficiently to enable the child to interpret others' ideas.

These considerations have important implications for theories of cognitive development, including in the first instance what these theories are about. For many researchers, theories address issues such as the development of language as a system, or the learning of arithmetic, or the acquisition of physical knowledge. In these cases theoretical models may be very formal, very abstract, and very static, confined to one domain of knowledge, elaborating how a final system of known (or hypothesized) constitution is constructed over time [see Valsiner (1987)]. The quirks of construction that depart from the ideal may tell us something about developing human minds that bears on other issues, but they do not provide an overarching developmental theory from this basis. Domain-specific theories and descriptions of this kind have proliferated in developmental psychology in recent years.

On the other hand, if theories of cognitive development are about the developmental process as it reveals itself in the complexities of human lives, as biologically constituted organisms growing in a socially constituted environment organized within a larger culture, and if the goal of such theories is to understand how cognition develops under these conditions, then the interplay of individual experience and the engulfing cultural communicative society must be the focus of analysis. Whereas this kind of theory draws on the wisdom afforded by behavioral developmental theories in general, it is necessarily specific to humanity because Homo sapiens is the only species that has constructed complex cultural environments, and thus the only species whose development is necessarily constituted within their constraints.

From this perspective the following section examines the ontogenetic course of development in terms of the phylogenetic model described in Chapter 2. Here the general, universal, and social are emphasized, but the individual and unique are always assumed to be the level wherein developments take place.
The Phylogenetic Model Revisited: Toward the Hybrid Mind

Donald’s (1991) scheme envisioned four levels of representational potential, all of which are present in the modern adult human mind, and which evolved sequentially with different successive species of hominids after branching off from a general primate line. Early hominids were conceived to share the general event or episodic representation system of other primates. *Homo erectus* developed a nonlinguistic mimetic system of externalization of shared, motorically based representations, capable of internalization as a private as well as public symbolic system. Early *Homo sapiens* developed true language and used it prototypically as a narrative device, for sharing experience and constructing histories and mythologies. Modern minds developed written language systems useful for complex operations dependent upon externalization of representations, such as mathematics, logic, and scientific theories.

The attraction of such an evolutionary model as an analogue to the ontogenetic sequence is its clear connections to both the beginnings and the endings of the sequence, as well as its clear connections to social, cultural, and linguistic developments. It is now apparent that by late infancy children have good representations of repeated episodes — mental event representations (MERs) — and can formulate and hold in memory single episodes as well. Thus event representations appear to be the basic building blocks of cognitive development, as both Donald (1991) on the phylogenetic level and Nelson and Gruendel (1981; Nelson, 1986) on the ontogenetic level claim. Moreover, it is clear that complex theoretical thinking requires extensive practice with written forms, as the traditional claims (e.g., Piaget & Vygotsky) about formal thought emerging in adolescence imply. Although for many, categorical thought might be placed in the role of “basic building block” rather than MERs, and some prefer to see theories in the minds of babes, the early event representation and late theoretical mind claims are not on the whole very controversial.

It is the intermediate stages that may give pause to some. The proposal of a mimetic mind as essential to the evolution of true human language is novel. In Chapters 3 and 4 the evidence for a developmental analogue was considered. First, it must be accepted that contemporary human infants are hardly equivalent to adult early hominids, and toddlers are not similar to adult *Homo erectus*. Modern human infants are more like other primate infants — in cognitive as well as motor development — than they are like adults of primate species (e.g., Diamond, 1991). But they are also different from other primate infants; not only do human infants live in a human world, but their brains are developing in human ways, including the capacity for processing speech sounds, a capacity that begins prenatally. They respond especially to the tonality of human speech as well as music. Thus they are never truly prelinguistic. They are surrounded by talk, even in groups in which the talk is not directed to the infant but to other adults. Unlike the infant *Homo erectus*, modern human infants are biologically and socially tuned to speech, and their social partners support their efforts to use speech as a communicative medium from infancy onward. For these reasons we can reject the idea that there is a “natural” course of development preceding the cultural (in the way that Vygotsky proposed).

Do we need a mimetic stage then? The answer rests on the true meaning of the mimetic stage in Donald’s (1991) theory, which is twofold. First, it established a means of communicating intentions, plans, technical skills, and complex social rituals between members of a group. With-out the mimetic capacity, the passing on of many complex cultural forms is not possible (Tomasello, Kruger, & Ratner, 1993). Second, because mimesis involves bodily movements and gestures, the external can be internalized and represented on a new level. Skills and routines can be practiced on the basis of internal models. The external social model then becomes the internal individual model. Likewise, the modern family group establishes for the human infant not only a communicative complex, but also a setting for practicing interpersonal routines, both caretaking (e.g., diapering, feeding, bathing) and playing (e.g., patty-cake, roll the ball). Parents typically insert words into these routines, and use words to signal their onset or the partitioning of the event.

This is important: The language of the community becomes part of the two- or three-person games played in private. In contrast, Tomasello (1990) points out that in chimpanzee groups, mother and child may establish a gestural signal between themselves, but it is not communally shared, and is discarded and lost once its utility within a situation such as nursing is no longer needed. The situation with human parents and children is subtly different — however idiosyncratic the rituals they establish may be, they incorporate the language of the group, a language that has utility beyond the infant situation. Still, it is not the language that establishes the routines, but the coordinated actions within the activity. Both actions and objects take on symbolic social value in these exchanges. Most important, the establishment of mutual understanding within routines enables a level of intersubjectivity within which words
can be used interchangeably by both infant and parent. The mimetic use of speech forms thus reinforces the sense that "We are the same."

In this way the basic capacity for representing events enables the practice of mimetic routines that incorporate symbolic objects and actions, as well as speech. When the infant begins to share mimetically the same speech forms in the routine, the path is paved for the onset of true language forms and structures. As many others have argued, in the absence of the scaffolding that the mimetic routine provides, language forms rattle around inside human activities without becoming easily accessible to the young child. Other ways in are then needed. One sees these other ways in the practices of communities where language is not specifically included in caretaking and infant games (e.g., Heath, 1983; Ochs & Schieffelin, 1984), but where language is linked with other community practices and used in different kinds of routinized forms. However, in cases where children are unable to partake of such routinized games and activities – as with autistic children, who appear to lack some component that makes intersubjectivity possible – language remains inaccessible.

The conclusion to the story is that in ontogenesis, as in phylogenesis, a prelinguistic establishment of shared symbolic activities is essential to the launching of language as a normal process. However, in human childhood such mimetic activities take place at the same time as language is being learned and established as an effective communicative medium, and they persist as the primary means by which activities are structured and carried out through the interim period from about 1 to 3 years of age. Thus, despite the onset and rapid development of language as a medium of propositional expression and pragmatic communication, language remains to be developed as a medium of narrative before it becomes an internal representational mode, that is, before the third representational stage analogous to Donald’s mythic stage is reached.

The third stage is launched after basic language skills are sufficiently developed so that complex discourse may be held in memory and interpreted according to available mental models. Again, practice with the use of narrative to express one’s own experience and to understand that of others is necessary, and again scaffolding by closely affiliated intimates is certainly helpful if not actually essential to the process. As Dorval (1990) has shown, sharing and sustaining a topic with a partner over extended discourse is not easily accomplished, and its development takes place over a long period of time, lasting into the adolescent years.

There are many observational data from parents and children demonstrating the process of establishing narratives of the past. But we don’t know precisely how such practices affect the child’s thinking. Indeed, much of the research with preschool children, including the recent research on children's theory of mind, takes these developments for granted. This research assumes that young children represent the world in the same ways that adults do and that they apply the same analyses to their knowledge, handicapped only by lesser knowledge than the adult possesses. In contrast, the implication of the present analysis is that the young child is working with representational systems that are still largely prelinguistic, and that linguistically formulated mental representations change the potential of the system dramatically, just as they change the structure of the models of the represented world (see Chapter 5).

In summary, Donald's phylogenetic model has provided many insights, particularly on the mimetic component and the primary contribution of language to cognition and culture. The years between 3 and 5 can now be seen as a significant period of transition in human development that replays, albeit in modern form, the move from mimetic to narrative representations, both social and mental. The problems faced and potentials opened in this transitional period, both psychological and theoretical, have been the main topics of the developments traced in this book.

Collaborative Construction of Language-Related Competence in Early Childhood

In this section, the findings from Chapters 6 through 10 are briefly reviewed to highlight the main themes and conclusions. As discussed in Chapter 6, memory in infancy displays many of the characteristics of what is generally referred to as implicit or involuntary memory, with deliberate recall evident in the latter part of the first year. Memory for objects and events – episodic and generic – is reliable as early as 1 year, but most episodic memories usually do not persist more than about 6 months during the early childhood years. A long-lasting narrative-based autobiographical memory system begins to emerge at about 4 years. Before 4 years there is evidence that children are easily confused as to the source of their knowledge, and may overwrite and thus effectively erase something experienced in a way that older children do not. This change in memory accounts is strongly influenced by the experience of exchanging memory with others, and is closely tied to the period when language becomes established as a complex mode of extended discourse.
Narrative competence is the most obvious of the language-dependent abilities. Narrative, which has its basis in the event representations of the infant and young child, can be realized through pictorial or dramatic means, but language is its primary medium; or, as Donald (1991) claims, narrative is the natural product of language. We have seen that children's abilities to engage in coherent narratives, and to extract a structured narrative from someone else's account, develops over the preschool years. It is not until the late preschool period that children engage in fluent personal episodic accounts, and not until the early school years that they generally are able to produce a short “made-up” story rather than a script. Much practice in listening to others' narratives, based on real-life experiences, as well as fictional stories in books, and contributing to these accounts from their own experience and knowledge, lies behind these developments. Emerging from them is a self-narrative or life history that begins as a social construction in collaboration with parents, teachers, and peers, and continues to develop thereafter at least in part in response to social sharing of viewpoints on experienced events. In consequence, the underlying cultural myths, themes, and values become part of the child's own ideology, embedded as they are in society's stories as told by adults.

Competence in constructing and using culturally defined categories of entities (objects, events, properties, etc.) has been shown to involve a number of different linguistic components, including superordinate labels and the vocabulary of inclusive hierarchies. These verbal components can account for aspects of conceptual development previously held to be perceptually based (e.g., grouping along lines of shape similarity), or logically based (e.g., set relations). The verbal contributions to the development of cultural categories are integrated with experientially derived categories, such as slot-fillers in scripts. The coordination and integration processes involved in the assembling of cultural taxonomies are evident in the residue of slot-filler categories found even in adult productions of familiar, everyday category members. These processes exemplify the more general problem encountered during the preschool years of reconfiguring individual experientially based representations established independently of linguistic input to accommodate knowledge systems displayed in language. This reconfiguration cannot be accomplished through individual constructive processes alone, but requires implicit and explicit collaboration with knowledge bearers, as was illustrated in Chapter 8.

Humans, like all organisms, have some inborn "clock" and "calendar" mechanisms that regulate their biological states with respect to temporal durations. Young children also regulate their actions in terms of sequences, with respect to both basic motoric actions and participation in socially established activities. They are sensitive to causal even more than temporally invariant relations, especially those causal relations involving the actions of agents. The language of time begins to enter the system at about 2 years. Children must eventually coordinate their earlier event-based temporal knowledge with the cultural knowledge system and its associated technologies. This coordination begins at about 4 years as children mark their event sequences with conventional terms for sequence and location ("before," "first," "yesterday," etc.). But this is only a beginning; acquiring the system in full requires years of explicit instruction involving artifacts for marking and measuring time. Unlike the hierarchies of object categories, or the linear plot structures of episodic narratives already described, temporal systems are organized in terms of recurrent cycles. It is not until the early school years that children begin to understand and participate in the several complex time-keeping and measuring systems that each culture establishes.

Research organized around the question of “theory of mind” implies that some new understanding of the intentional states of other people emerges at about 4 years. Prior to that age children engage in communicative interactions with closely related others and are able to predict the behavior of others in familiar situations, but they do not apply consistent rules to the predictions of others' actions on the basis of others' knowledge and belief states. Talking with others about their feelings and ideas, and learning the language of mental states and its implications, are critical to these developments. At the same time, the child's sense of self as different from others emerges and is nurtured by the reflection of self-knowledge in talk with others.

Consideration of these developments in relation to the developmental analogue of the phylogenetic scheme that Donald laid out (summarized in Table 3.4) in the end requires that the original projection be modified. The developments over the first 5 years of life are certainly dramatic in nature, but they now appear to be less stage-like, more complex, with representational processes more interwoven than sequential in nature. Event representations, mimetic representations, and language forms all begin to coexist in early forms toward the end of the first year of life, and become more elaborate and more firmly mastered over the next several years. They differ, however, in how easily the child can establish and use them in guiding action, coordinating action with others, and understanding the
actions of others, in the beginning and over time. Event representations are basic and arise from the child’s own organization of participation in routines. Mimetic representations depend upon the models provided by others, and an engagement with others in increasingly complex skills and games. Language, on the other hand, awaits the mastery of a complex system before it reveals its rich potentials.

Other Domains

Some domains that have been extensively studied by researchers in early cognitive development have not been examined in this volume. Spatial knowledge, such as orientation in a room or finding one’s way in a maze, develops over the period in question (Acredolo, 1982; Liben, 1982). Numerical awareness, according to current research, begins in infancy, but is established gradually over the preschool period as the number names are learned and used to mark both order and cardinality (Gelman & Gallistel, 1978; Wynn, 1992b). Using models as representations of large spaces is a skill that shows a quite dramatic development between 2 1/2 and 3 years (DeLoache, 1990). Understanding the relation of pictures to things in the real world also undergoes development (Beilin & Pearlman, 1991; Robinson, Nye, & Thomas, 1994; Zaitchek, 1990), and drawing develops in predictable ways that may be related to cognitive change.5 Each of these domains is certainly as important and as species-typical as those noted above and described in more detail in the previous chapters. These other domains may derive from specialized perceptuomotoric-neuronal structures adapted to the functions of human cognition. They differ from those given separate consideration in this book in two ways: (1) They do not obviously derive from event knowledge; and (2) they are not obviously interconnected with language processes, although language may affect them in some way; in the case of number, for example, language labels appear critical to the establishment of the arithmetic system.6 In the case of models and pictures, these may be precursor forms of later external symbol storage (ESS) system (Chapter 3) developments, including written language. But critical as language is to much of human cognition, concurrent development in these other domains indicates that it is not the entire story. Thus it is imperative to give closer attention to the ways in which language-specific processing is involved in cognition, particularly in cognitive representations, and ways in which it may not be.

The Importance of 4 Years

For each of the domains that have been given special consideration here, a level of functioning emerges or begins to emerge around the age of 4 years. A question of considerable interest is, "Why this particular age?" Campbell and Bickhard (1986) suggest that 4 years is the age at which a new level of knowing emerges. Karmiloff-Smith (1992) argues that different knowing levels emerge at different times in different domains or modules of functioning, although some may emerge in concert at 4 years. In their recent neo-Piagetian stages of cognitive development, both Fischer (Fischer & Rose, 1993) and Case (1992a) find a new level of functioning at 4 to 5 years, which accords as well with evidence from neurological studies of increased activity in integrative processes in the central nervous system at 4 to 5 years.

The general representational advance at around 4 years common to these theories is, I suggest, driven largely by the mastering of language for both communicative and cognitive purposes. Each domain of knowledge and skill undergoes development in response. In the process of representational change from a largely experientially based system to a potentially language-based system the child must coordinate and integrate her individually constructed knowledge with the culturally established knowledge systems that she meets through language. The claim here is that language is the key — that representation in language changes the cognitive system dramatically during this age period.

Limitations on Preschool Competence: Cultural Gaps

Impressive as the achievements of the preschool years are, there are strong limitations on the structure and function in each system, underscoring that much more is to be accomplished at the fourth level (analogous to Donald’s theoretical stage); it is important to note what those limits are, lest we fall into the trap of thinking that once basic language skills are in place cognitive development is simply a matter of learning more.

- Language. There is much for children to learn about how to construct both oral and written discourse beyond the competence achieved at 4 years, in terms of vocabulary, pragmatics and even matters of grammar. As illustrated in Chapter 7, the ability to compose cohesive text, whether oral or written, continues to develop, and as Dorval (1990; Dorval &
What Language Does for the Child

That language enters into and changes both cognition and communication between the years of 1 and 6 is the critical argument put forth here. As I have emphasized throughout this book, the roles of language change as language itself is mastered and organized and takes on functions in the child's life. At this point a summary of how language affects cognition during this transitional period that cross-cuts both functions and developmental levels brings out the critical importance of these roles to all aspects of the child's functioning.

Naming and Referring: Sharing Concepts

Referring is a function that can be achieved nonlinguistically through pointing and other gestures, for example, but it is a primary linguistic function. Referring points out what is to be attended to in the discourse. Naming is a natural corollary of referring, as shared naming practices make reference to things and events not present in the immediate context feasible. Much of the child's first language experience is spent in learning common names (see Chapter 5). One obvious function of establishing naming and referring is to build up a common vocabulary that serves as the base for simple communication between parents and children and for learning more words within familiar contexts. Another related function is to provide the base from which the child can interpret and produce word combinations and simple and complex sentences. Naming and referring are both fundamental to communicating with language.

A second important function of learning names for things—objects, actions, events, and other kinds—is to learn the categories of the social and cultural world. Prelinguistic infants recognize categorical similarity of objects and actions in experimental situations in which their attention to the dimensions of similarity is controlled. But children's use of words in early speech indicates that they are often indifferent to the categorical boundaries of these words, and cross ontological categories in using them. This is not surprising under the assumption that the child begins with event representations, in which objects are a part of the whole. Events are nonlinear and dynamic—action, actor, and object are only three aspects of the complex situation, in which many objects are visible at once, and many actions may take place at the same time. The practice of drawing attention to a specific object and naming it places it in a

A summary view of these limitations implicates the importance of the specific lack in the preschool years of external culturally designed symbolic systems, using artifacts such as clocks, written language, and graphic materials, which become mastered during the school years. More generally, the preschooler lacks access to the cultural knowledge systems contained in written works and archived in libraries, schools, and museums. During the preschool years the child begins to become a participant in larger cultural enterprises through such media as stories, television, and video. What the breakthrough into representational language at the age of 4 does is to establish the foundation for the entry into the more formal cultural knowledge systems through written and electronic media.
privileged class of named things that can be talked about in any situation. But the child often takes considerable time to learn this practice, and sometimes errs by using the name for objects and actions in the same situation but not in the same category. Also, often the child takes the name and applies it to other objects that bear little resemblance to the target object from the perspective of the adult.

Naming thus establishes categories, and shapes the child’s initial categories to those of the shared culture. This practice and function is even more critical to the many terms the child learns on the basis of concrete everyday experience that do not refer to objects, but rather to actions, places, events, times, and so on. For these categories the child must learn the characteristic components and boundaries of the culture’s definitions as displayed through the language terms used to refer to them in discourse contexts. It is not that the child cannot come to some preliminary understanding of these categories on her own, but that the categories are culturally defined; whatever understanding the child achieves independent of language does not guarantee that the categories are the same as those used by other cultural members. Of course this function of naming and referring does not end with the achievement of a first vocabulary, but extends throughout life as new vocabulary is learned for each new or expanding knowledge domain. From the beginning, however, it is dependent on a dialectic between individual conceptual representations and external linguistic representations. In this dialectic neither language nor cognition is primary; the two are interdependent and intertwined throughout the acquisition of language and the development of the conceptual knowledge base.

Linear Order: Slowing and Stabilizing

Experience is multidimensional, often with many different things displayed and many different actions taking place at the same time. Speech, on the other hand, is one-dimensional, linearly ordered through time. To express experience in language requires recomposing it into linear form, conforming to the syntax of one’s own language. This means that there is no one-to-one mapping of experience on language; the adults’ intuition that there is arises, no doubt, from their being fully inducted into the uses of language. Further, events that take place simultaneously or instantaneously take time to be expressed in full sentences. In other words, language slows down and stretches out thought into discrete parts in linear relations to each other.

Can this slowing process be an advantage, or is it a drawback, a necessary outcome of the language process, albeit an unfortunate one? For the cognitive uses of language in thought the slowing down and stabilizing of experience in linguistic form is actually an enormous contribution to individual and group processing. Compared with nonlinguistic thought, language enables the establishment of explicit stable concepts, referring to parts of the world experience that can be contemplated, reflected upon, and put into articulated conjunction with other concepts. Ordering and reordering of categories becomes possible through manipulation of language and emerges from the nature of the language medium itself, which requires stable components and standard orders for expression.

Many linguists and psychologists now recognize that thought might not be organized like language in terms of propositions and hierarchies but in more fluid forms (e.g., Lakoff, 1987). This realization appears to provide justification for the technologies (e.g., video techniques, hypertext) that break away from the logical linear forms traditionally imposed on written language. But the advantage that linear organization offers to thought – beginning with the sentence – should be recognized and preserved. It requires that one follow through with an ordered and completed argument or story rather than flying off in all directions at once. Sometimes, as in fantasy, dreams, or poetry it may be advantageous to follow one’s wayward thoughts wherever they may go, but to think clearly about a problem or a plan, linear order helps to keep matters straight and provides the basis for more complex logical or theoretical thought.

Regulating Action: Planning

A primary function of private speech emphasized in Vygotsky’s work and by his successors is the regulation of action, from the simple voluntary control of actions and reactions to elaborately planned activities. This function represents the “genetic law of cultural development” (Wertsch, Tulviste, & Hagstrom, 1993, p. 338) in that action is first regulated by social others, before the child takes over the role of planning ahead and subsequently internalizing the function in inner speech. As postulated in Chapter 6, memory, especially generic or script memory, serves the basic function of prediction, thus supplying the internal sup-port for action in the present and planning for the immediate future. But when a problem arises, when a script is not available or does not apply, problem-solving must be invoked and decisions made as to appropriate
actions. When peers collaborate on a plan, beginning with simple nursery pretense play, they invoke scripts, and verbalize their intentions, calling on the partners to enter into a shared plan. Later elaborations of the planning function may become very complex and call on the ability to engage in extended discussion and to use external symbols.

**Exchange of Expressions: Sharing Feelings and Beliefs**

We do our best to make sense to each other by establishing shared contexts and making our utterances relevant (Sperber & Wilson, 1986). In the process, we tell each other what we think about things. When mother says, "that hurts" as the child is pinching her arm, the child learns something about her own actions, and about language that expresses pain. When mother says, "I think it's in the kitchen" the child learns something about the word "think." A difficulty is that mother is usually right. Thus "think" may appear to the child to be equivalent to "know." Talking about mental states, motives, pains, and other private experiences is part of everyday use of language, but it is often obscure to unpracticed language users such as young children (see Chapter 10).

Yet it is only through language that children can be sure that someone else's experience of a situation is different from their own. Much exchange of point of view must take place, using language terms that are only partially understood, before the child can build an appropriate model that enables her to project onto others (without their explicit expression) a view that is different from her own. As with the acquisition of categories and temporal expressions, the process is inevitably cyclical. Learning the vocabulary requires hearing the words used in relevant contexts in which their meaning can be interpreted, but interpreting the meanings of others' perspectives requires understanding the vocabulary. Because the words are used multifunctionally the learning cannot be straightforward. No doubt there comes a point where enough experience with such words in use has taken place that children can begin to accumulate models of social experience that enable them to project different experiences onto other actors based on what they know of the actor's access to information. Of course, this process continues throughout life.

**Narrative World-making**

Infants and young children from the beginning attempt to form cognitive models of aspects of the world they live in, models that are organized in terms of events that they are part of, or that they observe, including the people, objects, and actions that are components of these events. In infancy these models must be rather fragmented, consisting of pieces that are stable and reliable (e.g., mealtimes, bedtimes, bath-times, outings) and others that appear and disappear or reappear in unpredictable manners. The child has good command of routines, but not of the overall structure of daily life, or of the meaning of novel settings and experiences or the behavior of strangers.

Narratives that tie experiences together come into play when language is used by adults to connect them into a whole. Parents use temporal and causal language to direct activities, and to lead from one activity to the next. As Emily's crib talk suggests (see Chapters 6 and 7), the fragmented models of scripted routines gradually become coherent narrative models of everyday experiences, incorporating the new and the old, the expected, and the unexpected, the fantasied, and the lived. Evidence from other children indicates that narrative plays a crucial role in structuring experiences to make sense in the context of their own understanding, and enabling the retention of the experience in memory. Eventually, these experiences become woven together into a life story or set of stories that constitute a history as a background for a sense of continuing self. Further, stories of others – real life and fictional – provide the child with a rich background of alternative experiences with which to elaborate her world models. The narrative capacity made possible by language has been underestimated as a contribution to human cognition and knowledge, but has begun to be recognized as a force that is a source not only of pleasure but also of understanding, whether the object of understanding is the actions of other people, a self-concept, or more abstract constructions.

**Reflective Articulation and Explanation**

Piaget's later theory (Beilin, 1992) emphasized the importance of reflective abstraction for explicit understanding of relationships. Similarly, Karmiloff-Smith's (1992) theory posits a redescriptions process that brings representations to a new level, and she recognizes the critical role of language in this process. In this function language becomes a tool of thought, a means by which intuitive understanding can be articulated and new relationships can be established. Bringing implicit knowledge to consciousness and examining its implications is surely one of the most important intelligent activities, one that language is
uniquely designed to perform. This move makes possible the generation of new relationships and thus the formation of new theoretical propositions.

In everyday life we say, "I have a theory" as easily as we say, "I have an idea" or "I have a dream." Yet what we mean by “theory” is usually no more than "I think the explanation for X is Y," that is, that there is a plausible cause for an observed effect. Young children of 3 and 4 years often state such explanations as well. Children in the late preschool years seem to be extraordinarily creative in finding and proposing what often appear to be very strange connections between experiences. As dialogue (6) in Chapter 8 suggests, their models of the world at times seem totally unconstrained by any physical laws. The permeability of ontological boundaries seen in that example implies that proposals that the preschool child’s mind contains coherent theoretical structures within a circumscribed domain are far off the mark. What emerges instead is a picture of a mind that engages in considerable constructive and imaginative activity, but that is incoherent in the sense that different conflicting parts can exist without disturbance, and that parts belonging to separate domains can merge without interference [see Harris (1994)]. Nonetheless, such thinking marks the beginning of using language as a reflective, articulating basis for explaining as well as representing.

The search for explanations is no doubt the beginning of the potential for forming valid theoretical structures that organize and explain within a domain of knowledge. But the latter require a level of articulation of elements and relations that is abstracted from the ongoing narrative construction of the world, which merges elements from many different domains. Donald (1991) claims that theories arise when written forms of language are available, making sustained reflection on an unchanging propositional structure feasible. The preschooler is far from this level of linguistic function. More important, as argued in Chapters 8 and 10, theories are based in cultural knowledge systems, which are formulated in language and conveyed therein.

**Acquisition of Cultural Knowledge Systems**

The most obvious cognitive use of language is for the acquisition of knowledge not attainable through direct experience. This case goes beyond the implicit functions involved in categorizing and interpreting experience to the explicit imparting of knowledge. This can begin very early as parents explain aspects of the world that are not within the child’s experience. For example, parents look at pictures with children and explain the uses of kinds of machines, or the roles of firefighters and doctors. Before visiting the doctor, parents might explain what she will do and why. They talk about their workplaces, about airplanes, and other cities where relatives live. These mundane examples are meant to convey how much of what very young children come to know about the world (however inadequately they understand what is said) is conveyed to them explicitly through language.

As explicated in Chapters 6 through 10, much of the everyday cultural organization of knowledge (“folk theories”) is displayed nonexplicitly in the language used by parents and others to direct activities and talk about experiences. Such talk embeds different kinds of systems of knowledge, from the familiar categories of food and clothes, to the complexities of temporal schemes, to the symbolism of religious institutions, to the rule systems of government. It conveys moral instructions as well as politeness formulas, systems of counting and measuring as well as judgments of character and aesthetics. All this is subtly displayed in ordinary talk to and around young children, and is imbibed by them as they begin to enter into the discussion themselves.

A point emphasized throughout this book, however, is that the child must reach a quite advanced state of language mastery before extensive explicit complex knowledge acquisition through language is feasible. Extended explanations, like extended stories, require on-line processing and representation of information presented, which are skilled linguistic activities. On the basis of studies of different knowledge domains it is apparent that this skill is not achieved usually until between the age of 3 and 5 years. It is a skill that must be attained if learning is to take place through verbal presentation in the classroom, and eventually through literate presentations.

**Emergence of the Self in a Social World**

All the cognitive functions of language just enumerated imply that the child’s mind becomes mediated by cultural ways of thinking and speaking during the preschool years. At the heart of all these ways and effects is the emerging sense of self. The emerging self is glimpsed at many points along the way. It is especially in the set of concerns discussed in Chapter 10, in interpreting the actions of other people in terms of their
thoughts and desires, that the child is seen most clearly as situated in a social world. Then the self must be differentiated from the activity if understanding of others is to be established. Taking a larger view, we can see that lurking behind all the developments discussed herein is an emerging self who learns to represent the categories of the culture, and not only those of her own egocentrically organized events. The same self learns to recognize that others have memories different from one's own, thus experiences that are not shared, and narratives to tell that one has not heard before and that speak of a world different from one's own experience. It is the self in a social world who tracks events through time, and learns that yesterday is no longer while tomorrow is yet to come. To understand the perspective of now one must have a sense of an enduring self existing through time (Nelson, 1989b, 1991b).

The social intelligence that enabled early humans to survive involved not only the individual's knowledge of and perspective on the social and cultural situation, but also the individual's knowledge and perspective on self and his or her own role in the specific situation. Self-knowledge and social knowledge proceed together, as Mead (1934) insisted: "The self, as that which can be an object to itself, is essentially a social structure, and it arises in social experience" (p. 140). In Mead's view also, language played the critical role in the construction of the self.

From one point of view, then, this book has been about the emerging self and its dependence on defining in social terms, terms conveyed and understood through communal language uses. As various authors have noted (see Chapter 4), self-awareness begins in earliest infancy, and by late in the second year the self is recognizable in mirrors and pictures. Hobson (1993) has provided a particularly persuasive account of the emerging sense of self in relation to the social other and joint interactions with objects, interactions that are key aspects of mimetic external representations. But until the various uses of language make it possible to imagine a past and future self, and to imagine that other people have different pasts and futures, as well as different presents, one cannot speak of a fully determined self distinct from ongoing experience. Event representations, like dreams, do not separate the self from the experience. Nor do mimetic activities like play, in which the self is still part of the experience, make this level of self-realization possible. Language uniquely enables contemplating a self that is different from present experience, and imagining a self that will grow older as well as a self that was once a little baby.

Domain Specificity, Children's Theories, and Conceptual Change

The chapters in this book have presented the developmental story in terms of processing (language, memory), organizing (narrative, category), and knowing (time, self, others) components of mind. These discussions might appear to be in tune with the now common partitioning of the child both vertically — in terms of domains and functions — and horizontally — in terms of focal ages. But at the same time, I have argued against attributing domain-specific theories to young children. Representing, processing, and organizing, I would argue, are applied to specific domains in ways that are both common and distinct, as the differences between the organization of temporal knowledge and knowledge of others' intentions illustrate. The outcome is distinctive and generally coherent systems within domains of knowledge, but this outcome is dependent as well on the collaborative construction of this knowledge, as explicated throughout this book.

Some domains such as space, number, and language appear to be specially designed by evolution to process information in distinct ways (see Chapter 2). Modularity of brain function is supported by evidence of specific aphasias and amnesias, as well as by specific deficits associated with brain damage at birth or later. However, evidence also supports the idea that the brain is extremely plastic in development and that modularity may be acquired rather than strictly preordained. Perceptual and motor skills, such as those involved in speech, are prime examples of modular functions, but so are culturally specific and late-acquired skills and social knowledge proceed together, as Mead (1934) insisted: "The self, as that which can be an object to itself, is essentially a social structure, and it arises in social experience" (p. 140). In Mead's view also, language played the critical role in the construction of the self.

Theories of domain specificity generalize from modularity to propose that ways of processing and organizing within specific knowledge domains are properly thought of as theories. At present the ideas of innate modules, domain specificity, and theory structure of conceptual representation are interconnected within a common theoretical framework [see discussions in Hirschfeld & Gelman (1994a)]. The view presented here differs from those based on these constructs in important ways, as the following discussion attempts to clarify.

Domain specificity initially was studied in relation to areas of knowledge such as physics, biology, cosmology, economics, psychology, and so
on, as a hypothesis from cognitive studies of expertise (Chi, 1978; Simon & Simon, 1978). This research indicated that experts and novices organize new learning within a domain in different ways, reflecting their different underlying structuring of the field. There is no implication that the way novices organize knowledge — in chess, for example — is somehow based on innate principles and that of experts is a cultural construction.

Knowledge domains of the kind to which expert systems and theories apply differ from cognitive processes such as memory or language processing, and from modes of organization such as narratives, categories, or theories. Narrative and category organization are ways of organizing memory and knowledge that are not specific to any particular knowledge domain. To the extent that they represent something universal and pervasive across domains, there is evidence for domain-general organization rather than domain-specific processing. As for the latter, at some very basic level general processing mechanisms must be at work, as in recently developed connectionist networks. The questions then turn on how such mechanisms are organized within domains to process information efficiently within those domains. But narrative and category organizations are higher-level organizing structures that apply to many different domains of knowledge. As we have seen, children’s competence with the use of each develops in terms of complexity and abstraction over the preschool period and into the school years.

The domain of temporal knowledge was presented in this book as representative of some of the cultural knowledge systems that children must acquire. It was noted that some temporal sensitivity and understanding are innately available, as reflected in the parsing of events by infants and young children. But this knowledge is concretely tied to knowledge about human activities, involving people, actions, material objects, spaces, and so on. It is only after encountering the organization of temporal concepts in linguistic form that children begin to conceptualize time independently of the events to which it relates. As with the child’s understanding of others’ intentionality, their understanding of time is initially embedded in knowledge of activities and language. Abstraction of such knowledge into an organized system is a long-term process that begins only as the child gains control of the shared meanings of words — in the one case referring to hours, weeks, and years; in the other to thinking, saying, and knowing — and understands their reference to concepts as they are constructed in the adult world. This domain illustrates that the existence of some innate function relevant to domain knowledge cannot in itself constitute or grow into a theory within the cultural knowledge domain to which it is relevant. Rather, the cultural knowledge must be cognitively reconstructed to reorganize and regulate the basic processing function.

Equally important, the experientialist model set out here rests on the assumption that the formal structure of a domain may have little to do with how expertise within it is acquired. In a similar vein, Flanagan (1992) states:

Much of what we are conscious of is culturally transmitted. The learning capacities that subserve the acquisition of knowledge are clearly adaptive. But the details of what we learn and how we use the information we acquire . . . may or may not be functional in the short or long run . . . . Many of our conscious capacities, for example, to do arithmetic or geometry, were probably not directly selected for. They are the fortuitous outgrowths of combining our linguistic capacities and our capacities for abstraction with our abilities to individuate objects, estimate quantities and display spatial savvy in manipulating objects and moving about in the world. (p. 139)

The extension of this idea to the acquisition of knowledge systems in early development is straightforward: The knowledge domains spontaneously acquired in childhood are the outgrowths of practical activities, not derivations from established principles. Children operate in a world that is subdivided not into knowledge domains but into activities, within which the knowledge is applicable. Knowledge specialists — for example, academicians and scientists — partition these domains and display them to students of all ages, beginning in the preschool years (e.g., dinosaur knowledge). But these domains are abstracted from the ongoing activities of everyday life, not abstractly constructed within it from innate principles, as much contemporary theory assumes.

Conceptual Change

Carey’s (1985) idea of scientific theory change as a model of conceptual change in childhood requires the reorganization of knowledge within a theory domain, and consequent redefinition of concepts in terms of new relations within the domain. This theory change proposal is similar to the conceptual change problem discussed by Vygotsky (1986) in terms of spontaneous and scientific concepts, in that the existence of relevant concepts, using the same terms but different conceptual bases, is emphasized in both. However, Carey’s model ignores the critical distinction
that Vygotsky drew between spontaneous and scientific, and does not explicitly recognize the sociocultural/linguistic origin of either system.

Current views of conceptual change such as Carey’s rest on the assumption that the individual encountering a new, more advanced, higher-order scientific body of knowledge has in place a prescientific conceptual system that applies to some of the same phenomena that the more advanced system does. But except for claims that children arrive in the world with naive theories, there has been little concern for the origin of those prescientific theoretical systems. Obviously if we wish to understand the problem of conceptual change it is necessary to understand both ends—the nature of spontaneous conceptual systems, as well as adult theoretical systems. Labeling all of the young child’s knowledge as “theoretical” and then discussing any change as the move from one theory to another poses the danger of supposing that the autonomous mind creates theories from scratch and changes them at will.

As implied in the discussion in Chapter 8, two fundamental changes in conceptual systems may be found, the first a shift in the child’s thought from the spontaneous presemantic, based in activities, to the conventional “folk” semantic, based in lexical meanings, which must precede a second shift from the “folk” system to a more formal or theoretical, directly conveyed through instruction. The first transition, outlined in Chapter 8 in terms of hierarchical categories, involves the child’s achievement of a system that coordinates the event-based primitive system with the system revealed through adult language use. The second transition builds on the first folk cultural system and transforms it in terms of the established knowledge structures of the communities that define formal knowledge domains. Building on these observations, the proposal is that within all basic domains of knowledge (those open to encounter by the independent individual) two progressions are possible—from the individual to the folk/semantic, and from the semantic to the scientific.

The semantic level of knowledge organization is a product of the language-using community. It abstracts from activities to provide a generalized organization of related knowledge. The “folk taxonomies” observed across the world in different cultures (Berlin, 1978; Atran, 1990) are examples of this kind of knowledge structure, as are the general nonscientific practical taxonomies of the English language, such as those of food, clothes, furniture, and the natural kinds of animals and plants. These are systematically organized domains serving cultural purposes. An individual who has acquired knowledge at the level of the semantic organization of a domain has acquired the tools for viewing activities within a larger context of relationships. Food is not only what one eats at lunch, but also anything edible by any organism. A day is not only a sequence of activities, but also a unit in an organized temporal system that can be counted, divided, multiplied, and located within an abstract temporal space.

Culturally organized knowledge of this kind tends to exist in an informal system that is conveyed to individuals partially through simple exposure to the concepts embedded in language use, and partially through informal instruction in school, workplace, or other context. It may result, therefore, in partial conventional knowledge idiosyncratically organized, as the levels sketched in Figure 8.1 suggest. This figure indicates that a systematically organized body of knowledge exists in the community at large. Most adults possess part or all of it, and in discourse with children they convey, implicitly and explicitly, parts of the system. The child, operating with a differently organized body of experientially derived knowledge in the domain, attempts to align and reorganize her knowledge with that conveyed by the adult. The process results in partial and incompletely connected knowledge on the part of the child. As Valsiner (1993) has pointed out, this kind of indirect semiotic mediation may lead at first to confusion and increased complexity, rather than leading directly to clarification and reorganization.

In contrast, formally organized cultural knowledge systems as theoretical knowledge are not accessible informally to the individual through simple exposure to discourse in the domain, but must be mastered as an abstract system. There are, no doubt, distinctions to be made within this level of knowledge systems, and significant, often radical, conceptual change takes place as one formal system displaces another in the domain, as Carey (1991) and Chi (1992) have both discussed. These change levels both feed forward and then feed backward, as Figure 11.1 indicates.
In summary, making sense in the first instance involves practical knowledge derived from everyday activity. Eventually the child advances beyond simple observation and representation, with the substantial help of other people who provide explanations and systematic knowledge systems that the child can use to inform her own deeper understanding. All children acquire practical knowledge systems; not all children—or all adults—go on to acquire formal systematic theoretical knowledge systems in the most basic domains of experience. We should be wary of projecting our own academic images as scientists or epistemologists into the heads of universal children. Only by situating our inquiry within the child's frame of reference can we begin to make sense of how the child makes sense. How the child uses linguistic representations, as well as social guidance and feedback, as sources of knowledge is at this point poorly understood, and is a vital point toward which research should be directed.

Collaborative Construction of Mind, Self, and Knowledge

The ultimate challenge to cognitive development is to formulate a theory of both process and product that begins in infancy and extends into adulthood; that recognizes the unique social and cultural condition of humankind without losing sight of its biological-organismic individuality and evolutionary history. To do this is to trace how, at any point in development, the current state is an ongoing product of individual history and a specific complex of resulting competencies and potentials. Recognizing the continuity of the characteristics of human mentality does not mean attributing adult competence and knowledge organization to young children. Rather, recognition of growth and development of the biological in the context of specific social and cultural conditions of childhood necessitates a model that focuses on processes of change. The claim here is that language is the mediator, the medium, and the tool of change in the major cognitive transitions of early development.

The overarching thesis of this book is that the individual child constructs representations—of the real experienced world, of desired states, of pretend worlds, of others' worlds—and that these representations are from the beginning constructed in collaboration with social others, adults and peers. Thus the model outlined here is one of COLLABORATIVE CONSTRUCTION, emphasizing both individual construction (as in Piaget's model) and social construction (as in Vygotsky's model). Neither is adequate alone to account for human cognitive development. But both collaboration and construction change with development as the potential to engage in symbolic activities, including language, is realized.

In the beginning, the child's event representations are constructed from her experience in the world, experience that is dependent upon caretakers to assemble, arrange, and guide. Thus the infant is in a state of greatest dependency upon others, but at the same time she is in a cognitive state of greatest autonomy, being unable to call on others for help in constructing meanings of her experience.

As the infant becomes mature enough to engage in simple mimetic activities—routines, play—these serve as collaborative scaffolds for her individual reconstructions of experiences. During these early years the mimetic activities serve as a childhood adaptation to a symbolically organized world. Mnemonic representations of activities and routines provide the background for the implicit fallout of categories of material objects and social relations. Within these activities the roles of participants become understood (e.g., the hider and the peeker), but the internal perspectives of others remain hidden from view. Between 1 and 3 years speech mimesis and linguistic constructions become part of the mimetic activities. During this period children not only participate, but also transform in pretense; they engage in invention as well as imitation—both critical characteristics of emerging human minds.

Narrative begins to become a part of children's lives as parents and others collaborate with them in reconstructing past events, marking ongoing experiences with narrative structure, planning future happenings, and telling made-up stories or playing out dramas. These activities may begin as early as 2 years with children whose language is well advanced. Linguistic narratives can tie previously experienced activities (understood on a participant level) into stories that include motivations and goals. Through them, children's goals (previously private and egocentric) may begin to be coordinated with adults' goals, and a broader, more coherent understanding of the particulars of the experienced world may come into view. The language of narrative includes temporal, causal, intentional, and conditional forms that help to constitute the story, and in so doing make explicit relations that were previously obscure or only partially understood. These linguistic forms thereby also take on more of the meanings of the wider community and no longer are tied only to the child's understanding of events.

Three novel developments emerge thereafter: first, the possibility of incorporating other previously unknown worlds into one's representations. Not everything is assimilated to the child's own prior experien-
tially based representations. Stories can be understood as *about a different time and a different place*, where the child herself has never been. Second, this level of linguistic achievement enables the use of language to turn back on experientially based representations and to reanalyze and re-represent them on another level, decontextualized from actual experience. Third, the collaborative constructions in narrative provide the basis for understanding perspectives, motivations, goals, and emotions of others in a way that is not possible on the mimetic level alone, when different roles in activities are understood, but not the internal states of the other actors.

Beyond this point, but to a very large extent dependent upon it, lies the use of all the material externalizations of symbolic forms, including but far from limited to written language, which makes the larger culture accessible to the mind of the individual. At this point the collaboration in constructing cognitive representations becomes culturewide. It comes into play especially in the school years, but has its beginning in the earlier period in the use of pictures, films, and models to represent things and states of the world both known and unknown.

As this final summary suggests, there is no discrete division of event, mimetic, narrative, and externalized symbolic stage, as originally hypothesized in Table 3.4. Rather, what we find is a seamless weaving together of individual experience-based constructions in collaboration with others, gradually incorporating the potential of social and cultural forms, including especially language in its first simple and later complex constructions. The shared meanings of the community thus gradually enter into the individual child’s knowledge representations and to a large, but nonetheless limited, extent take over the child’s mind. Thus individuality is balanced with sociality.