

The Emergence of Autobiographical Memory: A Social Cultural Developmental Theory

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Abstract

We present here a multi-component dynamic developmental theory of human autobiographical memory that emerges gradually across the preschool years. The components that contribute to the process of emergence include basic memory abilities, language and narrative, adult memory talk, temporal understanding and understanding of self and other. We review the empirical developmental evidence within each of these components to show how each contributes to the timing, quantity, and quality of personal memories from the early years of life. We then consider the relevance of the theory to explanations of childhood amnesia and how the theory accounts for and predicts the complex findings on adults' earliest memories, including individual, gender and cultural differences.

“In probing my childhood (which is the next best thing to probing one’s eternity) I see the awakening of consciousness as a series of spaced flashes, with the intervals between them gradually diminishing until bright blocks of perception are formed, affording memory a slippery hold.” (Nabokov, 1989, p. 20-21).

The theory of autobiographical memory proposed here is that of a functionally new human memory system, one that emerges gradually across the preschool years in the context of developments in language, memory and self, supplementing the memory systems of early life. Significant individual and gender differences and cultural variations characterize autobiographical memory in both early development and in adulthood. The proposed theory accounts for such variation in terms of a multi-component dynamic developmental system that yields multiple pathways toward converging but also differing endpoints (Gottlieb, 1997; Oyama, 1985; Fischer, 2000; Van Geert, 1998).

Autobiographical memory is defined here as an explicit memory of an event that occurred in a specific time and place in one’s personal past (a detailed discussion of the definition follows). The components that contribute to the emergence of autobiographical memory include basic memory systems, the acquisition of complex spoken or signed language, narrative comprehension and production, memory talk with parents and others, style of parent talk, temporal understanding, representation of self, person perspective and psychological

understanding (i.e., theory of mind). Our ultimate goal is to explain universals of process, developmental change, and differences in the pathways toward and ultimate characteristics of mature autobiographical memory. Toward this end we need to understand the ways in which these components interact within particular cultural milieus and in particular contexts of social interchange.

In the first section, we clarify basic concepts of the theory, including emergence, developmental systems, and the central concept of autobiographical memory – what it is and is not in terms of general memory systems theories. Next we present the basic assumptions and claims of the social cultural developmental theory. Following an explication of the theory, we review each of the components proposed to contribute to the emergence of autobiographical memory. After presenting the developmental evidence, we consider the relevance of the theory to explanations of childhood amnesia and detail how the theory accounts for and predicts the complex findings on adults' earliest memories, including individual, gender and cultural differences. In the end we consider the functions of autobiographical memory in human and cultural development in relation to the theory proposed.

Autobiographical Memory and Its Emergence

Autobiographical memory emerges gradually across the preschool years through processes of social interaction and cognitive developments that are conceived here in terms of dynamic developmental systems theory (Fischer, 2000; Gottlieb, 1997; Oyama, 1985; Thelen & Smith, 1994; Van Geert, 1998). *Emergence* is a well-established concept in evolutionary and developmental biology, and has increasing use in psychology as well (MacWhinney, 1999). It is

applied to the appearance of structure at a new level of complexity from the interaction of structures existing at simpler levels. For example, one can only understand the fully formed newborn infant from its beginnings as a single-celled zygote in terms of the emergence of a complex organism from an inconceivably large number of interactions of DNA, cells and their products, organ growth, and the maternal environment. Of course each of these contributing levels of organization also needs to be understood, but none alone either constructs or causes the resulting infant, which is in each individual case a genuinely novel product. The concept of emergence is equally applicable to problems of psychological development, in this case to the emergence of a new form of memory.

The idea of dynamic developmental systems goes hand in hand with the idea of emergence. The process is dynamic in that it occurs over time. It is time-dependent in the sense that the effect of a particular input at any point is dependent upon the state of the entire system at that point, which is itself variable depending upon the sequence and character of prior inputs. That is, the ultimate outcome is history-dependent. The process is developmental in that the system in its entirety increases in both size and complexity over time, adding components that interact with the previous state of the system to produce a new level of a complex whole. This process depends upon the self-organizing characteristic of systems, which determine limits on its variability from an expected path (Gottlieb, 1997; Oyama, 1985; Thelen & Smith, 1997; Turkewitz, 1993; Waddington, 1957). Oyama (2000) has provided extensive discussion and elegant arguments for this perspective in psychology, as well as in evolutionary biology. From

this perspective the child is embedded in a social environment, which together comprise the developmental system as a whole.

Taking seriously the contextually situated cognitive developments of childhood requires such systems concepts in order to understand the emergence of new psychological forms without falling back on concepts of either innate knowledge or instruction. Thus, we need to account for the emergence of autobiographical memory in childhood as the outcome of a social-cultural-cognitive *system*, wherein different components are being opened to experience over time, where experiences vary over time and context, and where individual histories determine how social and cognitive sources are combined in varying ways. Any less complex view cannot account for the developmental and differential findings in this area.

What is Autobiographical Memory?

Examining the emergence of autobiographical memory requires a definition of what it is and how it is differentiated from other kinds of memory. Consider this rather standard definition: “Autobiographical memory is memory for the events of one’s life. . . [I]t constitutes a major crossroads in human cognition where considerations relating to the self, emotion, goals, and personal meanings all intersect” (Conway & Rubin, 1993, p. 103). This definition differentiates autobiographical memory as memory for events, in distinction from memory of other kinds of content such as facts or lists, or skills, such as how to ride a bicycle. It also invokes self-impinging emotions, goals, and personal meanings, which most authors agree are characteristic of autobiographical memories. However, as it stands it provides no clues as to how

autobiographical memory develops, if it does. Toward that end we need to ask: what kind or kinds of memory is/are autobiographical memory?

It is widely accepted that memory is not a unitary concept, but “is composed of multiple systems that have different logic and neuroanatomy” (Kandel & Squire, 2001, p. 127). Memory theorists have proposed a number of different memory types based on studies of normal adults, amnesic subjects, brain structures and neural circuits. In Squire’s (1995) taxonomy a basic cut is made between declarative and nondeclarative memory distinguished by different neural structures. Squire (p. 207) states: “Declarative memory is fast, specialized for one-trial learning and for forming associations between arbitrarily different stimuli . . . [with] the capacity for having conscious recollections of recently occurring facts and events (emphasis added).” In contrast, “Nondeclarative memory refers to ways in which performance can change but without requiring access to any conscious memory content.” In nondeclarative memory there is “no sense of memory being involved” and no sense of “pastness.” This basic dichotomy and terminology are widely used in the developmental as well as the adult literature.

Schacter, Wagner and Buckner (2000) identified five systems distinguished in recent (as of 1999) neural imaging studies: working memory, semantic memory, episodic memory, the perceptual representation system (PRS), and procedural memory. The first three of these may be considered to be subsystems of Squire’s declarative memory, whereas the last two qualify as non-declarative. The distinction between semantic and episodic memory was first made by Tulving (1972, 1983), “defined in terms of their special functions (what the system does or produces) and properties (how they do it)” (Tulving, 2002, p. 5). In his theory *semantic memory*

is seen as a general knowledge base, which may be common in form and function to that of some other animals. In contrast “episodic memory is a recently evolved, late-developing, and early-deteriorating past-oriented memory system, more vulnerable than other memory systems to neuronal dysfunction, and probably unique to humans” (Tulving, 2002, p. 5). In this view most forms of memory “have nothing to do with the past” (Tulving & Lepage, 2000, p. 209); the single exception is episodic memory. (See Nelson, 1993a, 1993b, 2000 for similar claims).

Episodic memory, according to Tulving and his colleagues, is always specific in terms of location of an event in time and space, as well as in the specific awareness of self in the experience – the feeling that “I was there, I did that.” These characteristics constitute “autonoesis” or “experiential awareness” (Wheeler, Stuss & Tulving, 1997; Tulving & Lepage, 2000). Noetic remembering contrasts with autonoetic; noetic memory consciously draws on the personal knowledge base, but does not “relive” the past or “travel backwards in time” as Tulving (1983) put it. Tulving and his colleagues have provided extensive evidence from neuro-imaging and case studies of amnesia for the claim that semantic and episodic memory processes employ distinctive neural pathways and brain regions for encoding and retrieval (Tulving, 2002). In particular, it appears that semantic memory retrieval may be more localized in the frontal lobes of the left hemisphere whereas episodic retrieval involves additional processes in the right hemisphere.

Autobiographical memory then may be seen as a type of declarative memory, and its most distinctive form is episodic in Tulving’s sense (i.e., self-involved and temporally specific). This point is important in considering its development. Non-developmental accounts of

children's memory (e.g., Howe & Courage, 1997; Rovee-Collier & Hayne, 2000) do not account for the special characteristics of episodic memory or for its late appearance in development (Perner, 2000). Rovee-Collier (1997) makes a different distinction, that between implicit and explicit memory, one often made in studies of amnesia. Patients with retrograde amnesia are unable to recall newly acquired information, but remain capable of learning some new skills, although more slowly than people without impairment. For example, such a patient may be introduced to a new doctor, learn her name, and engage in normal conversation for several minutes, but when the doctor leaves the room, no memory of the episode is retained. When the doctor appears again a few minutes later, the patient gives no evidence of having seen or talked with her previously (Damasio, 1999). Yet when taught the rules of a simple game, the same patient is able to learn and to follow the rules on later occasions without needing to be entirely retaught.

Schacter and Moscovitz (1984) discussed this dissociation in memory in terms of explicit memory (for the doctor's name and conversation) and implicit (for the game). They proposed that a similar dissociation could be found in development in that infant memory (prior to the end of the first year) could be characterized as implicit, while a later system came "on line" at about 12 months of age enabling explicit memory. [Later authors have equated explicit with declarative memory and implicit with nondeclarative in Squire's (1995) terms.] The Schacter and Moscovitz and related claims have raised heated debate in the developmental literature. A number of authors in addition to Rovee-Collier have challenged the assertion that infants do not have explicit or declarative memory (see Mandler, 1994; Bauer, Hertzgaard &

Dow, 1994), on the basis of behavioral evidence, as well as the maturation of underlying neural structures, particularly the hippocampus and related medial structures that mature toward the end of the first year. Our claim here does not call into question the infant or toddler's ability to engage in declarative or explicit remembering. Rather, our theory involves both episodic and semantic memory as types of declarative memory that derive from earlier forms after the end of infancy and that are used in forming autobiographical memories. Some memory in the early years is certainly declarative and may be formed on the basis of a single experience, such as in the delayed imitation studies used by Mandler and Bauer, et al. However, such memory typically requires external as well as internal cueing, whereas autobiographical memories may be self-cued, and are usually auto-noetic, with a sense of the self re-experiencing an event in the past. Delayed imitation studies have not thus far provided evidence of auto-noetic remembering.

Not all personal memory is or becomes autobiographical. The pragmatic use of memory for routinely experienced events invokes still another memory type distinction, that between scripts and specific episodes. Scripts (Nelson, 1978, 1986; Schank & Abelson, 1977) are a kind of generalized memory for the structure of routine events. The classic example from Schank and Abelson is the script for going to a restaurant: enter, get seated, read menu, order, receive food, eat, pay, and leave. There is good evidence that even very young children who appear to have few if any autobiographical memories have strong and extensive scripts for the everyday events of their lives (Nelson, 1986). Linton (1982), in an innovative study of her own memory, traced the development of general scripts over time from the experience of diverse episodes of a similar experience (such as going to a conference). She was able to do this by keeping a detailed daily

record of memorable experiences, and periodically testing her memory by randomly picking a clue from the deck of memory cards that she had accumulated. In this way she documented the way in which different experiences of the same event began to be merged and confused over time. (See also Neisser, 1982; Thompson, Skowronski, Larson, & Betz, 1996; Hudson & Nelson, 1986 for data and discussion).

This distinction between specific and general event memory formed the basis for a functional theory of memory development related to the evolution of different memory systems (Nelson, 1993a, 1993b 1996; cf. Oakley, 1983). This account proposed that basic memory forms and functions serve to organize action in the present and the immediate future (e.g., in ancient hominid ancestors, perceptual memory for edible plants or predators to avoid). Specific memory for a specific episode in the past (if not life-threatening) would not be relevant to this basic functional system, whereas general memory for scripts, scenes, and procedures would be. This proposal implies an early (in both ontogenetic and phylogenetic senses) generalized memory system for events, later supplemented by an explicit system for specific episodes experienced in the specific past. Inasmuch as the generalized event memory system may serve adaptive needs for most creatures, some additional function must be postulated for the exceptional human capacity for retaining specific memories for episodes of the personal past. Therefore identifying the function of remembering the specific past and the involvement of a specific past self is seen here as a key to understanding the development of autobiographical memory.

From this brief survey of memory systems in relation to autobiographical memory, several conclusions can be drawn. First, although different theorists make somewhat different

distinctions, most agree that autobiographical memory is explicit and declarative. Further we emphasize with Tulving that autobiographical memory typically involves a sense of self experiencing the event at a specific point in time and space (i.e., auto-noesis). And as Conway and Rubin have argued, autobiographical memory is not just referenced to the self, but is personally significant, concerned with episodes that have personal meaning. Personal meaning emerges from emotions, motivations and goals that are constructed in interaction with others in the world. Thus we define autobiographical memory as declarative, explicit memory for specific points in the past, recalled from the unique perspective of the self in relation to others.

We conceptualize autobiographical memory as a *functionally* distinct system; whereas episodic memory has a dedicated neurological structure (Schacter et al, 2000), we make no specific neurological claims about autobiographical memory as defined here. Rather, we assume that autobiographical memory depends partly on neurological developments necessary for the development of memory and specifically episodic memory, but that autobiographical memory emerges from interactive development across social, cognitive and communicative domains to serve functional goals. Further, although our focus is on the emergence of personally referenced episodes experienced at specific points in the past, it must be acknowledged that a great deal of self-knowledge is not autobiographical in this sense, but rather more like semantic knowledge or facts about the self, such as date and place of birth, addresses of various places lived, names of schools attended, and so forth (Brewer, 1986). Moreover, because we are concerned with the early emergence of autobiographical memory, we focus on single episodes. Clearly, these personal episodes begin to cohere into larger life stories with development. There is suggestive

evidence that children begin to construct more comprehensive life narratives encompassing thematically related episodes sometime during adolescence (Habermas & Bluck, 2000; MacAdams, 1992). We believe that the same kinds of processes that allow for the emergence of single personally referenced autobiographical episodes are responsible for the construction of these more overarching life narratives. That is, further developments in language, narrative, temporal understanding, and understanding of self and other are critical components of creating life narratives, just as these are critical components of creating specific autobiographical memories during the preschool years. However, the emergence of an autobiographical life narrative during adolescent is well beyond the scope of this paper. Here we outline the first step in this process, the emergence of specific self-referenced personal narratives located at particular points in the past.

The Social-Cultural Developmental Theory

Autobiographical memory can be described in general terms, but it is also individually highly variable. Thus to describe its developmental emergence, one must be cognizant of its variability as well as its general course. Our theory is explicitly proposed to deal with both aspects. Autobiographical memory is a fundamentally distinctive form of memory that emerges across the preschool years that involves basic memory abilities, as well as a developing understanding of temporal relations, of narrative, of self and other, and of mental states. Moreover, memory of self in the past is embedded within a social cultural milieu in which particular forms and contents of experience are valued and shared.

Three critical arguments underlie this theory: 1) there is a gradual emergence of autobiographical memory across the preschool years rather than a point before which there are no autobiographical memories and after which there are; 2) language is a fundamental social-cultural tool in the development of an autobiographical memory system; and 3) there are cultural, gender and individual differences in autobiographical memory across the lifespan that need to be explained. Whereas a number of conceptions of the beginnings of autobiographical memory have focused on one or two explanatory constructs, our proposal brings together multiple concurrently developing processes that contribute to the construction and the shape of autobiographical memory. In this way we are able to account for all of the currently available evidence regarding autobiographical memory from developmental, cognitive and cultural perspectives.

An important assumption of this theory is that autobiographical memory incorporates many different concepts and skills – language ability, narrative understanding, temporal concepts, self concepts and consciousness, and social psychological concepts – as well as being embedded within social cultural discourse models; and that each of these individual and social processes follows a variable course of development. An often overlooked fact is that not all children or adults remember as many episodes from their childhoods, or from their adult experiences, or in the same narratively coherent way or with the same degree of explicitness. The implication of this assumption is that differences are expected in the order in which any given influence becomes effective for a particular individual (or across genders and cultures) and thus there will be differences in both the course and time of emergence and in the eventual outcome.

Figure 1 provides a diagram incorporating our concept of the sources and sequence of the emergence of autobiographical memory during the early childhood period. Reading from left to right in this figure indicates the order in which different contributions to the process may come into play. Large arrows indicate direct and necessary relations between components. Thus the basic characteristics of memory in the infant period (implicit and explicit) are seen to be directly and causally related to later autobiographical memory, but not independently of successive contributions from other components, both social and cognitive. Although we do not see the social and cognitive contributions as separable, for clarity of exposition roughly cognitive components are poised along the top of the diagram while social and cultural components are poised below the central arrow. However, as the many interconnected and dual-direction arrows imply, all of the components interact in development. For example, basic and complex language developments depend upon social interactions and are fostered by conversations as well as contributing to them.

Moreover, although too complex to depict here, all of these components also are subject to developmental processes over the course of the overall developments leading toward autobiographical memory, and are highly important developmental achievements in their own right, regardless of their influence on or relation to autobiographical memory. The particular times involved and magnitudes of influence of particular components are to be read as approximations based on our understanding of the evidence at hand. The “onset” ages shown in Figure 1 are to be interpreted cautiously. That said, we can summarize the general developmental course as we see it, using this diagram as a guide.

The developing system begins with infant and toddler memory for events (routines and episodes) for weeks or eventually, months. This system is already socially constituted, in that *what* is remembered is a function of the social-cultural context within which the child lives. The child experiences social interactions from birth, and from these emerge two nascent conceptions at the end of the first year, the intentionality of others and self (Tomasello, 1999) and a core self (Damasio, 1999). Intentionality has been much discussed of late; in its most general sense it means that infants act on goals (have means-ends understanding) and understand that others do as well. Damasio's idea of the core self is essentially related to intentionality, in that infants are aware of their own goals and actions in distinction to those of others, a self-other distinctiveness that goes beyond the simple self-boundary that is implied in physical self-awareness. However, no more "theory-like" conception of self is implied here.

The developmental process from this beginning point involves the infusion of new skills, social experiences, and emerging concepts, evidence for which is discussed in the following sections. The first two additions to the system are the beginnings of language comprehension and expression, and the establishment of an objective or "cognitive" self. This is usually evaluated in terms of the child's recognizing the self in a mirror (described later). Hearing or using linguistic labels during the second year aids in retaining a memory for an experience for a longer period of time. The dawning of the idea of "me" has ramifications for how the child sees herself in relation to the views of other people. This can hasten the child's understanding of her own special role in an experience as differentiated from others. These two developments – language and self - like all those we describe, are subject to wide variations among normally developing

children. Not all children begin language at one year, nor do they all recognize themselves in a mirror at 16 months. Each of these landmarks may be observed in normally developing children as late as the second birthday.

As infants become language-using toddlers, parents begin to engage in talk about past and future events with them, and as we document later, these conversations also vary in their frequency and characteristics, which may enhance the child's memory or not. Importantly, discourse about the child's past and about anticipated events provides support for the child's developing concept of time, in terms of specific temporal positions in the past and in the future, a necessity for establishing order in autobiographical memory. Conventional temporal distinctions are emergent capacities of language development as complex syntax and semantics are established, and extended discourse functions (stories, conversations) come to be understood and participated in (Nelson, 1996). Conversations and stories also foster a newly emerging sense of the distinctiveness of self and other, one that we characterize in terms of a new level of extended consciousness. This level recognizes the differences between mental states of the self and of others (different knowledge, different memories) that is evident in "theory of mind" and false belief understanding (Nelson, in press a; Nelson, et al., 2003).

Experience with different forms of narrative, in play, in stories, and especially in talk about personal episodes, provides a model for organizing one's own episodic memories into the kind of narratives that emphasize personhood, motivations, goals, outcomes, emotions, and values. Practice with this organization has a two-sided outcome: the child learns to tell about

personal experience in the social forms valued by the community, and acquires a more coherent form that aids in the retention of a whole episode, and not just fragments of scenes.

There is no single cause of autobiographical memory, nor is it a simple combination of different causal “inputs.” The changes that take place in the early childhood years are integrative across social and cognitive systems, resulting in a different sense of self with a different functional value of personal memory, among many other important changes. Whereas there is continuity across the developmental span from 1 to 5 years, as each of these influences comes into play and intersects with the others within the social and cognitive system of the developing child, there is also a dramatic change in the characteristic of memory for personal episodes. However, the emergence of autobiographical memory is also not a simple outcome of preschool neurocognitive maturation or of greater language facility. As noted earlier, the medial temporal brain structures that are critical to memory are reaching functional maturity by one year, but the frontal lobes that play a role in the establishment and retrieval of semantic and episodic memory develop more slowly during the early childhood period, with significant development as late as 5 or 6 years.

As we have emphasized, language is important to the development of autobiographical memory, as is the changing conception of the self in the social world. But, as our research has demonstrated, the variability in development and outcome of autobiographical memory is an indication of the complexity of system integration, as well as the variability of social and cultural experience in the child’s life. This complexity and diversity of individual life histories provides both the challenge and the solution to the joint puzzles of the demise of infantile amnesia and the

emergence of autobiographical memory. In the following sections we consider each of these contributions to this emergence in their own developmental terms.

Developmental System Components

Early Memory Systems

Before describing research on early memory, it is important to consider the kinds of methodologies available, especially for preverbal infants. Memory of previous experiences are inferred on the basis of behavior in three distinct tasks, conditioning, preferential looking (or habituation), and deferred imitation. In conditioning tasks, memory is inferred when infants respond in similar ways to previously seen stimuli. If infants emit the same response when presented with the previously conditioned stimuli, then it is inferred that the infant “remembers” the presented stimuli. Preferential looking and habituation tasks both rely on infants’ greater looking time to novel than familiar objects. If infants look longer to something new, then it is inferred that they must “remember” the previously seen stimuli. Finally, in deferred imitation tasks, infants are shown an action or a sequence of actions on an object or objects and are then presented with that object or objects at a specified delay interval. If the infant now produces the previously seen action at a rate greater than baseline (what was spontaneously produced with that object before viewing the action sequence) then it is inferred that the infant “remembers” the modeled sequence. We put “remembers” in quotes here because as discussed earlier, it is not always clear what kind of memory is being assessed in these tasks.

More specifically, as tasks move from relying on repeated learning trials and heavily cued recall contexts, to one trial learning and decontextualized recall, we can be more confident

that the task taps declarative or explicit memory. Obviously, given the limits of pre-verbal infants, we must also be cautious in not confounding limited methodologies with limited memory ability. Moreover, it is a truism in developmental psychology that new abilities most often emerge gradually. As we present the data on early memory abilities, we also present our arguments for why we believe declarative memory emerges slowly across the second half of the first year, and continues to become more temporally organized and decontextualized across the second year of life.

Even before birth, the human child is capable of differentiating and discriminating incoming information, and retaining that information over time. De Casper and his associates (De Casper & Fifer, 1980; De Casper & Spence, 1986) have demonstrated that neonates can differentiate their mother's voice from other female voices within hours of birth, indicating that they have at least implicit memory of voices heard during the last trimester of pregnancy. During the first six months of life, infants will show habituation to pictures of various stimuli. For example, when shown the same set of faces over and over infants will stop looking, but will begin to look again when a new face is shown (Fagen, 1973). However, the time window for habituation is quite short, usually within the same viewing session. At about 6 months of age, infants will continue to show decreased looking to already seen faces as long as two weeks after the initial viewing session (Fagen, 1973), suggesting that memory for previously seen stimuli may become more enduring over this time period.

In the first few months of life, infants will also display retention of previous experiences through emitting the same behavioral response when placed back in the same context. For

example, infants will learn to kick in order to make a mobile above their head move, and when presented with the same mobile again, infants will demonstrate memory of this contingency by kicking (Rovee-Collier & Shyi, 1992). In this paradigm, infants are trained over a number of sessions, and retention of the contingency is assessed at variable intervals, using the same or a different mobile. In programmatic research, Rovee-Collier has established that retention of the contingency increases linearly from 2-18 months of age, as does speed of retrieval (see Rovee-Collier & Hayne, 2000, for details). However, young infants need more training spaced over a larger number of sessions in order to demonstrate retention over longer periods of time. For example, at 2-months of age, infants trained over two 9-minute sessions will retain the contingency for 1-2 days, but if trained over three 6-minute sessions, retention is demonstrated at 2 weeks. Between 2- and 6-months, infants will only demonstrate the response to the same mobile that they were trained on, and only in the same context in which they were trained. By the end of the first year, infants show spontaneous generalization from both the specific mobile and the specific context regardless of training conditions.

The time delay across which infants will continue to emit the previously conditioned response can be extended with the use of reminders. If infants simply see the still mobile on which they had been trained after a delay but at a point when they still emit the response, they are able to tolerate another delay of equal length. For example, at 2 months, a reminder at day 2 will extend the infant's responding for another 2 days; at 6 months the reminder will extend the response another few weeks. The efficacy of reminders suggests that seeing the mobile cues the

infant even in the absence of the experienced contingency, and thus reactivates the infant's memory of the contingency, strengthening the memory trace.

Based on these findings, Rovee-Collier and Hayne (2000) argue “[t]he mechanisms that underlie memory processing are fundamentally the same in infants and adults: memories are forgotten gradually, recovered by reminders, and modified by new information that overlaps with old” (p. 279). However, the slow learning over repeated trials and context-dependence of these memories, especially in the first 6 months of life, are characteristic of implicit perceptual and motor representations that are not accessible to conscious recall (as defined by Kandel & Squire, 2001). While we agree that these particular mechanisms are continuous throughout development, new processes and functions emerge with development as well. In particular, one-episode learning and conscious recollection not dependent on context indicate the development of explicit memory.

Studies of deferred imitation in the second half of the first year support claims of explicit, declarative memory. Bauer (1996) and Meltzoff (1995) have found evidence of deferred imitation in the laboratory as early as 9 months of age. In these types of tasks, infants and/or toddlers are shown unique actions or action sequences performed on objects and, following a specified delay, infants are given the objects and their performance of the actions is assessed. Multiple factors have been manipulated, including number of actions and objects, causal structure of the modeled sequence, number of exposure trials, and whether the infant is allowed to model the sequence during the initial exposure trials or only at the retention trial. The results are, not surprisingly, quite complex (see Bauer, Wenner, Dropnik & Wewerka, 2000, for details

and review), but several conclusions can be drawn. First, deferred imitation of even single actions on single objects after short delays is variable early in the second half of the first year. Between 6 and 12 months infants show increasing reliability in reproducing single actions on single objects (e.g., Meltzoff, 1988) but are less consistent in reproducing longer sequences. By 9 months of age, infants are able to recall 2 action sequences for 4 weeks, and by 10 months they are able to recall sequences for up to 6 months (e.g. Carver & Bauer, 2001). By one year, there is increasing stability and durability of performance (e.g., Bauer & Hertzgaard, 1993).

In a large longitudinal study assessing memory during the second year using deferred imitation, Bauer et al (2000) examined 13-, 16-, and 20-month-olds on 3-step (13- and 16-months olds) and 4-step (16- and 20-months olds) sequences after delays of one, 3, 6, 9 and 12 months. Evidence of recall was assessed by higher performance on the previously seen sequences than on new sequences. Children at all ages and all delay intervals showed some degree of recall by this measure, although the length of the action sequence influenced recall for younger children. Further, there were important differences with age in reproducing the temporal order of actions. As a group, twenty-month-olds were reliably better than chance in reproducing the order of sequences at all delay intervals; 16-month-olds were better than chance on reproducing temporally ordered actions at one, 3 and 6 months, and 13-month olds were only better than chance at the one month retention interval. These findings provide evidence that declarative memory becomes more enduring and more reliable, and encompasses more temporal information across the second year of life. In addition, toddlers are able to recall these action sequences even when the objects change from exposure to test (see Bauer, 1996; 1997, for

reviews) suggesting that memory is becoming decontextualized (see Fivush, 1994, special issue of *Memory* for evidence and discussion).

As argued by McDonough and Mandler (1994) and Bauer and Wewerka (1995), deferred imitation relies on declarative recall memory based on one-trial learning and conscious recall, in that when provided with the props from the previous display, infants must recall both the actions and the correct sequence in which to perform them. Nonetheless, this memory task incorporates a large number of external cues, all of the objects being present to cue the action sequences in the same physical location as the original event. We can agree that this is evidence of declarative memory, but further evidence would be needed to differentiate between semantic (general knowledge of “how to make things happen”) and episodic (autonoetic) memory. Thus deferred imitation studies have documented a clear move to declarative (or explicit) memory skill by about one year, but have not provided evidence of the beginnings of autobiographical memory.

During the first 2 years, infants also become quite facile at learning scripts for familiar routines. They learn sequences of common actions for feeding, bathing, and dressing routines among others; indeed, they become adamant that actions must occur in a specified order (Bauer & Wewerka, 1995; Lucariello, Kyratzis & Engle, 1986). They also learn the formats of give and take games such as peek-a-boo and patty cake (Bruner, 1975). By the second year, toddlers reproduce in play the everyday events of their lives, indications that they are developing well-organized representations. Laboratory tasks using imitation of everyday routines using toy objects (Bauer & Thal, 1990), such as bathing (e.g., “giving teddy a bath”) have verified that 21-month-olds readily imitate “correct” sequences, but not reversed or violated ones. Such

representations of everyday events form a background of basic knowledge about how the world around the infant works, much as scripts, scenes, and schemas of everyday life function for adults. Moreover, as Nelson and colleagues (1986) showed, scripts for familiar events support the child's memory for specific components within the overall event.

However, as impressive as these various accomplishments and evidence of reliable memory are, they do not indicate that infants or toddlers have autobiographical memory as defined previously. Rather, infant memory for routines and scenes may come to constitute a kind of semantic knowledge base during the toddler years. Clearly imitative learning requires conscious attention, and delayed imitation demonstrates conscious recall. But a mixture of repeated learning trials and dependence on environmental cues in studies thus far carried out during the second year of life suggests a developing recall ability, not evidence of its achieved status. Moreover, with regard to the autobiographical memory proposal, there is as yet no sense of a self remembering a specific point in the past, or of a past memory being related to current conceptions of self in a continuous self narrative during the first two years.

Even when children first begin to refer to the past verbally, at about 18 months of age, these references are fleeting and fragmentary (Nelson & Ross, 1980; Weist, 1986). Children's first verbal references to the past usually refer to just completed actions (e.g., "did it!" or "all gone"), or to familiar routines (e.g., referring to eating breakfast earlier that morning), and are almost always interpretatively framed by adults (e.g., the child says "berries" and the adult responds "yes, we ate berries for breakfast this morning, didn't we?"). At about 20- to 24-months of age, children often begin making more extended references to the past, and they may also

refer to events that occurred in the more distant past (Eisenberg, 1985; Sachs, 1983), although again, these references are infrequent and fragmentary.

Between 2 and 2 1/2 years of age, children become better able to verbally provide more details about past occurrences, although these memories are still most often in response to specific questions and prompts from an adult (Eisenberg, 1985; Fivush, Gray & Fromhoff, 1987; Hudson, 1990). By the age of three, most children are able to give extended, and often reasonably coherent, accounts of their past experiences (Fivush, et al., 1987; Peterson & McCabe, 1982), although these skills continue to develop in complexity and organization across the preschool years and into middle childhood (Fivush, Haden & Adam, 1995; Hudson & Shapiro, 1991; Peterson & McCabe, 1982). For example, Hamond and Fivush (1991) asked 4- and 6-year-old children to recall a family trip to Disneyworld that had occurred either 6 months or 18 months in the past, when the children were between 2- and 4-, or 3- and 5-years of age, respectively. All children responded to the interviewer's questions, providing a great deal of accurate information about their experience, with a mean of about 40 subject-verb propositions. In fact, there were no significant differences either as a function of age at time of experience or at time of interview on how much children recalled. However there were age differences in both amount of detail provided and the amount of free recall. Older children recalled more information in response to open-ended questions, whereas younger children needed more questions, cues and prompts from the interviewer to recall as much information as the older children, and this pattern was consistent regardless of how long ago the event had occurred. In addition, older children recalled their experiences in more detail than the younger children, for

example recalling the “big flying Dumbo ride” rather than just the “Dumbo ride.” These results confirm that children become more competent at verbally recalling their past experiences in coherent detail across the preschool years. During the same years children acquire the rudiments of their native language. This raises the important question of whether, and if so, how, memories from the nonverbal period may be “translated” into language as children develop these skills.

Myers, Perris, and Speaker (1994) addressed this issue in a longitudinal study in which 10-month-old children were trained to release a lever in a puppet in order to receive a treat. These children were seen again at 14-months, 32 months and 60 months to assess both nonverbal and verbal memory of this contingency. In addition, a naïve group of same-age children were added at each assessment point, to determine whether the trained children were “remembering” or simply figuring out the task, and to then follow these children over time as well. There was some evidence of nonverbal memory across the first 3 assessments; trained children were somewhat more likely to select the puppet that had previously dispensed treats from an array of three puppets, and trained children were also able to relearn the contingency faster than naïve children. However, there was virtually no evidence of any of the children displaying verbal memory of the event at any assessment point.

In a similar study, Bauer and Wewerka (1995) showed 13-, 16-, and 20-month old children 3-step or 4-step sequences, and assessed memory within the first 3 months, at 6 months, 9 months and 12 months. This was a subset of the Bauer et al (2000) data discussed earlier, and as already detailed, all children showed memory of the sequences through deferred imitation. In the 1995 report verbal memory of the sequences was also assessed. Many children expressed

some verbal memory of the event during reenactment; importantly, productive vocabulary at the time of encoding, as determined by parental report, predicted subsequent verbal recall even after accounting for age and retention interval (but see Bauer, Wenner & Kroupina, 2002, for evidence that concurrent vocabulary is also predictive of verbal recall.)

Simcock and Hayne (2002) recently reported even stronger evidence along these lines. They created a complex and engaging play event for 27-, 33- and 39-month old children and assessed their memory of this event either 6 or 12 months later. They also collected both receptive and productive language data at both encoding and recall. In addition, Simcock and Hayne examined the specific words that children used in the recall to determine whether these words were in their vocabulary at encoding. Strikingly, although all children verbally recalled the event, “in no instance during the test did a child use a word or words to describe the event that had not been part of his or her productive vocabulary at the time of the event” (p. 229). These results support the conclusion that the specific language skills available at time of experience determines what can subsequently be verbally recalled.

Another investigation of verbal recall of preverbal experience is reported by Peterson and her colleagues (Peterson & Bell, 1996; Peterson & Whalen, 2001). They have conducted longitudinal research on children’s memories of an injury resulting in emergency room treatment. Children aged 3 years and older at the time of experience were able to verbally recall the details of this event quite accurately and retain this memory over a five year period. Peterson and Rideout (1998) also assessed 1- and 2-year olds ability to verbally recall an event of this kind. At time of experience, few of these children were able to provide much verbal recall of

what happened. As much as two years later, although children answered interviewer's questions, half of what they reported was erroneous, suggesting that they did not have a verbally accessible representation. Further, Peterson and Rideout present descriptive evidence suggesting that only those children who were able to verbally recall core actions of the event when it occurred (how they got injured, what treatment they received) were subsequently able to provide any accurate verbal information about what occurred. Children who could not initially verbalize aspects of their injury and treatment were subsequently not able to verbally report any accurate information.

Overall, then, the findings of several studies indicate that early experiences, even if remembered in behavior, do not become accessible for verbal recall as children develop more sophisticated language skills. Thus it does not seem to be the case that language simply allows children to express what they may remember. Rather, language actually supports the development of a verbally accessible autobiographical memory.

Language in Memory

Independent effects of language on adults' memory are hard to demonstrate because it is difficult to suppress the covert use of language to encode material, even when instructed not to use language (e.g. Bartlett, 1932). As Damasio (1999, p. 185) states, it is impossible for adults to escape from the verbal translation of the ongoing nonverbal narrative of consciousness.

Certainly, the beneficial effects of verbal rehearsal are well-demonstrated as effective strategies in the developmental and educational memory literature. However, it has been argued that, specifically in the case of autobiographical or episodic memory, language only reflects memory but does not provide any additional contribution to it, such as organization (Howe & Courage,

1997). This claim is difficult to counter because of the rather obvious dependence on verbal reports of much of the data related to autobiographical memory.

Nonetheless, language appears critical in the development of autobiographical memory for three interrelated reasons: First, language is not simply the way in which autobiographical memories are expressed, but is instrumental in providing the organizational and evaluative forms characteristic of autobiographical memory. Second, as children's developing language skills allow them to enter into dialogue with others about their past experiences, children become more skillful in forming organized representations of past experiences. Third, such practices facilitate children's emerging awareness that memories are representations of past events, and as such, can be evaluated from multiple subjective perspectives.

Language development and verbal recall. Children begin comprehending and using a few words productively around the end of the first year and in the first half of the second year. However, words are used sporadically and primarily for pragmatic purposes throughout the second year (Halliday, 1975; Nelson, 1991). Beginning around 20 to 24 months children's vocabularies increase and they begin producing short sentences. They also begin to engage in brief conversations with parents and other close adults or siblings, expressing their wants and wonders. As already reviewed, many children begin to make references to remembered objects, locations, persons, or events at about 18-20 months of age, and at 2 years children may expand their references to the past, encompassing events that happened weeks or even months ago (Nelson & Ross, 1980). However, at this early point these references tend to be fragmentary and difficult to interpret for adults who did not share the experience.

Many aspects of grammar and the lexicon that are relevant to re-construction of the past remain unavailable to children of this age, including complex tense constructions, references to temporal locations whether relative or specific (e.g., “yesterday,” “Sunday”) and relative temporal locators such as *before*, *after*, *while*, and so on (Nelson, 1996; Weist, 1986). It is not surprising then that children’s contributions to talk about the past tend to be fragmentary and brief. Indeed, in these early phases of conversations about the past, adults provide most of the content and structure, and children participate often by simply repeating or confirming what adults say (Bloom, 1991; Hudson, 1990). In this way, adults provide the linguistic scaffold, or framework, that helps children to organize their experience, both as it is occurring and in retrospect, and it is this organization that allows children to both represent and subsequently verbally recall the event in a coherent and meaningful fashion.

A study by Haden, Ornstein, Eckerman and Didow (2001) illustrates this effect. They asked mothers to interact with their 30- to 42-month-old children around novel play events, such as birdwatching and going camping. Children were asked to recall these events one day or one week later. Although at this age verbal recall was very limited, the few details that children did recall were those aspects of the event that mothers talked about and that children responded to either verbally or nonverbally. Virtually no aspects of the event that mothers had not scaffolded through language were recalled. This finding suggests that toddlers in the early phases of language development use the adult’s linguistic structuring of the task to help them organize their own memory representation.

Even as children get older, they remain dependent on adults to help them organize their experiences through language. Tessler and Nelson (1994) examined the effects of maternal discourse on memory in 3-year-old children. Conversations of mothers and children during a visit to a natural history museum were tape-recorded. One week later the children were visited at home and asked to recall the experience. Comparison of children's reports with the museum transcripts revealed that only specific items viewed and commented upon by both mother and child were later recalled. Neither items named by the mother or by the child alone appeared in recall, only joint references were effective for memory formation or retention.

In a related study, Pipe, Dean, Canning & Muchaver (1996) had one group of 5-year-olds experience a novel pirate event with full narration by an accompanying adult, and another group experience the same event but with "empty" narration (e.g., "First we do this, then we do this," etc.). Children in the full narrative group recalled more about the event both verbally and in action than did children in the empty narrative group and they also included fewer errors in recall. Taken together the pattern of evidence clearly indicates that throughout the preschool years, children are to some degree dependent on an adult's ability to structure an event in language as it is occurring in order to help organize the event for future recall. Recalling an event in retrospect also requires linguistic scaffolding, in the form of narratives.

Language of narrative. As both psychologists (Bruner, 1990; Neisser, 1982) and sociolinguistics (Chafe, 1990; Labov, 1982; Linde, 1993) have argued, a coherent account of a past event contains more than the sequential rendering of what occurred. A full narrative must place the event in context, providing information about when and where the event occurred in

order to orient the listener, and a good narrative must also provide evaluative information, information that conveys the meaning and significance of the event. Evaluative information can be conveyed through the use of emphasis (“it was *really* cold.”) and repetition (“I ran *and ran and ran.*”) which highlights the importance of specific details of what occurred, or more specifically through the inclusion of mental state language such as emotions (“I was so *angry.*”), motivations (“I *wanted* to go to the party.”) and thoughts (“I *thought* I was gonna die!”) that express one’s reactions to and perspectives on what occurred (see Fivush et al, 1995, and Peterson & McCabe, 1982, for discussions). Evaluative information can also be non-linguistic, including prosody and body gestures, and children’s earliest narratives contain some non-linguistic evaluations (Miller & Sperry, 1988).

Over the years from 2 to 5 children’s developing language and narrative skills allow them to understand and represent events in more complicated ways than they did earlier in life. Whereas events in the world appear temporally and causally structured, and infants and children are sensitive to these dimensions in their early event representations (see Bauer, 1997, and Fivush & Haden, 1997, for reviews), narratives bring a new form of organization to events. Narrative adds layers of comprehensibility to events above and beyond what is available from direct experience by linking events together through causal, conditional, and temporal markers. Narratives are structured around meanings, emphasizing goals and plans, motivations and emotions, successful and failed outcomes and their meaningful relation to the teller as well as to the other players. Through the narrative medium, events may be related to other experiences that are part of ongoing life frames, for example, school life. Perhaps most important, through the

use of evaluative devices, narratives provide for the expression of and reflection on personal meaning and significance that in turn allows for a more complex understanding of psychological motivation and causation.

Across the preschool years, children become increasingly competent narrators, providing more temporally organized and elaborated accounts of what occurred, as well as orienting and evaluative information (Fivush, Haden & Adam, 1995; Peterson & McCabe, 1982). In a longitudinal study from 40 to 60 months of age, Fivush et al (1995) examined narrative coherence through children's use of orienting, referential and evaluative information in recall of unique events experienced at various points in the past. As can be seen in the examples provided in Table 1, even at 40 months, children related some personal events from the past, and were able to give some elaborated details about components of their experience. However, with increasing age, children provided longer, more coherent, and more complex narratives. Specifically, by the end of the preschool years, children included more complex actions (statements that set conditions for other actions to occur) and more temporal markers (words such as "then", "when" and "before" and "after"). Older children also provided more background information that linked the specific event to other people and events in their lives (e.g., "Billy is my cousin" and "It was just like the time I went to Sea World."). Finally, children begin to provide narratives that express their evaluative stance on what occurred, although obviously narrative skills continue to develop throughout childhood (Hudson & Shapiro, 1991; Peterson & McCabe, 1982).

These developments reflect more than increasing linguistic sophistication; children's developing narrative structures reflect something about the way they come to understand and

organize the events of their lives. This claim is asserted for two reasons. First, if language simply allows children to express their underlying representations in more complex ways, then we would expect non-verbal measures of memory representations to show more complex understanding of events than linguistic measures in early development. But, in fact, research assessing preschooler's event representations through both verbal and nonverbal means consistently demonstrates that preschooler's representations are not more complex when assessed nonverbally than when assessed verbally. For example, both Fivush, Kuebli and Clubb (1992) and Price and Goodman (1990) found that preschool children showed the same level of organization and complexity in verbally recalling an event as in behavioral re-enactment. Price and Goodman asked children ranging in age from 2 to 5 years to verbally and behaviorally recall an event in which an action earlier in the sequence (getting a key) was causally related to an action later in the sequence (opening a box). Children who did not verbally recall this causal connection even when probed also did not evidence behavioral re-enactment of the causal connection, being surprised when they could not open the box at the end of the event sequence.

In a similar vein, Fivush et al (1992) asked 3- and 5-year-old children to recall an event verbally and behaviorally in which some of the component objects changed from the original event to the re-enactment scenario. Five-year-old children had no difficulty incorporating these optional objects into their verbal and behavioral recall, but 3-year-old children were quite confused. They omitted the changing objects from their verbal recall and were stymied when confronted with these objects during re-enactment. Yet when asked to recall the event after several specific episodes in which objects changed, even the 3-year-olds were able to extend

their knowledge to incorporate new objects both in verbal and behavioral recall (see also Bauer & Fivush, 1992 and Kuebli & Fivush, 1994, for related findings). These results indicate that preschooler's verbal reports reflect the complexity of their understanding of conditional and optional actions within learned event sequences.

In terms of event organization, Fivush and Mandler (1985) asked 4-, 5- and 6-year old children to sequence pictures of familiar and unfamiliar events. Children were asked to both construct forward and backward sequences from unorganized displays of the pictures and to reconstruct seen sequences. The youngest children could neither create nor reconstruct backward sequences, but the oldest children could do both. Five-year-olds were transitional; they could reconstruct seen sequences even if backward but they could not create backward sequences. These results mirror findings of preschoolers' abilities to verbally produce forward and backward sequences of events (see Mandler, 1983, for a review). Finally, Ratner, Smith & Padgett (1990) asked 5-year-old children to verbally recall and sort pictures of two episodes. In one episode each action was causally connected to the following action and all actions formed a hierarchical causal chain, and in the other episode the actions followed no necessary temporal order. Both verbal recall and picture sorting converged on the same finding; the causally connected episode was hierarchically organized but the arbitrarily ordered episode was not. Across these studies, verbal and nonverbal assessments show the same pattern, suggesting that younger children's more limited verbal recall is not simply due to limited language ability but reflects underlying differences in the complexity and organization of the event representation.

Moreover, there is evidence that narrative skills lead to better memory rather than the reverse. Kleinknect & Beike (2001) assessed preschoolers' abilities to tell coherent narratives about both personally experienced events and fictional stories, and related their findings to memory of specific facts in response to a series of questions about one of the experienced events. A series of regression analyses indicated that children's abilities to construct coherent, temporally organized personal narratives predicted the content and the exhaustiveness of their recall of facts about a specific past event. These results support the proposition that narratives provide a new way of organizing and recalling information.

Narrative development depends upon the acquisition of complex linguistic constructions that allow the expression of time, perspective, mental states, emotions, motivations, plans and problems. At the same time experience with narratives fosters the development of such skills (Bamberg & Moissinac, 2003), as indicated by the double-headed arrows in Figure 1. These complex linguistic skills are acquired gradually over the pre-school period and competence in both receptive and expressive language shows considerable individual variability among children of the same age.

One study that included an assessment of language competence in relation to memory for a novel complex event was carried out by Walkenfeld (2000). The design involved three sessions spaced three weeks apart. On the first occasion 3- and 4-year-old children engaged in a treasure hunt carried out in a pretend zoo. Children's receptive and expressive language was assessed with a standard clinical instrument, the TELD (Test of Early Language Development), which yields raw and standardized scores and a "language age" for each child. At the second visit each

child was engaged in one of three conditions: re-enacting a portion of the event with the original props, verbally recalling the same portion of the event without props (“verbal reminding”), and an unrelated activity. Younger children (3-year-olds) benefited more from verbal reminding than did older children (4 year olds). Stepwise regression analyses across the entire sample for age, receptive and expressive language showed that receptive language competence was highly predictive of both recall of items and a measure of narrative cohesion in recall (p 's < .0001). Neither expressive language nor age appeared as significant predictors. It is of interest that the “language age” of the children in this study was considerably in advance of the actual chronological age with an overall mean Language Age of 5years, 5 months where chronological ages ranged from 3,2 to 5,3. This finding suggests that developments in language continue to be relevant to narrative development throughout the preschool years. That receptive language is more related to recall and narrative cohesion than is expressive language suggests that the development of these skills relies on children’s developing ability to interpret the contributions of others in extended discourse, including narrative discourse (Nelson in press b).

Conclusions based on standardized language scores may appear too conservative regarding children’s ability to understand and compose narratives during the preschool years. There is ample evidence of children’s ability to reminisce with parents about the past and to tell unfamiliar interviewers about such experiences beginning at the age of about 3 years. However, there has been little evaluation of the narrative quality of the child’s contributions in these dialogues. There is also documented evidence that some children are quite facile in both remembering and reconstructing parental talk about past and future, as well as recounting their

own experiences. Nelson (1989b) presented detailed analyses of the ability of one 2- to 3-year-old child, Emily, to remember adult presentations about future activities and to reconstruct her own experiences. However, Emily was very advanced in language, as analyses of her sentence grammar indicated, and although her nighttime monologues began to include brief narratives of personal experience at around 2 years, these accounts increased in coherence and complexity until the end of the study when she was 3-years-old. It seems probable that many of the children for whom there is extensive anecdotal or observational evidence of narrative competence in the preschool years are similarly advanced in general language competence and have similarly had extensive experience in reconstructing experiential and story narratives with parents and other adults. Children's growing ability to use the language of narrative rests to a large extent on their experience with adults who present them with narratives of personal experience, as well as fictional stories, as we discuss next.

Adult Memory Talk

Maternal reminiscing style. There is now abundant evidence that the ways in which parents, and especially mothers, structure conversations about past events with their preschool children have strong and enduring influences on how children come to construct their own narrative life history. At the point where parents usually begin reminiscing with their young children at about 18 to 20 months of age children provide little information and rely on their adult caregivers to provide most of the content and context for these conversations (Eisenberg, 1985; Harley & Reese, 1999; Hudson, 1990). Over the next 12 months, children begin to provide more of the information about what happened. Still, during toddlerhood and the early

preschool years, adults continue to provide most of the content and structure for these conversations (Eisenberg, 1985; Fivush, 2001; Harley & Reese, 1999; Hudson, 1990).

Individual differences in the ways in which mothers structure conversations about the past with their young children have been clearly shown to influence children's developing autobiographical skills (Engel, 1986; Fivush & Fromhoff, 1988; Hudson, 1990; McCabe & Peterson, 1991). Mothers vary along a dimension of elaborativeness, with some mothers talking frequently about the past, and discussing past events in richly embellished detailed ways. Highly elaborative mothers continue to question their children about the past, giving more and more detail about what occurred with each question even when their children do not recall any information. In contrast, less elaborative mothers ask fewer and more redundant questions, essentially repeating the same questions over and over in an effort to prod their children to produce a specific detail about what occurred. In order to illustrate these styles over time, Table 2 presents excerpts from a high and low elaborative mother and their children both early in development and toward the end of the preschool years.

Maternal reminiscing style is remarkably consistent across the preschool years (Harley & Reese, 1999; Reese, Haden & Fivush, 1996) and across siblings within the same family (Haden, 1998). Moreover, maternal reminiscing style is not simply a difference in maternal talkativeness; mothers who are highly elaborative during reminiscing are not necessarily more talkative in other interactional contexts (Haden & Fivush, 1996; Hoff-Ginsburg, 1991). Most compelling, longitudinal analyses have demonstrated that maternal reminiscing style predicts children's developing autobiographical memory skills. Figure 2, reprinted from Reese, Haden

and Fivush (1993) illustrates these kinds of findings. In this longitudinal study, mothers and children were visited in their homes at 4 points during the preschool years, when children were 40 months of age, 46 months, 58 months and 70 months. At each time point, mothers engaged their children in reminiscing about 3 specific past experiences that they shared together, and these conversations were coded for level of elaboration. Both maternal elaborations and children's recall were defined as the provision of new information into the conversation. Figure 2 displays all significant concurrent and cross-lagged correlations between level of maternal elaboration and children's recall.

Several important points in this figure should be noted. First is the remarkable continuity of maternal level of elaborativeness across the preschool years. Second, maternal style early in development has a substantial effect on children's emerging ability to recall their own past, and this effect emerges over a relatively long developmental period. The ways in which mothers reminisce with their young preschool children continues to affect children's memory skills more than two years later (Figure 2 displays correlations but these effects are corroborated in regression analyses; see Reese et al., 1993, for details). Third, whereas early in development, effects are directional from mother to child, by the end of the preschool years, effects of children on mothers are as strong as effects of mothers on children. This pattern highlights the bidirectionality of these relations. Children play an important role in eliciting and sustaining maternal style, and in this way are co-contributors to their own socialization environment.

Similar effects have been reported by Harley and Reese (1999). They also examined mother-child reminiscing longitudinally, but began earlier in development, assessing reminiscing

style at 18, 24 and 30 months. Maternal elaboration was stable even this early in development, when children were barely recalling any information at all. Over time, children of more highly elaborative mothers began to recall more information than children of less elaborative mothers. Harley and Reese also found that even before children could participate fully by recalling information, more highly elaborative mothers had children who indicated more interest and attention in reminiscing by confirming and/or repeating what the mother said. In turn, children who indicated this kind of interest had mothers who became more elaborative over time, again reflecting the bidirectionality of this relation. (See Reese, 2002-a for further details.)

As can be seen in Table 2, when children are young, mothers provide the entire structure and content of the recall. But note that in the conversation between the highly elaborative mother and her child there is a sense of story; with each conversational turn, this mother continues to tell another piece of the story until the entire episode is recollected, even though her child contributes little to the emerging narrative. Contrast this with the low elaborative mother. When her child does not recall any information, this mother repeats the same questions over and over, and then simply switches topic. By the end of the preschool years, the highly elaborative mother and her child co-construct a rich story of a shared experience. Together they weave in details and embellishments about what occurred, creating a coherent and complex shared narrative. Again, in contrast, although the older child of the low elaborative mother contributes to the reminiscing, the conversation takes place in a question and answer format, with little attention to creating a shared story of a shared past.

Maternal narrative style. Just as adults help children learn the skills for retrieving, rehearsing and elaborating their accounts of the past, so do they help children to construct more coherent narratives. Several studies have established that mothers who use more orienting information, asking questions or providing information about when and where the event occurred have children who begin to incorporate more of this information into their own independent narratives about the past (Haden, Haine & Fivush, 1997; Peterson & McCabe, 1992). And the children of mothers who include more evaluations, such as emotional reactions and subjective stance on the event, include more of this information in their independent narratives later in development (Fivush, 1991; Haden et al., 1997).

In a longitudinal study of 17 parent-child dyads Haden et al. (1997) examined the narrative structure of reminiscing. They assessed both mothers and fathers reminiscing with their child at 40-months of age and again at 70-months of age. In addition, an interviewer assessed children's independent narrative skills when children were 70-months of age through an open-ended elicitation of a personal narrative. All parent and child utterances were coded for expression of orienting information, referential information or evaluative information. Regression analyses indicated that children's own narrative skills in parent-guided reminiscing at both ages predicted their independent narrative coherence. But mothers' use of narrative orientations and evaluations when their children were 40-months-old predicted additional unique variance to children's independent narrative skills at 70-months (fathers' narrative style was not a significant predictor).

Tessler and Nelson (1994) studied the effect of narrative style of mothers in ongoing conversations about an event while it was taking place. Narrative style was coded as the proportion of utterances that included information such as time, cause, motivations and mental states; the contrasting style, paradigmatic (Bruner, 1990) focused on categorical and descriptive information. In this study mothers were assessed as primarily narrative or not prior to the episode, and the 4-year-old children were randomly assigned to groups that received either narrative type conversational styles and questions in a later recall session or a contrasting (paradigmatic) style. The most detailed and narratively coherent memory reports of the experience were given by the children of narrative mothers interviewed in narrative styles. The “mother style effect” was greater than the interview style, even when the interview styles were reversed on a subsequent recall session weeks later. That is, children of narrative mothers recalled more and provided more narrative information at both sessions, regardless of interviewer style.

Overall, these results indicate that maternal narrative style is instrumental in children’s developing narrative abilities over the long term. Similar to elaborative reminiscing style just discussed, the effects of maternal narrative style on children’s own personal narratives have been shown to emerge over a period of months or years. Thus the conclusion from this research is that it is the cumulative effect of many conversations about past events, occurring across the preschool period, that influences children’s autobiographical memory skills. Further, while there is clear evidence that the effects of maternal reminiscing and narrative style on children’s

developing autobiographical skills are substantial, it also seems to be the case that what children bring to this context modulates maternal style and influences their own development.

In summary, research conducted over the past decade has established that children acquire memory and narrative skills through participating in adult-scaffolded social interactions. However, this is not to argue that children are passive recipients of adult scaffolding. Like their mothers, children differ in personal style, or temperament, which enters into their patterns of interaction. Thus we see the mother-child dyad as a mutually accommodating system. Although research studies focus on a few specific interactions, each of these interactions reflects a long history in which mothers and children both conform to and challenge each other's styles and abilities. Statistically we can separate out effects of children's earlier skills and mothers' interactional styles, but in reality, all developmental outcomes reflect a history of integrated social interactions in which both participants bring something to the interaction and take something new away. Thus we are not claiming that maternal style "causes" child outcome; rather, mother's and children's engagement in mutual activities facilitates and/or hinders the development of specific skills. These findings also underscore individual differences. Although as later discussed, all adults may have autobiographical memories, the content, organization and density of autobiographical memories are highly variable, across culture, across gender, and across individuals, as we will discuss in more detail later. Much of this may be due to the ways in which autobiographical experiences are discussed early in development. Further, as children develop the language and narrative skills to organize and recall their past through participating in adult-guided reminiscing, they are also beginning to differentiate the past *as* past, that is, the

understanding of time and sequence and how past experiences fit along a developing time line.

This understanding is critical to the development of autobiographical memory in two ways.

First, it allows children to locate a specific past event at a specific point in time and space.

Second, through locating past events in time, children begin to develop the idea of a continuous self, a self that exists through time. How and when do children come to understand past time and how might their memories of past experiences contribute to their growing understanding of the past and of a self identity as continuous in time?

Consciousness of the Past

Recent discussions of self have emphasized its relation to consciousness of past and future. For example, Damasio (1999) distinguished between “core consciousness” and “extended consciousness,” the latter proposed as a unique achievement of post-infant human life, dependent upon the capacity to reactivate personal memory. He claimed that without autobiographical memories there would be no sense of past or future. [This position is similar to that of Tulving (2001) referred to previously.] Edelman and Toniono (2000) make a similar distinction between primary consciousness and symbolic consciousness, but put more emphasis on the role of language in bringing about consciousness of the extended self in the past, stating (p. 198) that “higher-order consciousness, a self-concept, and a notion of past and future emerge rapidly with language and socialization.” Although they lack developmental details, these neurocognitive theorists view extended consciousness, self, autobiographical memory, and concepts of past and future as crucial developments of human childhood, dependent to a large extent on experience with language. Our observations concur with these positions.

Autobiographical narratives involve at least two orderings of time, and in a full realization of a life story, a third ordering. In this section we address the question as to what extent these orderings are apparent in young children's recall of events. The first order of time is that of the sequence within the event recalled, including settings, plans, goals, actions, outcomes, achievements, and the temporal and causal relations among them. Very young children have been shown to have good command of sequence of familiar routines, or scripts (Nelson, 1986; Fivush & Mandler, 1985), and to be sensitive to order, especially causal order, in brief, newly learned action sequences (Bauer & Mandler, 1989). Friedman (1990; 1993) showed that the ability to order familiar daily events increases over the preschool period, and that children's understanding of sequence, duration, and distance of events begins during the preschool years but continues to develop in later childhood. However, there is little evidence regarding development of the ability to order longer sequences of novel events experienced only one time. Indeed, the best evidence is found in the studies of memory already discussed, showing the growing ability to co-construct event accounts with parents, with parents initially providing the structure and sequence of the event.

The second ordering dimension places the event narrative at a specific time in the past. For a young child who has no external measures of time, such as days, weeks, months, years, this can be achieved primarily by nominal days, for example, "my birthday" or "Christmas" or times of the year, such as "last summer." Use of labels of this kind indicates that the child is conceiving of an event as having happened at a particular time in the past different from the present. At least one such use was recorded by Nelson and Ross (1980) for a 2-year-old

remembering an episode from Christmas. However, the acquisition of relative time markers, such as *yesterday* and *tomorrow* is typically a late achievement, often not acquired until late in the fifth year. At the outset of their use, *yesterday* and *tomorrow* may be used for any day not today, or *yesterday* may be used for any time in the past (Harner, 1982). For example, Emily (Nelson, 1989a) at two years stated “yesterday did that” referring to an event from earlier that day. This statement indicated that she was acquiring a sense of the past different from the present, but its location in her past life was vague. Indeed, Emily’s monologues from 2 to 3 years contained very few temporal locators of any kind, although they were formulated with the past or future tense.

The third temporal ordering of autobiographical memory involves the placing of memories in a life-span relation, which usually requires sequencing memories in relation to an external sequence, such as school years, jobs, or family events. This ordering is beyond the capacity of the pre-school child and thus does not enter into our theory here, although it obviously depends upon cultural experiences and markers (see Habermas & Bluck, 2000, for a full review).

To many people it seems bizarre to hold that infants and young children do not have a sense of past and future, and this point thus needs further clarification. James’ (1890) notion of the “extended present” may help to clarify this perspective. Ongoing activities can be considered within the extended present. Thus, for example, having a meal may be comprehensible as a present “now”. Actions that are completed within the activity may be referred to with the past tense, and those that are anticipated with the future tense. But beyond the bounds of the activity

(say, after finishing the meal, or the playtime before the meal) actions would not qualify as “now.” Memory of what has happened before “now” is simply general knowledge without specific reference to a point in the past. The specific past, and the specific future, involve an ordering in time of things that happened before now, and things that will happen after now.

The sense of past seems to emerge when the child understands the existence of a past life, which comes to include the time when “I” was a baby.” Although a child might eventually infer that she began life as a baby, like everyone else, she cannot know the specifics of her previous life without access to some other person’s report about it. Thus parental narratives make an important contribution to the young child’s concept of the personal past. Talking about experienced events with parents who elaborate the child’s fragments into narratives of the past not only provides a way of organizing memory for future recall, but also provides the scaffold for understanding the order and specific locations of personal time, the essential basis for autobiographical memory. Friedman’s research (Friedman, 1992; Friedman & Kemp, 1998) shows that children gradually acquire command of events in their own past during the preschool years.

Although there has been less work on young children’s understanding of the future, there is increasing evidence that parents begin to talk about the future at about the same time that they begin to talk about the past (Benson, 1994; Lucariello & Nelson, 1987; Nelson, 1989b). Friedman (2000, 2002) found that children’s knowledge about the relative and specific times of notable future events developed over the period from 4 to 10 years. Two studies have found effects of talking about future events with children of this age range on their subsequent

memories for the events after experiencing them (Presler, 2000). In both studies the way in which teachers (study 1) or parents (study 2) formatted the to-be-experienced event for the children influenced the way in which the event was recalled weeks later.

The Self in Time

The self is closely connected to this sense of the personal past and future, as children develop the understanding that it was the same self that exists in the present that experienced an event in the past. Povinelli and his colleagues have studied the understanding of the relation of the present self to the past self in 3- and 4-year-olds through a delayed self-recognition paradigm (Povinelli, Landau & Perilloux, 1996; Povinelli, Landry, Theall, Clark & Castille, 1999). In this paradigm (an analogue of the mirror recognition procedure described in the next section) the child is engaged in a game of sorting cards during which the experimenter surreptitiously places a sticker on the child's head, which remains visible in a video record of the game. A few minutes later the child watches the video-recording and points and names his/her image on the screen. However, whereas most 4-year-olds and all 5-year-olds note the sticker and attempt to remove it from their heads, very few 3-year-olds do so. This research indicates that only at about age 4 do children have an enduring sense of self, relating past self to present self, a requirement for autobiographical memory. Additional research found a strong relation between findings from this paradigm and children's recall of personal episodes (Welch-Ross, 2001) providing a direct link from awareness of self in time to the construction of autobiographical memory (see Reese, 2002b for review and discussion).

Relating the self in the past to the self in the present arguably requires the ability to hold and map two representations simultaneously, self-in-past and self-in-present, as Perner (2000) has argued. Related to this is the ability to recognize two different perspectives on the same past event, one's own perspective and the perspective of another. This also gives rise to the distinction between a shared past, as with parents and siblings or school mates, and a distinctively personal past of one's own unique life. The concepts of experiential time (past and future) and the concept of the self in the past and future can be understood in terms of differentiated states of consciousness, as Damasio (1999) has elaborated. Extended consciousness and the extended self allow for the deliberate recollection or reflection on what has occurred prior to the momentary now, thus constituting the self extended in time (Nelson, 1997; Moore & Lemmon, 2001). The extended self depends in the first instance on accessibility to previous states of consciousness, that is personal memories (see also Donald, 2001 for similar views).

Understanding self and other. In early work on self-development, Lewis and Brooks-Gunn (1979) focused attention on the one-year-old's achievement of self-recognition through what is now a standard test of recognition in a mirror (based originally on Gallup's 1970 work with apes). In this test, a spot of rouge is surreptitiously placed on the child's nose or forehead prior to showing the child's reflection in a mirror. A child who reaches up to touch the spot on his or her own face (rather than pointing to the mirror, for example) is assessed as passing the mirror test of self-recognition. Most children pass this test sometime between 16 and 24 months of age. Lewis and Ramsay (1999) consider that this indicates a milestone in self-conception,

termed the achievement of a cognitive self, which is also characterized by a new self-consciousness, evidenced in inhibition, shyness, and embarrassment.

Howe and Courage (1993) use the term “cognitive self” as that indexed by mirror recognition, and they see it as the point where autobiographical memory begins. They argue that before there is a cognitive self as indexed by mirror self-recognition, there can be no autobiographical memory because there is no “I.” With the appearance of the cognitive self there is in place a self-schema around which memories of personal experience can coalesce, thus allowing for autobiographical memory. Reese and her colleagues (Harley & Reese, 1999; Reese, 2002a) have examined this relation in the longitudinal study described earlier. Children who were early to recognize themselves in the mirror showed better memory skills early in development, supporting assertions by Howe and Courage. However, these effects were overshadowed later in development by maternal reminiscing style. Children who recognized themselves in the mirror early in development had mothers who showed steeper increases in elaboration than mothers of children who recognized themselves later. More importantly, level of maternal elaboration directly predicted children’s later memory reports, whereas mirror self-recognition no longer predicted memory as children grew older.

Thus, we agree with Howe and Courage (1993) that developmental understanding of self indexed by mirror self-recognition is critical to the emergence of autobiographical memory, but in contrast to their position, we see this is one component of a more complex model. The mirror recognition test is an indication that the child has moved beyond the early stage of core self to the first awareness of an extended self, with much growth in self-understanding and self-concept

to come with further development. This perspective is in accord with that of a number of other theorists (Barresi, 2001; Lemmon & Moore, 2001; Perner, 2001; Povinelli, 2001; Zelazo & Somerville, 2001) and with a body of empirical research now emerging (Fivush, 2001; Hudson, 2001; Welch-Ross, 2001; see Reese, 2002b for review). Several of these theorists (e.g., Lewis & Ramsey, 1999, Zelazo & Somerville, 2001) have proposed developmental levels of consciousness that explain achievements in theory of mind as well as self understanding. Others (Perner, 2001, McCormack & Hoerl, 2001; Povinelli, 2001) relate self conceptions to episodic or autobiographical memory, similar to Wheeler (2000) and Tulving & Lepage (2000). Much of the research and many of the theoretical proposals of these scholars are convergent with our conception of the developments that enter into the emergence of autobiographical memory. However, for the most part these proposals (like the neurocognitive theorizing of Damasio) are internalist, in the sense that development is viewed as the endogenous product of constructive processes within the child's own cognitive system, without taking into account the contribution of social experience, although some of those mentioned do view language development as a critical contributor to self. In contrast, our view is that self development cannot be adequately explained from a cognitive perspective alone, but must take into account the situation of the child within the social cultural milieu, wherein the child has experience with reminiscing about the past, and with the cultural schemas for distinguishing past, present and future. This development is related to psychological understanding or theory of mind.

Theory of Mind. Theory of mind, conceptualized as children's ability to attribute mental states as causally related to action, and specifically to entertain the possibility of false belief on

the part of oneself or another, has been extensively studied over the past 20 years (see Astington, 1993; Flavell & Miller, 1998). By age 2 years children use the language of emotion and desire (Bretherton, Fritz, Zahn-Waxler & Ridgeway, 1986) suggesting an understanding that self and others have desires relating to their actions and that others' desires may be different from their own. However, it is not until 4 years of age that children begin to understand that self as well as others can believe something that is not true of the world, that is, that one may have "false belief" as well as true belief. This understanding is also, of course, crucial to understanding that self and other may differ in their beliefs about the world.

Theory of mind and autobiographical memory both involve understanding of psychological states and causes, relating the past to the present and future. Perner (1991, 2000) has emphasized the relation between the two as requiring meta-representational ability. Perner argues that both emergence of experiential awareness of the past, and the relation between knowledge sources and present knowledge states are critical to theory of mind and depend upon meta-representational ability. Welch-Ross (2001) has also found significant correlations between theory of mind understanding and autobiographical memory (see Reese, 2002a for review). These investigations lend support to the conclusion that children's developing understanding of their own and others' mental states is developmentally related to their autobiographical memory skills.

Self and other in reminiscing. In order to engage in a conversation about a past event, children do not need to have any awareness either that they are recalling an event that occurred in a specific time and place (i.e., the sense of auto-noesis) or that the person with whom they are

interacting may remember the event differently or that they may or may not accurately represent what occurred. Through participating in adult-guided interactions children may become aware that memories are representations, and that as representations memories are subjective in the sense that what one person remembers about an event may or may not be the same as what someone else who has experienced that same event remembers (Fivush, 2001). In mother-child reminiscing there are critical conversational junctures at which mothers and children disagree about what occurred, as the examples in Table 3 illustrate. Sometimes this is at the level of the “facts” of the event, who was there, what objects were present, what activities were engaged in. These kinds of disagreements challenge children to begin to understand that memories are representations of what occurred, and that different people may remember different aspects of experienced events. The same process encourages children to reflect on their own recollection of the event as a unique re-experience unshared by others.

Often, disagreements in recollection are not about “facts” but about emotions and evaluations. Mothers and children may disagree on whether they felt sad or angry, whether they were scared or not, whether they liked the roller coaster, or visiting Santa, or did not. These points of conflict highlight for children that they may have a different interpretation, evaluation and/or emotional reaction to an event than others. Through negotiating such disagreements, children may come to understand that they have a unique perspective on what occurred. Their memory is “theirs” in the sense that they have a particular evaluative stance that may or may not be shared with others. Thus, parent-child reminiscing can facilitate children’s understanding of a past self as differentiated from others, yet as continuous with self in the present: “This is what I

remember about that past event in contrast to what others may remember and this is how I evaluate that experience from my current self-perspective.”

We began this paper with the presentation of a conceptualization of the gradual emergence of autobiographical memory across the preschool years that emphasizes the contributions of developments in memory, language, narrative, temporal understanding, and understanding of self and other. Further, we underscored that these developments are dynamic and interactive, becoming integrated over time through the collaborative process of discourse about self in specific temporal contexts. We have reviewed the evidence in support of this theory from a developmental perspective, tracing the inter-weaving of these various contributing strands. We now turn to a consideration of this approach from the perspective of theory and research in adult cognition. Specifically, memory researchers have studied the phenomenon of childhood amnesia, the inability of adults to recall the events of their early childhood. A review of this research demonstrates how our theory provides a convincing explanation for childhood amnesia.

Childhood Amnesia and Autobiographical Memory in Social-Cultural Context

Studies of autobiographical memory in adults have uncovered the phenomenon that Freud call infantile amnesia (also childhood amnesia), pointing to the fact that memory of one’s past life is not present from birth. The evidence is clear: adults in general are unable to remember episodes from their early years; typically the first 3 to 4 years are blank, while

occasional memories appear thereafter, until they begin to accumulate in fairly dense numbers around the age of 6 to 8 years.

Over the course of 100 years a body of research on this topic accumulated, reviewed in 1941 by Dudycha and Dudycha, and more recently by White and Pillemer (1979; see also, Rubin, 1986). This research showed remarkable consistency in the finding that the earliest childhood memory of the populations studied (primarily Euro-American males) was dated on average at 3.5 years of age. At the same time rather wide individual differences were reported, with some adults claiming memories from two years or younger, and some not until 7 or 8 years of age. Intelligence, education, female gender, and language ability were all found in one study or another to be correlated with earlier memories (Dudycha & Dudycha, 1933, 1941; Waldfogel, 1948; see White & Pillemer, 1979, Pillemer & White, 1989 for excellent reviews).

Two methods have typically been used to assess adults' early memories. The first asks adults to report their earliest memory. There are problems with this method, including the fact that many, perhaps most, adults have difficulty providing a precise date for their earliest memory unless it is tied to some datable event, such as the birth of a sibling, or a move to a new home. Nonetheless, the fact that the average age (3 years) is very consistent over many studies is revealing. To overcome some of the problems of the methods used in these investigations, Usher and Neisser (1993) asked college students to recall events that were known to have occurred when they were 2, 3, 4, or 5 years of age. Events queried included birth of a sibling, an overnight hospitalization, a family move and the death of a relative. Rather than asking for a free narrative, they asked participants to answer a set of specific questions concerning the event.

Age of earliest memory depended on the event in question. Respondents recalled a sibling birth and overnight hospitalization that occurred as early as age 2, but a family move and death of a family member were not recalled before the ages of 3 or 4.

These results point to the critical fact that childhood amnesia is not an all or none phenomenon; events that vary along dimensions of emotionality and distinctiveness may be differentially retained into adulthood. However, it must also be emphasized that “recall” of an event in this study constituted a bit of detail in response to two or three out of 20 specific questions (see Eacott & Crawley, 2000, for a discussion and extension of this study). Thus these early memories may be only fragments or sensory images rather than coherent memories of a temporally extended event. Still, the results change the question from age of earliest memory to ages of earliest memories, and highlight the importance of considering the density of early memories. Childhood amnesia cannot be represented as a single point before which memories of childhood are unavailable and after which they are. Rather, early memories may be seen as “points of light” in an otherwise dimly remembered past.

Indeed, when we turn to the second methodology that has been used to study early memories, we see a gradual increase of memories across the preschool years. In this method adults are asked to recall as many memories as possible from specific time periods within their lifespan (Rubin, 1986). This method provides an estimate of the “forgetting curve” for personal memories, and it has revealed two points of divergence from the expected linear function. First, there are significantly fewer memories below the age of 7 than would be expected by extrapolation of the forgetting curve, and second, there is a dramatic drop off of memories below

the age of three suggesting virtually no memories for this early period of life. Figure 3, reproduced from Wetzler & Sweeney (1986) shows this idealized function, based on combined data from a number of studies.

The implication is that adults' autobiographical memory may generally begin around 3 or 4 years, but it develops slowly over the subsequent years with only a few memories from each year until school age. This general finding gains further support in a study by Weigle and Bauer (2000), in which adults were specifically asked to report in writing their two earliest memories. While they confirmed that age of earliest memory was about 3 years (in this study it was 2 years, 8 months), in line with previous research using this methodology, they additionally found that the next earliest memory averaged a full year later (the mean age of the two earliest memories combined was 3 years 2 months), indicating that the first recalled memory does not imply a now continuous autobiographical memory.

Bruce, Dolan and Phillips-Grant (2000) developed a technique for estimating when memories become more continuous. They asked participants to recall two early memories and also to report two early life events that they know happened but could not recall. Not surprisingly, the "remember" events were dated later than the "know" events." More interesting for our purposes, Bruce et al statistically calculated the age at which "remembering" surpasses "knowing", that is, that age at which participants begin to have more continuous memories. They found this point to fall at 4.64 years of age, substantially later than the age of earliest memory.

Thus the emerging picture of childhood amnesia has become more complicated than it appeared earlier. When asked for their earliest memory, adults (at least Euro-American males)

on average consistently report a memory from about age 3 1/2. Yet when specific events are targeted, at least some adults can remember at least some details of events that occurred at age 2. At the same time, early memories are sparsely spaced across time and do not seem to approach a continuous sense of the past until the end of the preschool years.

These findings underscore that the so-called “offset” of childhood amnesia reflects a gradual process rather than an all or none phenomenon. In their comprehensive review, Pillemer and White (1989) propose two phases in the establishment of autobiographical memory, the first characterized by fragments of memory, often sense impressions that cannot be placed in time, and that seem to have little meaning. The second phase is the beginning of true autobiographical memory, of episodes that are meaningfully situated in a life story, however fragmentary the narrative may be. Recent research supports their proposal and indicates that we need to account for both the extreme scarcity of memories before the age of three and the gradual emergence of memories across the preschool years.

Explaining childhood amnesia

Freud (1953) was the first to identify childhood amnesia as a theoretical problem (earlier authors had simply viewed it as part of a general weakness of infantile mentality). He proposed at least two distinct explanations for it: repression of memories that were too arousing for the ego to deal with, and the re-construction of disturbing memories into bland stories that provided a secure sense of self. Freud’s explanations were almost immediately discounted by experimental psychologists, although some were quick to verify the phenomenon through surveying adult early memories, and others tested Freud’s proposals by examining the quality of emotion

revealed in the earliest memories (Waldfoegel, 1948). What they found was that early memories are neither particularly bland (which would support the repression account) nor especially emotional. William James (1890) also recognized the phenomenon in his discussion of self, but offered no special explanation for it. Given James' view of infancy (the infamous "booming, buzzing confusion") it seems likely that he, like others before him, attributed childhood amnesia to the weakness of the infant mind.

In fact, before the 1980's there was relatively little interest among research psychologists in autobiographical memory as such (see Neisser, 1982; 2000) or in its relation to childhood amnesia. There was quite widespread acceptance, in line with James's view, that infants and young children simply lacked memory or at least memory of the kind studied in adults. Most explanations of the absence of autobiographical memory in the early years have been framed in terms of an amnesia barrier that needs to be overcome in order to enable memories to persist into later life. One explanation, common to Schachtel (1947) and Neisser (1962) invoked the dramatic change in the social and cultural context of the child's world as language and schooling impinged on the "natural" memory and knowledge base of early life. This reconfiguration of the context of memory was held to make earlier memories inaccessible to recall. This theory is difficult to test. Which life changes are dramatic enough to make prior memories inaccessible? Adolescence appears to be as dramatically different from the prior childhood years as they are from the preschool years, yet there is no comparable amnesia barrier that blocks the school years from later remembering.

Several authors in recent years have attempted other explanations, some of which have already been alluded to. Pillemer and White (1989) reviewed the extensive literature then available and proposed a social construction account similar to the one we present here. In contrast, Rovee-Collier and Hayne (2000) propose that infantile amnesia phenomena result from memory loss because of problems of identifying the origins of the memories or weak representations of and mismatches of context. However it is not clear from their approach how these factors might change with development to allow for relatively decontextualized memories that endure over a lifetime, even if they are not often recalled. Howe and Courage (1993; 1997) explain childhood amnesia in terms of the development of a self concept, making possible “self in memory.” This position appears consistent with Tulving’s notion of auto-noesis, as well as various ideas about the development of self in memory (e.g., Fivush, 1988, 2001; Nelson, 1989a, 1997) and the development of experiential awareness (Perner, 1989, 2000; Perner & Ruffman, 1995).

However, Howe and Courage link the “self in memory” to their construct of “cognitive self”, as indicated by the toddler’s recognition of self in a mirror (Lewis & Brooks-Gunn, 1979), which is typically found between 16 and 24 months of age. This age is much younger than the average age of first autobiographical memory (around 3 1/2) remembered by adults, and is even younger than all but a few “earliest” memories reported in the childhood amnesia literature. In support of their proposal, Howe and Courage cite evidence that children do begin to have memory for specific episodes during the second year. However, true episodic memory at this age is highly controversial (e.g., Perner, 2000; Wheeler, 2000). The developmental evidence

indicates that verbal memories at this early point in development are sparse and fragmentary, gradually cohering into temporally extended narratives over the later preschool years. Whereas clearly the notion of self in memory is crucial to autobiographical memory, and thus to the issue of childhood amnesia, the explanation put forth by Howe and Courage rests on a single causal factor (e.g. the mirror self) that overcomes the amnesia “barrier” and forever changes the nature and the retention of a child’s memories. As such, it cannot account for the actual developmental emergence of and subsequent changes in autobiographical memory, nor can it account for variations by gender, culture, or individual differences. As Reese and her colleagues have shown (Harley & Reese, 1999; Reese, 2002a), evidence of a cognitive self in the toddler years is but one factor that is mediated by maternal discourse style in predicting later memories.

Most previous accounts of childhood amnesia assume that there is a “barrier” that needs to be overcome, and once this barrier is crossed, autobiographical memories are possible. Barrier accounts assume that what needs to be explained is the *lack* of autobiographical memories before a specific point, and then an offset to this amnesia that results in the presence of autobiographical memories. In contrast, our theory assumes that what is in need of explanation is the *presence* of autobiographical memories *at all*; how and why do humans develop autobiographical memory, and how does this occur developmentally? The accumulating evidence of a gradual emergence of autobiographical memories across the preschool years, rather than a break point before which there are no memories and after which there are, confirms our approach. Further, previous explanations of childhood amnesia have difficulty accounting for

individual, gender and cultural differences in autobiographical memories, differences that are not only explained within our approach but are actually predicted (Nelson, 1992, 1993a).

Gender, Cultural, and Other Differences in Autobiographical Memory

Certainly in adulthood, there are substantial individual differences in autobiographical memories, and these are in many cases related to gender and culture. In general, adult females have longer, more detailed, more vivid and more emotionally laden autobiographical memories than adult males of events from both adulthood and childhood (see Fivush & Buckner, in press, for a review). And individuals from Asian cultures have less detailed and fewer overall autobiographical memories than individuals from Caucasian cultures (Leichtman, Wang & Pillemer, in press; Pillemer, 1998). More important for our argument, there are also gender and culture differences in the age of earliest memory. Females tend to have an earlier age of first memory than do males (Pillemer, 1998), and Asians have a later age of earliest memory than do Caucasians (MacDonald, Uesiliana & Hayne, 2000; Mullen, 1994; Pillemer, 1998). Because we situate the emergence of autobiographical memory within social and cultural contexts that facilitate or hinder the development of the various components that coalesce into an autobiographical memory system, these differences are fully expected and explained within our model.

More specifically, maternal reminiscing style differs by gender of child and by culture. Although not all studies have found gender differences, when they do appear, they are in the direction of mothers being more highly elaborative and more evaluative of their children's participation with girls than with boys (Fivush, Berlin, Sales, Mennuti-Washburn & Cassidy, in

press; Reese et al, 1996; Reese & Fivush, 1993; see Fivush, 1998, for a review). In line with the emphasis on bidirectionality between mothers and children, we assume children bring different skills and interests to the reminiscing context, and some of these may be related to gender.

Related to this, Bauer and Burch (in press) have found that maternal reminiscing style, children's language skills and children's temperament all predict unique variance to children's developing autobiographical memory skills. In particular, small gender differences in temperament (Davis & Emory, 1995), in language ability (Hyde & Linn, 1988) and in interest in social interaction over motor activity (Maccoby & Jacklin, 1989), may lead girls to be more able and interested participants in reminiscing than are boys, and thus girls may elicit a somewhat different style from their mothers. At the same time, parental expectations of girls versus boys may lead mothers to assume girls are more social and relationally oriented than are boys (see Golombok & Fivush, 1994 for an overview) and therefore mothers and daughters may mutually engage in more highly elaborated reminiscing than mothers and sons.

Maternal elaborative reminiscing style would predict an earlier age of first memory for several reasons. First, a more elaborated reminiscing style will lead to more organized and detailed, and therefore more accessible memories. Second, more elaborative reminiscing would facilitate children's developing understanding of time, and especially self in time, through focusing the child on details of temporally specified events. Finally, more elaborated reminiscing would allow more opportunities for mothers and children to disagree and negotiate the past, thus facilitating children's developing understanding of memory as representational, and of the self as having a unique perspective, thus creating a truly personal past (Fivush, 2001;

in press). Thus our theory predicts that females would have an earlier age of first memory than males, and that females' memories would be more elaborated and detailed in general than are males, as has been found in the literature.

Just as expectations about gender roles may influence maternal reminiscing style, so might cultural expectations. Several theorists have posited that Euro-American cultures support a more independent notion of self whereas Asian cultures support a more communal concept of self, and these differences may be displayed in particular ways of processing information (Markus & Oyserman, 1989; Triandis, 1989). For autobiographical memory, Euro-American cultures might foster a more detailed sense of self in the past whereas Asian cultures might downplay the independent self in the past in favor of a more communal past. Studies showing that Asian mothers are less elaborative than American mothers (Mullen & Yi, 1995; Wang, Leichtman & Davies, 2000), support the idea that Asian mothers do not focus on the independent self as an agent of past experiences. Again, less elaborative reminiscing would predict later age of earliest memory, as has been found in Asian populations. These authors (Mullen, 1994; Wang, 2001) have also found differences between adults from Asian countries (Korea and China) and from the US in the age of earliest memories.

In a series of studies Peggy Miller and her colleagues (Miller, Wiley, Fung & Liang, 1997) have compared the narrative practices of Chinese and American families, concluding that the Chinese families use personal storytelling to convey moral and social standards, whereas American parents use storytelling for its entertainment values. Thus, although memory narratives are shared in both cultures, the social and self functions of the narratives vary by

cultural context. In comparisons between working-class and middle-class American families they found differences in the degree to which children were expected and encouraged to express their autonomy (Wiley, Rose, Burger & Miller, 1998). Strikingly, in a comparison of Chinese and American deaf children of hearing parents, the authors found that the preschool children managed to convey personal narratives of past experiences similar to those of hearing children, although conveyed through gesture and single vocalizations (Van Deusen-Phillips, Goldin-Meadow & Miller, 2001). However, they also noted that the children's narratives echoed the cultural differences in parental values, emphasizing moral lessons or entertainment. The authors suggest that the deaf children, who are not exposed to co-narration in the same way that hearing children are, nonetheless absorb the styles and values from all-encompassing social and cultural familial experiences and third-party narrations, as well as from the reactions of their parental audiences.

Gender and cultural differences support the idea that elaborative mothers help their young children to organize and elaborate on early memories and that these effects contribute to the later accessibility of these memories. If this account is correct, we would also expect that children who are deprived of the ability to converse about the past with adults would have deficits in their early memories. Weigle and Bauer (2000) examined this possibility by asking hearing and deaf adults to recall their two earliest memories. The deaf adults in this study did not grow up with sign language, and thus were deprived of language interaction during their early years. Against predictions, these groups did not differ in age of earliest memory, but they did differ in the density of early memories. The average age of the two earliest memories for hearing adults was

19 months younger than the average age of the two earliest memories for deaf adults, suggesting that deaf adults have significantly sparser early memories than hearing adults. This conclusion accords with the hypothesis that they lacked experience with discourse about the past. It might also reflect the specific effect that lack of language prevents rehearsal.

There are also gender and culture differences in the ways in which emotions are incorporated into parent-child reminiscing. Parents talk more about emotions with their preschool girls than boys (Fivush, Brotman, Buckner & Goodman, 2000; Fivush & Buckner, in press; Fivush et al., in press). Focusing to a greater extent on emotion with girls than with boys may lead females to have more emotionally laden autobiographical memories throughout the lifespan, and indeed, some studies have found exactly this (Bauer, Stennes & Haight, 2003; Davis, 1990). Similarly, American parents focus on emotion in reminiscing more than do Asian parents (Wang, 2001) and American children include more emotion in their independent narratives of past events than do Asian children (Han, Leichtman & Wang, 1998). Thus differences in maternal style seem to have implications for the content of autobiographical memories across the lifespan.

Functions of Reminiscing

Given the theoretical perspective we have outlined here, the question changes from why one does not have autobiographical memories before the age of about 3 (at least in Caucasian, Western cultures) to the question of why, as human beings, we develop an autobiographical memory system at all. As we have argued throughout this paper, autobiographical memory emerges within specific social and cultural milieus, which shape the ways in which individuals

may or may not develop memories of a specific personal past. Thus we argue that autobiographical memory serves mainly social and cultural functions. Whereas memory for specific episodes are important for anticipating and predicting the environment (e.g., Nelson, 1986; 1996) autobiographical memory as defined here, is about defining self in time and in relation to others. These functions allow individuals to create a shared past with others from which an individual personal past emerges. The human ability to create a shared past allows each individual to enter a community, or culture, in which individuals share a perspective on the kinds of events that make a life and shape a self (Fivush, 1988; Fivush, Haden & Reese, 1996). In some cultures, and to some extent in all, these functions may be served by shared cultural narratives, while in others (such as the contemporary West) more may depend on the individual's self definition and self story (Nelson, in press).

Perhaps surprisingly, then, valuing a sense of the past appears not to be a universal human characteristic. Leichtman and her colleagues have studied residents of a rural Indian village who claim not to remember events from their early lives, and to deny the value of so remembering (Leichtman, 2000). Of course we would not claim that they have no sense of "past" as we would claim for very young children, but this sense does not appear to be far extended. Things that happened "long ago" are said to be of no interest, and therefore are not remembered. Because the past is not highly valued in this culture, it is very little differentiated: it contains very few landmarks, in contrast to the multiplicity of markings that most Westerners, and indeed most urban dwellers of other cultures may report. Thus the way in which the past is

understood, constructed and differentiated will be very much a function of the kinds of cultural values and goals that are placed on the shared understanding of a past.

More specifically, shared reminiscing provides children with information about how to be a “self” in their culture. Whereas modern western cultures tend to assume that the self is an active agent in the construction of one’s life course, Asian cultures tend to emphasize the goals of family and community. By focusing less on the past, less on the self in the past, and less on emotional aspects of the past, Asian mothers may help their children to adopt the culturally appropriate understanding of the role of self as an integrated part of a community (Leichtman, 2001; Leichtman, Wang & Pillemer, in press). In contrast, western mothers are focusing the child on an independent self in the past as differentiated from others, and possibly a more differentiated sense of others as well.

Even within a specific culture, mothers who are more highly elaborative may be working harder to establish a shared history that functions to maintain a shared identity. In accord with this supposition, recent research has established that dyads that have a more secure emotional attachment (Ainsworth, Blehar, Waters, & Well, 1978 ; Bretherton, 1990; Thompson, 2000) engage in more elaborated reminiscing (Fivush & Vesudeva, 2002; Farrant & Reese, 2001). This finding suggests that individual differences in the ways in which mothers and children co-construct their past together may serve the social and emotional functions of familial bonding (Fivus et al., 1996). Moreover, individual variation in this function of autobiographical reminiscing may be related to gender, such that females engage in more elaborated and more emotionally laden reminiscing beginning early in development, leading to a more embellished

shared past, more emotionally laden relationships with others, and a more detailed sense of an autobiographical self (Fivush & Buckner, in press). Moreover, through the creation of a shared past, individuals gain a sense of who they are in relation to others, both locally within their family and community, and more globally within their culture. Through the creation of a shared past, we attain a shared perspective on how to interpret and evaluate experience, which leads to a shared moral perspective. In a very real sense, the achievement of an autobiographical memory system sets the stage for the intergenerational transmission of family and cultural history, which is the bedrock of human culture.

Conclusion

The theoretical perspective presented here differs from most other theories of autobiographical memory in two ways: it is specifically developmental and it incorporates social, cultural, and linguistic processes as constituents in its development and operations. With most others we see the centrality of self in autobiographical memory, as a personal construction of life's experiences, giving rise to the possibility of re-experiencing the past (and pre-experiencing the future) through auto-noetic processes. However, rather than viewing the self in this construction as an autonomous construction of the mind or the brain, we view it as a product of innumerable social experiences in cultural space that provide for the developmental differentiation of the sense of a unique self from that of undifferentiated personal experience. This view has many roots, particularly in the social theories of James Baldwin and G. H. Mead.

The developmental perspective on memory and self is especially important. When autobiographical memory is viewed from the standpoint of normal adult functioning, the stability

of a sense of self and its experiential past seems assured. The problem then is typically seen as why certain memories are retained in an autobiographical store and why some are forgotten. Among the latter, memories from the earliest years of life have posed significant theoretical puzzles. Usually the problem has been seen as some sort of barrier that prevents the adult from traveling backward beyond the 3-year-old mark to recover the earliest memories (James, 1890). And again, typically, as we have emphasized, theorists have postulated single factors that stand in the way, for example, repression, immature life schemas, inadequate self concepts, and so on.

From the developmental perspective, there is no barrier, but rather continuity in development within a social-cultural context, where new functions and competences emerge and blend with the old, supported by and enriched by the contributions of the social, linguistic and cultural world. (These three words, of course, define the human world, but they are not always seen in that light.) Infants develop into toddlers and then into pre-schoolers, and then enter middle childhood and adolescence. Much changes organically over this period in terms of motoric, cognitive, linguistic, emotional, neuronal, physical growth, and social development. Memory, even autobiographical memory, is not something apart from these developments, but, as much recent research has demonstrated, it is related to developments in the sense of self, theory of mind, language skills, social attachments, and to the social engagement of parents and others as illustrated in Figure 1. These intertwined relationships point to the emergence of autobiographical memory as a significant central development of this early period, with implications for social, cultural, and cognitive growth over the succeeding years.

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Table 1. Examples of children's personal narratives over time ("I" stands for Interviewer and "C" stands for child, and "... " indicates some missing dialogue).*

Example 1:

At 46-months-old:

I: When you went to (name of beach resort), remember doing that?

C: I saw, um, penguins go to the beach. Sometimes the fin goes in the ice. They got hats.

I: Oh really

C: Uh huh, when I go to the beach, I got those kinds of hats.

I: ...Can you think of the very first thing you did when you got to the beach?

C: Um, the first thing we did, we had dinner. (unintelligible) then we went swimming.

I: You went swimming?

C: Then we went came down there. We, I, I didn't have my bathing suit on. Mommy took me up to the hotel and we, um, I put on my bathing suit. She didn't want to go when she didn't want to put her bathing suit on. Then I went in. That's it.

At 70-months-old:

I: Can you tell me when you went to Seaworld?

C: Oh, it was fun when we went to Seaworld. It was real fun. Um, we saw a whale show. And, umm, the whale show, if you saw them dive up, the whales, that you'll get all splashed.

And I was wet.

I: You were wet.

C: 'Cause we were like sitting in the second row, and we got wet. But, if you were sitting like very up high, you won't get as wet. And we saw Shamu, and, um, we, um, what else did we see? We saw a real pretty girl with a white bird. That was (several unintelligible words) like white bird that was (unintelligible word). And I was, then we had lunch there. My mom took a picture of a white bird. A real pretty white bird. That was a long time ago.

Example 2:

At 46-months-old:

I: Tell me about the Easter egg hunt.

C: I find the basket. I won the Golden Egg (singsong voice).

I: You won the Golden Egg?...So tell me some more about finding that Golden egg.

C: In the tree.

I: In the tree?...Do you have any more to tell me about the Easter egg hunt?

C: I found, we found candy inside of different eggs. They were green, pink, yellow, orange, umm, and blue. And we found candy inside. Jellybeans, suckers, and tootsie rolls, and, and, maybe I, we found different color jellybeans.

I: Uh huh, yum yum.

C: And yum yum yum. And we ate cupcakes with M&M sprinkles and maybe had drinks of lemonade.

At 70-months-old:

I: Can you tell me about the ballet recital?

C: It was driving me crazy.

I: Really?

C: Yes, I was so scared because I didn't know any of the people and I couldn't see Mom and Dad. They were way on top of the audience. Right in front of the stairs. Umm, we were on a slippery surface and we all did "Where the wild things are." And we have hats which went to it. Mine had horns sticking out of it. And I had baggy pants. And, umm, Breen was our director which we watched the whole time. My sister was a flower, she was the leader, she was the leader of the whole crew. And, umm, she was an orange flower.

I: Oh, how pretty.

C: Her, her dress, her dress, and her thing that went around her neck was supposed to be orange but it looked more like red. The leotard was supposed to match, but the leotard's orange and the costume looks red. And they put these headbands around their heads. They had to put flowers, and the fake flowers sticking put of the headband.

Table 2. Examples of high and low elaborative parents across early childhood.*

High elaborative mother	Low elaborative mother
At 40 months of age	
<p>Mother: What was near the ocean that you played with?</p> <p>Child: I don't know.</p> <p>Mother: Do you remember that we used to walk, we used to walk on the beach and –</p> <p>Child: Um hmm Mommy</p> <p>Mother: And what did we pick up?</p> <p>Child: I don't know</p> <p>Mother: You don't remember?</p> <p>Child: You tell me</p> <p>Mother: Remember we picked up sea –</p> <p>Child: Uh huh</p> <p>Mother: --shells. Remember all the seashells we collected?</p>	<p>Mother: Who else went with us? Think about who was in the car, when we went...</p> <p>Child: Tyler (younger brother)</p> <p>Mother: Did Tyler go with us?</p> <p>Child: Yeah</p> <p>Mother: No, Tyler didn't go with us. Who else went? Did Daddy go?</p> <p>Child: Yeah</p> <p>Mother: He did? Now think about who was in the car the day we went.</p> <p>C: You and Daddy did</p> <p>Mother: Daddy wasn't there. What was sitting up front with Mommy?</p>
At 8-years-old	
<p>Mother: Do you remember any animals at that zoo that we don't have at our zoo?</p> <p>Child: Umm, cheetahs.</p> <p>Mother: Yeah. Oh, I remember one.</p> <p>Child: What?</p>	<p>Mother: Do you remember last summer when we were in Mount Eagle?</p> <p>Child: I think.</p> <p>Mother: Well, Andrew and Emma and all of them were there.</p>

Mother: kinda big.	Child: Yeah
Child: Oh, white white tiger	Mother: And Lisa –
Mother: Yeah, that’s right. They had white tigers... You know what? We may not have seen them now that I think about it. The hippos. Were the hippos out?	Child: Um hmm
Child: I don’t think so. Oh, the kangaroos.	Mother – brought our some –
Mother: Oh yeah! They had kangaroos, didn’t they?	Child: Shaving cream. We had a shaving cream fight. I covered myself, but I –
Child: Um hmm	Mother: Tell me about that. How did you do all that?
Mother: I forgot about that.	Child: You know, you were there.
	Mother: Well, I wasn’t down there. I was just watching.
	Child: So, you were still there.

*examples are taken from Reese et al (1996)

Table 3. Examples of parent-child negotiations about the past

Example 1: Mother and 5-year-old child discussing a visit to a museum of Natural History:

M: What other kinds of dinosaurs were in there?

C: Uh, Tyrannosaurus Rex.

M: ...and they made 'em move, didn't they? Didn't they move?

C: No.

M: They did too move (laughing)

C: No, he did not. It did not have his skin on.

M: Oh, that's right, one of 'em was just bones.

C: That was Tyrannosaurus Rex.

M: Tyrannosaurus Rex was just his bones. Ok.

Example 2: Mother and 6-year-old child discussing a trip to American Adventures:

M:...That was our first time there, and I thought you had –

C: (interrupting) No, I don't, no, it wasn't my first time there.

M: Yes it was.

C: You don't remember. Mom, remember when we went to it, umm, not at

Chad's birthday and not when we met Lauren, some other time.

M: Oh, that was when we went to that place in Florida.

C: No

M: With the rugs?

C: No.

M: Okay, well, that's enough about American Adventures.

Example 3: Mother and 4-year-old child discussing a carnival:

M: ...Was that fun to go on the ferris wheel?

C: No.

M: It wasn't fun? You said it was fun. Was it scary?

C: Yeah. I didn't like the swings.

M: I know you like to swing. But you just sat there.

Figure Captions

Figure 1. Hypothetical relations in developments from 1 to 5 years leading to the emergence of autobiographical memory. Larger arrows indicate more direct influences; double-headed arrows indicate reciprocal influences. Years in the bottom scale indicate approximate ages when influences come into play on average in normal development. Areas above the center are presumed to be more endogenous, those below more exogenous as sources of development.

Figure 2. Significant correlations among maternal levels of elaboration and children's memory responses over time. (Reprinted from Reese, Haden, & Fivush, 1993).

Figure 3. The hypothetical distribution of memories across the lifetime of a 20-year-old subject. Solid line represents a linear function of normal forgetting; broken line represents the accelerated forgetting due to childhood amnesia. (Reproduced from Wetzler & Sweeney, 1986, p. 193).